DEVI AHILYA VISHWAVIDYALAYA, INDORE

FACULTY OF ENGINEERING

SCHEME OF EXAMINATION (CBCS)
&
COURSE OF CONTENTS
Electronics and Instrumentation

BE Programme
(Common to All Branches)
Effective from July 2015

INSTITUTE OF ENGINEERING & TECHNOLOGY

(www.iet.dauniv.ac.in)

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

CBCS SCHEMES OF EXAMINATION FOR BE I PROGRAMME
(Subject to Revision)

B. E. I YEAR (Common to all branches)

(Computer Engineering, Information Technology and Civil Engineering*)

SEM - 1				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR1C1	Applied Mathematics-I	3-1-0	PC1
2.	ACR1C2	Chemistry & Environment Science	3-1-1	PC2
3.	MER1C3	Elements of Mechanical Engineering	3-1-1	PC3
4.	ETR1C4	Basic Electronics	3-1-1	PC4
5.	MER1C5	Workshop Practice	0-1-2	PC5
6.	SSR1S1	Technical English	3-1-0	SS1
7.	BER1V1	Comprehensive Viva I	0-0-4	Viva1
Total Credit for SEM I			**26 actual + 4 Virtual credits**	

SEM – 2				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR2C1	Applied Mathematics-II	3-1-0	PC1
2.	APR2C2	Applied Physics	3-1-1	PC2
3.	MER2C3	Engineering Drawing	2-1-2	PC3
4.	EIR2C4	Electrical Engineering	3-1-1	PC4
5.	COR2C5	Computer Programming in C++	3-1-1	PC5
6.	SSR2S2	Humanities	2-0-0	SS2
7.	BER2V2	Comprehensive Viva II	0-0-4	Viva2
Total Credit for SEM II			**26 actual + 4 Virtual credits**	

* Semester 1 for three branches and Semester 2 for other three branches for the teaching load balancing.

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

CBCS SCHEMES OF EXAMINATION FOR BE I PROGRAMME
(Subject to Revision)

B. E. I YEAR (Common to all branches)

(Mechanical Engineering, Electronics & Telecommunication Engineering and Electronics & Instrumentation Engineering*)

SEM - 2				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR2C1	Applied Mathematics-II	3-1-0	PC1
2.	APR2C2	Applied Physics	3-1-1	PC2
3.	MER2C3	Engineering Drawing	2-1-2	PC3
4.	EIR2C4	Electrical Engineering	3-1-1	PC4
5.	COR2C5	Computer Programming in C++	3-1-1	PC5
6.	SSR2S2	Humanities	2-0-0	SS2
7.	BER2V2	Comprehensive Viva II	0-0-4	Viva2
Total Credit for SEM II			**26 actual + 4 Virtual credits**	

SEM – 1				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR1C1	Applied Mathematics-I	3-1-0	PC1
2.	ACR1C2	Chemistry & Environment Science	3-1-1	PC2
3.	MER1C3	Elements of Mechanical Engineering	3-1-1	PC3
4.	ETR1C4	Basic Electronics	3-1-1	PC4
5.	MER1C5	Workshop Practice	0-1-2	PC5
6.	SSR1S1	Technical English	3-1-0	SS1
7.	BER1V1	Comprehensive Viva I	0-0-4	Viva1
Total Credit for SEM I			**26 actual + 4 Virtual credits**	

* Semester 1 for three branches and Semester 2 for other three branches for the teaching load balancing.

Semester 1

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE-I Year (Common to all branches)
Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AMR1C1:
Applied Mathematics-I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To develop the concepts of calculus, useful to create mathematical models in order to arrive into an optimal solution in various disciplines like physics, engineering, economics, and statistics.
- Provide the fundamentals of formal techniques like differentiation to find the slope of a curve, find approximation to the original function by Taylor's series, determine the stationary points of functions in order to sketch their graphs, optimization of functions and so on; Integration to find areas, volumes, central points and many useful things; Vector fields to represent many physical quantities like velocities, forces (useful in fluid mechanics), particle displacements (useful in solid mechanics), and electric and magnetic fields (electromagnetism).

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT-I

Differential Calculus: Review of Successive differentiation, Leibnitz theorem and problems; Expansion of functions by Taylor's and Maclaurin's Theorem; Asymptotes; Curvature in Cartesian and Polar Coordinates; Envelopes; Evolutes and Involutes.

UNIT-II

Advanced Differential Calculus: Function of Several Variables; Partial Differentiation; Approximations and errors; Jacobians; Taylor's Series of Two Variables; Maxima and Minima of Function of Two and More Variables; Lagrange's Method of Undetermined Multipliers.

UNIT-III

Integral Calculus: Beta and Gamma functions; detailed study of tracing of curves-Cartesian, polar and parametric curves; Area; Length of Curve; Volume; Surface of Revolution; Theorems of Pappus and Guldin and problems.

UNIT-IV

Advanced Integral Calculus: Multiple integrals: Double and Triple Integration; Change of Order of Integration; Area; Volume; Centre of Gravity; Moment of Inertia.

UNIT-V

Vector Calculus: Differentiation of a Vector; Gradient; Divergence; Curl; Integration of a Vector Function; Gauss's, Green's and Stoke's Theorems.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply the concept of function derivatives to study the behaviour and rate of how different quantities change, how the graph of a function can actually be computed, analysed, and predicted and use integrals to find the summation of infinitely many small factors to determine whole.
- Learn the applicability of calculus in various fields like, in physics, it is used in the study of motion, electricity, heat, light, harmonics, acoustics, astronomy, dynamics and advanced physics concepts including electromagnetism and Einstein's theory of relativity use calculus. In the field of chemistry, calculus can be used to predict functions such as reaction rates and radioactive decay. In addition, it is used to check answers for different mathematical disciplines such as statistics, analytical geometry, and algebra.
- Find a way to construct relatively simple quantitative models of change, and deduce their consequences.

BOOKS RECOMMENDED

[1] B.S.Grewal, Engineering Mathematics, 39/e, Khanna Publishers, 2006.

[2] Erwin. Kreyszig, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.

[3] Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.

[4] C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co. Ltd., 6/e, 2003.

[5] H.K.Das, Higher Engineering Mathematics, S.Chand New Delhi.

[6] E Mendelson, G J Hademenos, F Ayres, Schaum's Easy Outline: Calculus, McGraw-Hill, 2000.

[7] R C Wrede, M Spiegel, Schaum's Outline of Advanced Calculus, 2/e, McGraw-Hill, 2002.

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<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ACR1C2:
Applied Chemistry &
Environmental Science</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To learn chemistry of various engineering materials and processes, their importance, properties, testing, structure-property relationship, tailoring and their applications in various technologies.
- To understand and aware with various environmental issues and pollution and control studies in modern society for sustainable development.

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Prerequisite: Nil

COURSE OF CONTENTS

UNIT-I WATER AND ITS APPLICATIONS

Sources, impurities, applications, Hardness- its expression and determination; Boiler troubles and their causes; Industrial water requirement, Treatment of water for industrial purpose; De-ionization of water; Analysis of water; Water quality parameters, Numerical problems on water analysis and water treatment processes.

UNIT-II ENGINEERING MATERIALS AND TESTING

Introduction, classification and requirement of engineering materials. Material testings.

Polymers: Chemistry of polymer materials and their diversification; Types of polymerization and their brief account; Examples of polymers.

Cement, Glass and Refractories: Different types, composition, properties and uses.

UNIT-III LUBRICANTS

Introduction, Principle and functions of lubrication, Types of lubricants, Properties, tests and applications of solid, semi-solid and liquid lubricants; Synthetic lubricants and lubricating emulsions.

UNIT-IV INSTRUMENTAL TECHNIQUES IN MATERIAL CHARACTERIZATION

Classification, Lamberts and Beers Law; Introduction, Principle and applications of Colorimetry, IR, UV-Vis, NMR and Mass spectroscopy; Chromatographic Techniques and applications, Numerical Problems on spectroscopic techniques.

UNIT-V ENVIRONMENTAL SCIENCE

Components of Environment and their interactions, Natural resources, Ecosystem, Impacts of development of environment, Environment protection act, EIA, Sustainable development.

Pollution and its types, Description, effects and control measures of Air, Water, Land and Noise pollution, Chemical toxicology, Global warming, Depletion of ozone layer, Acid rains, Eutrophication, Rain water harvesting, Pollution case studies.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply applications of various engineering materials in different technologies.
- Relate structure-property-uses relationship of engineering materials and tailoring of materials for technology development.
- Use of material testing and material characterization required in different engineering applications.
- Understand the components of Environment and their interactions with modern world. Also to analyse factors affecting, causes of Environmental Pollution and to apply possible control measures for Sustainable development.

BOOKS RECOMMENDED:

[1] Jain & Jain, Engineering Chemistry, Dhanpat Rai Publications, 2007.

[2] S. S. Dara, A Text Book of Engineering Chemistry, S. Chand & Company, 2007.

[3] B.Joseph, Environmental Studies, Tata McGraw Hill.

[4] A.K. De, Environmental Chemistry, New Age International, 1996.

[5] Shashi Chawala, A Text Book of Engineering Chemistry, Dhanpat Rai Publications, 2006.

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<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER1C3:
Elements of Mechanical Engineering</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To understand the basic fundamentals of Mechanical Engineering in light of thermal engineering and production engineering.
- To provide an insight about the basic thermal and production processes, materials, components and applications.

Prerequisites: Nil.

COURSE OF CONTENTS

UNIT I

Thermodynamics and energy, Temperature and Zeroth law of thermodynamics, Systems and control volume, Properties of a system, Energy transfer by heat and work, First law of thermodynamics, Energy analysis of closed systems, Internal energy and enthalpy of ideal gases, Energy analysis of steady flow systems, Analysis of some steady flow engineering devices, Relevant review problems.

UNIT II

Properties of pure substance, p-v and T-s diagram for a pure substance, Mollier diagram for a pure substance, Quality or dryness fraction, Steam tables, Methods for measurement of steam quality, Relevant review problems.

UNIT III

Basic considerations in the analysis of power cycles, Air standard assumptions, Overview of reciprocating engines, Thermodynamic analysis of Otto cycle: Ideal cycle for spark ignition engines, Thermodynamic analysis of Diesel cycle: Ideal cycle for compression ignition engines, Comparison of Otto and Diesel cycles, Effect of Specific Heat and Dissociation on the performance of the cycles, Relevant review problems.

UNIT IV

Metal Casting: Classification and overview of metal casting processes: sand casting, expandable mould casting and permanent mould casting; Patterns, cores and moulding; Elements of gating systems; Heating, pouring and solidification; Casting quality: cleaning, finishing and defects.

UNIT V

Welding and Machining: Fundamentals of welding and overview of welding processes: Oxy-Acetylene gas welding, Arc welding: TIG, MIG, SAW etc., Resistance welding; Soldering & Brazing; weld quality and defects; Fundamentals of metal machining and introduction to turning and related operations; Constructional features of lathe, Geometry of single point cutting tool and cutting tool materials.

Learning Outcomes:

- Upon Completing the Course, Student will able to:
- Understand basics of thermodynamics and components of steam.
- Identify engineering materials, their properties, manufacturing methods encountered in engineering practice.

- Understand basics of internal combustion engines.
- Understand functions and operations of welding, casting and machine tools including milling, shaping, grinding and lathe machines.

BOOKS RECOMMENDED:

[1] Nag P K, Engineering Thermodynamics, The McGraw-Hill Companies, Fourth Edition.
[2] P N Rao, Manufacturing Technology, Vol. I and Vol.2 Tata McGraw-Hill, 4th Edition, 2014.
[3] Hajra & Chaudhary, Work Shop Technology, Vol. 1 & 2, 12th Edition, Media Promoters & Pub, 2007.
[4] Cengel Y A, Boles M A, Thermodynamics-An Engineering Approach, The McGraw-Hill Companies, Fifth Edition.
[5] Mikell P. Groover, Fundamentals of Modern manufacturing, 3rd Edition, John Wiley and Sons.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR1C4:
Basic Electronics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce the basic concepts of electronics along with the understanding of working fundamental circuit devises such as diode, transistors and op-amp. To apply the basics of diode to describe the working of rectifier circuits such as Full and half wave rectifiers and zener diode as a voltage regulator in line and load regulation.Describe the application of transistors for Current and voltage amplification, the characteristics of different configurations of the transistor, DC load line and bias point. List, explain, and design and analyse the different biasing circuits, to give basic knowledge of working of op-amp, its characteristics and applications
- **Prerequisite(s):** nil

COURSE OF CONTENTS

UNIT I

Discrete electronic devices: Diode, zener diode, BJT (Bipolar junction transistor), LED, photodiode phototransistor, varactor; characteristic and operation (qualitative description and quantitative behaviour with black box approach)

UNIT II

Diode circuits; clipper, clamper circuits, DC power supply: rectifier-half wave, full wave (center tapped, bridge), zener regulated power supply, regulation (with regulator IC-LM317)

UNIT III

BJT characteristics; BJT biasing; CE-biasing circuits: operating point; h-parameter model of transistor; large/small signal models (concept);large/small signal models of CE-BJT amplifier, Design of amplifier; Differential amplifier (using BJT).

UNIT IV

Operational amplifier: basic model; virtual ground concept; inverting amplifier; non-inverting amplifier; integrator; differentiator; Schmitt trigger; astable multivibrator, Simple active filters: low pass, high pass, bandpass, notch filter

UNIT V

Basic feedback theory; +ve and -ve feedback; concept of stability; oscillator, Waveform generator using op-amp schimitt trigger for Square wave, triangular wave Wien bridge oscillator for sinuisoidal waveform.

Learning outcomes:

- Students will be able to get the knowledge of Q point and can calculate it using different biasing circuits. They will easily compare different biasing circuits on the basis of stability factor.

- Students will be able to solve clipper and clamper circuits. They get the knowledge og op-amp and its various applications as integrator, differentiator and as an oscillator.

BOOKS RECOMMENDED:

[1] Ralph J.Smith, R.C.Dorf circuits, devices and systems, john Wiley, 1992.
[2] R.L.Boylestad, L. Nashelsky, Electronic devices, and circuit theory, Prentice Hall, 2002.
[3] A. S. Sedra, K.C. Smith, Microelectrinic circuits, Oxfort University Press, 1998
[4] R.A. Gayakwad, OP-amps and linear integrated circuits, Prentice Hall of India.
[5] Millman, Grabel, Microelectronics, Mc-Graw-Hill.
[6] De Carlo, and Lin, Linear circuit analysis, Oxford Univesity Press, 2001 (second edition).
[7] Hayt, Kammerly and Durbin, Engineering Circuit Analysis, Tata McGraw Hill, sixth edition.

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<tr><td colspan="2">Devi Ahilya University, Indore, India
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Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SSR1S1:
Technical English</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

. **Learning Objectives:**

- To develop the English communication skills in terms of reading, writing and understanding of Engineering terms.
- To develop the technical ideas in English and to be able to express the technical ideas.

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT I

Basic of technical communication: Meaning of technical communication; process of communication; Forms of communication: Verbal and Non-verbal; technology-enabled communication; Barriers to communication; Essentials of effective communication; Types of communication; Defining audiences for technical communication; Aspects of communication: Global, Ethical and Legal.

UNIT II

Professional correspondence: Qualities of professional correspondence: Goodwill techniques; Types of correspondence: Letters, Memos, E-mails; Business Letters: Elements of a Letters, Basic Letter Formats; Types of Business Letters: Positive Letters, Negative Letters, Inquiry Letters, Sales Letters, Complain and Adjustment Letters. Memos: Meaning and Format of Memos. Writing job application letters & Designing Resumes; Meeting and Minutes.

UNIT III

Technical Writing: Meaning & Concept of Technical Writing: Process of Technical Writing: Forms of Technical Writing: Technical Description, Summaries, Instructions & User Manuals: Technical Reports: Meaning and Essentials of Good Report Writing: Classification of Reports; Report Formats: Formal and Informal; Common Informal Technical Reports: Progress Reports, Lab Reports, Feasibility reports, Problem Solving Reports.

UNIT IV

Reading Comprehension; Precis Writing; Expansion of an idea; Dialogue Writing; Paragraph Writing (Related to Technical Communication).

UNIT V

Foreign Words & Phrases; Antonyms and Synonyms; Transitional Words and Phrases; Articles, Use of Prepositions, Modal Verbs, Connectives, Relative Clauses, Noun/Nominal Compounds: Correction of Sentences and Homophones; Punctuation, Abbreviations, Capitalization and Number Usage; Use of Technical Words and Jargons.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply various technical terms and terminologies practically
- The course aims at developing the fundamentals of Technical English and mastery in the professional writing like Business letters, Business correspondence .designing Business

Memorandum, Resume and E-mail writing.

- Will be able to write formal and informal reports in work place.
- Will have complete knowledge of comprehending different passages and Precis writing.
- Apply various grammatical skills practically.

BOOKS RECOMMENDED:

[1] A. Esenberg, A Beginner's Guide to Technical Communication, McGraw-Hills.
[2] A. J. Rutherford, Basic Communication Skills for Technology, Pearson Education Asia.
[3] C. L. Bovee, J. V. Thill & B Schatzman, Business Communication Today, 7/e, Pearson Education, 2002.
[4] R. V. Lesikar, J. D. Perrit, Jr., & ME Flately, Lesikar's Basic Business Communication.
[5] R. C. Sharma and K. Mohan, Business Correspondence and Report Writing, Tata McGraw-Hill, 2002.

Semester 2

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE I Year (Common to all branches) Semester- 2			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
AMR2C1:	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Applied Mathematics-II	**3**	**1**	**-**	**3**	**1**	**-**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To introduce the mathematical concepts of Matrix Algebra, Differential Equation Probability and Statistics and Fuzzy sets for solving engineering problems that shall be used in various branches of engineering.
- Provide the basics of Matrix mathematics useful in providing a more compact way to deal with groups of equations in linear algebra; Differential equations, a mathematical equation that relates some function (usually represent physical quantities) with its derivatives (represent their rates of change), and the equation defines a relationship between the two; Probability distributions describe the dispersion of the values of a random variable; Curve fitting and regression analysis, to find the "best fit" line or curve for a series of data points; Theory of equations, which tells when an algebraic equation has an algebraic solution; Fuzzy sets generalize classical sets (Crisp sets), as the characteristic functions of classical sets are special cases of the membership functions of fuzzy sets.

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT-I

Matrix Algebra: Review of Matrices; Elementary Operations on Rows and Columns; Normal Form; Linear Dependence; Rank; Application of Rank Theory in Solving System of Linear Equations; Linear Transformation; Orthogonal, Unitary and Hermitian Matrices; Characteristic Equation; Eigen- Values and Eigen-Vectors; Caley-Hamilton Theorem; Quadratic and Linear forms.

UNIT-II

First Order Ordinary Differential Equation: Exact Differential Equation; Equations Solvable for x, y and p; Clairaut's Form; Application to Simple Problems.

Higher Order Ordinary Differential Equation: Linear Differential Equations with Constant & Variable Coefficients; Method of Variation of Parameters, Simultaneous Differential Equations; Application to Simple Problems.

UNIT-III

First Order Partial Differential Equations: Formation of Partial Differential Equations; Partial Differential Equations of First Order and First Degree i.e. $Pp + Qq = R$.

Higher Order Partial Differential Equations: Linear Homogenous Partial Differential equations of n^{th} order with constant coefficients; method of Separation of variables; their Simple applications.

UNIT-IV

Probability and Statistics: Conditional Probability, Baye's Theorem; Binomial, Poisson and Normal distributions and their Mean and Variance, Methods of least squares and curve fitting, Correlation and Regression Analysis.

UNIT-V

Theory of Equations: Polynomial equations, relation between root and coefficients, symmetric functions of roots, cube roots of unity, Cardon's method for solution of cubic equations.

Fuzzy sets: Membership function, definition, Operations on Fuzzy sets, Properties of Fuzzy sets.

Learning Outcomes:

Upon completing the course, students will be able to:

- Express a linear map between finite-dimensional vector spaces with a matrix, calculate the electrical properties of a circuit, with voltage, amperage, resistance, etc. with matrix arithmetic, use them in 3D geometry (e.g. computer graphics), can try to improve linear solvers efficiency. Matrices can also represent quadratic forms (for example, in analysis to study hessian matrices, which help us to study the behaviour of critical points) and also computers run Markov simulations based on stochastic matrices in order to model events ranging from gambling through weather forecasting to quantum mechanics.
- Use differential equations to model natural phenomena, engineering systems and many other situations like exponential growth and decay, the population growth of species or the change in investment return over time, describing the movement of electricity, in modelling chemical reactions, in finding optimum investment strategies, describing the motion of waves, pendulums or chaotic systems.
- Handle probability distributions, to indicate the likelihood of an event or outcome, which are used for making forecasts and risk assessments. Pdf's are quite important and widely used in insurance, engineering, physics, evolutionary biology, computer science and even social sciences such as psychiatry, economics and even medical trials.
- Use fitted curves as an aid for data visualization, to infer values of a function where no data are available, and to summarize the relationships among two or more variables.
- Apply Fuzzy sets and logic to reason like a human in terms of linguistic variables, design Traffic monitoring systems, AC and heating ventilation, Gene Expression data analysis, Facial pattern recognition, Weather forecasting systems and many more.

BOOKS RECOMMENDED:

[1] B.S.Grewal, Engineering Mathematics, 39/e, Khanna Publishers, 2006.

[2] Erwin. Kreyszig, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.

[3] Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.

[4] C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co. Ltd., 6/e, 2003.

[5] H.K.Das, Higher Engineering Mathematics, S.Chand New Delhi.

[6] Zafar Ahsan, Differential Equation and their Applications, Prentice Hall of India Pvt. Ltd., New Delhi, 2004.

[7] S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical statistics, Sultan Chand & Sons., 2000.

[8] Freund John E, Mathematical Statistics, PHI, N.D., 7th Ed., 2010.

[9] G. J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PHI, New Delhi, 2005.

[10] H. J. Zimmerman, Fuzzy Set Theory and its Applications, Allied Publishers, 1996.

[11] Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd Edition, John Wiley & Sons, Inc., 2010.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">APR2C2:
Applied Physics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce the basics concepts of physics and make a bridge between basics and their application.
- To introduce the concept of the modern science like Laser, Optical fire, X-rays and quantum physics.
- To introduce fundamental physics like wave optics, interference, diffraction polarization, and semiconductor physics.

Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I

Optics-I: Interference of Light Waves: Thin film, Newton's Ring experiment, Michelson interferometer; Diffraction of Light Waves: Fresnel's & Fraunhoffer diffraction, Zone plate, Single slit experiment, diffraction by double slit, Diffraction at Circular aperture, Plane transmission Grating.

UNIT-II

Optics-II: Polarization of Light Waves, Double refraction, Nicol Prism, Half Wave & Quarter Wave plates, Circularly & elliptically polarized light, Polarimeter; LASER: Stimulated & spontaneous emission, Population Inversion, Optical Resonator, Einstein's coefficients, He-Ne Laser, Co_2 Laser, Semiconductor Laser; Optical Fiber: types of Fibers (material, refractive index, mode), Acceptance angle, Numerical aperture, V-Number, Propagation of Light through Fibers, Applications.

UNIT-III

Crystal Structure and Semiconductors: Symmetry & properties of Simple crystal structure, Miller's Indices, Interplanar spacing, production and properties of x-ray, Bragg's law; Semiconductors: Band theory of Semiconductors, Intrinsic & extrinsic semiconductors, Fermi level , pn junction diode, LED, Zener diode, npn & pnp Transistors.

UNIT-IV

Electromagnetism: Continuity equation for Charge & Current, Inconsistency of Ampere's law for time varying field, Concept of Displacement current, Maxwell's equations; Wave equations for E & H, Propagation of one dimensional electromagnetic waves in dielectric medium, Energy density in electromagnetic field: Poynting Vector.

UNIT-V

Quantum Physics: Plank's law, Compton's effect, Concept of Matter Waves, Devison & Germer's experiment, Phase velocity & Group velocity, Heisenberg's Uncertainty Principle; Schrodinger 's Wave Equation, Interpretation of Wave function Ψ, Time dependent & Time Independent equations, Schrodinger's Wave equation for a free particle in a box.

Learning Outcomes:

- The student will demonstrate the ability to use concepts of Morden physics to their engineering applications.

- The course aims at developing the fundamentals of wave optics, crystal structure, structure of atoms and their applicable to obtain quantitative solutions of problems in physics.

BOOKS RECOMMENDED:

[1] R K Gaur & S L Gupta, Engineering Physics, Dhanpat Rai & Sons, 2006
[2] H.K. Malik & A.K.Singh, Engineering Physics, Tata McGraw Hill, 2011
[3] N. Gupta & S.K. Tiwary , A Text Book of Engineering Physics, Dhanpat Rai & Co. 2009.
[4] W. T. Silfast, Laser Fundamentals Cambr. Un. Press, 1996,
[5] D Halliday & R Resnick, Physics Vol-II, Wiley Eastern, 1993
[6] H White, Modern Physics: Van Nostrand; 15/e.
[7] D P Khandelwal, Optics and Atomic Physics.
[8] R Feyaman,Feyaman Lectures on Physics, /e, Narosa Publication, 1998.
[9] S.O. Pillai, Solid State Physics, New Age International Publication, 2010.
[10] R.S. Sedha, A Text Book of Applied Electronic, S. Chand & company Lmt. 2005.
[11] R.P. Goyal, Unified Physics-II,,and III Shivlal Agrawal & Co. ,1994.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER2C3:
Engineering Drawing</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">1</td><td rowspan="2">4</td><td rowspan="2">2</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To understand the concepts of imagining, envisioning and visualizing the objects & machine parts and drawing them with the instruments & tools.
- To introduce the students to the "universal language of Engineers" for effective communication through drafting exercises of geometrical solids
- **Prerequisite(s):** Nil

COURSE OF CONTENTS

UNIT-I
Introduction, need & Classification of Engineering Drawings, Drawing Instruments and their uses, Indian Standards for Drawing, Drawing Sheet Layout, Various conventions used in drawing, Technical Lettering, Dimensioning, Basic Geometrical Constructions. Engineering Scales & Engineering Curves

UNIT - II
Orthographic Projections, Isometric Projections, Oblique Projections, Perspective Projections & Missing Views.

UNIT - III
Projection of Points, Straight Lines and Plane Surfaces.

UNIT - IV
Projection of Solids, Section of Solids and Development of Surfaces.

UNIT - V
Interpenetration of Solids / Intersection of Surfaces, Introduction to Computer Aided Drawings, Drawing of Machine elements like Riveted Joints, Screw fasteners and Welded Joints.

Learning Outcomes:

- Upon Completing the Course, Student will able to:
- Understand the importance of BIS and ISO Standards in Engineering Drafting.
- Graphically construct and understand the importance of mathematical curves in engineering applications.
- Visualize geometrical solids in 3D space through exercises in Orthographic Projections.
- Interpret Orthographic, Isometric and Perspective views of objects.
- Develop the surfaces of geometrical solids.

BOOKS RECOMMENDED:

[1] Bhatt N D, Engineering Drawing, Charoter Publishing House, Anand, Gujrat Agrawal B, and Agrawal C M, Engineering Drawing, Tata McGraw-Hill Publishing Company Limited.
[2] French T E, Vierck C J, Foster R J, Engineering. Drawing and Graphic Technology Mc Graw-Hill

International, Singapore, Low Price Edition.
[3] Luzadder W J, Duff J M, Fundamentals of Engineering Drawing, Prentice- Hall India, New Delhi.
[4] Dhananjay A Jolhe, Engineering drawing, Tata McGraw Hill.
[5] Shah M B and Rana B C, Engineering Drawing, Pearson Education, New Delhi.

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Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR2C4:
Electrical Engineering</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To understand the concepts and practical ideas of AC/DC circuits along with basic 3 phase power management, Properties of different magnetic material used in Electromagnetic Circuits to create an idea among students that how different magnetic materials were choose for different practical machines.
- Practical concepts of Transformers and different Electric Machines to make students easy understanding of electrical machines surrounded by us and also they are basic to all the engineering streams.

COURSE OF CONTENTS

UNIT-I

AC circuits: Generation of EMF, Phasor Quantities, RMS, Average, Form Factor, Peak Factor Etc, Phasor Diagrams; Single Phase AC Circuits: R, L, C And Combinations, Resonance, Q-Factor, Bandwidth; Three Phase AC Circuits: Generation, EMF, Phase Sequence, Analysis of Star and Delta Connections, and Power Measurement In Single Phase& Three Phase Circuit.

UNIT-II

Circuit analysis tools: Kirchoff's laws, Analysis of DC and AC circuits, Thevenin's theorem, Norton's theorem, Max power transfer theorem, Superposition theorem, and Source transformation.

UNIT-III

Magnetic Circuits: Electromagnetism, Magnetic flux, Magnetic flux density, Intensity of magnetization, B-H curves, hysteresis and eddy current losses, Magnetic circuit calculations, laws of Electro-magnetic induction, Magnetic induction, Lifting power of an electromagnet.

UNIT-IV

Transformer: Construction, principle, ideal transformer, EMF equations, Analysis of transformer on no load and load conditions, Equivalent resistance and reactance, voltage regulations, transformer losses Transformer testing, transformer efficiency, Types of transformer, Cooling methods, Auto transformer.

UNIT-V

Rotating electric Machines: Construction, working principles, EMF equations, Characteristics, Torque equations of DC machines (generators & motors), 3-phase synchronous and induction motor, single phase induction motor

Learning Outcomes:

Upon completing the course, students will be able :

- To solve circuit problems based on KVL,KCL laws and different network theorems which helps them to solve practical circuits for future industries exposure .

- The course also covers basic knowledge of alternating circuits and their practical applications, which helps students to understand their domestic home load in bettr way.
- Students were also able to understand uses of different magnetic materials available in market for constructing different electrical machines and they also able to solve their circuit parameters which helps in designing a electrical machine at initial level.
- After this course, students were able to understand different properties, characteristics and functioning of different parts of transformer and different rotating electrical machines at basic level.

BOOKS RECOMMENDED:

[1] V Del Toro, Electrical Engineering Fundamentals, 2/e, PHI, 2000.

[2] D P Kothari, I J Nagrath, Basic Electrical Engineering, 2/e, Tata McGraw Hill, 2002 (Fifth Reprint 2003).

[3] A Sudhakar, Network Theory, 2/e, Tata McGraw Hill, 2004

[4] P S Bimbhara, Electrical Machinery, 7/e, Khanna Publishers, New Delhi, 2006.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">COR2C5:
Computer Programming in C++</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To learn to analyse a problem and construct a C++ program that solves it using C++ basic constructs and advanced constructs.
- To learn the syntax and semantics of the C++ programming language.
- To learn how to design C++ classes with constructors and class member functions.
- To understand the concept of data abstraction and encapsulation.
- To learn how to overload and override functions and operators in C++.
- To learn how containment and inheritance promote code reuse in C++.
- To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
- To learn how to use exception handling in C++ programs.

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Prerequisites: Nil.

COURSE OF CONTENTS

UNIT-I

Introduction to flowcharts and problem solving. Types of programming languages, Programming with C++:- C++ Data Types:-auto, bool, int, char, float, double, void. Variables and Constants, Operators, Arithmetic and Logical Expressions, Assignment Statements and Type Casting. Control structures- Iteration statements, Jump Statements and Selective statements. Common C++ Header files, Generation of Random numbers in C++.

UNIT-II

Functions: Introduction - Call by Value and Call by Reference – return values – recursion – Arrays - Introduction to Arrays - Initialization of Array - Multi dimensional Arrays - passing arrays to functions – Strings - Arrays of Strings - Standard Library String Functions.

Structures: Structure elements, Nested Structures, Array of Structures, Array within structures and passing structures to functions.

Unit- III

Pointers:-Declaration and Initialization of Pointers, Dynamic Memory allocation/deallocation operators:-new and delete. Pointers and Arrays:-Array of Pointers, Pointer to an array, Function returning a pointer, Reference variables and use of alias. Invoking functions by passing pointers. Files – Introduction – File Structure - File handling functions - File Types - Error Handling.

UNIT-IV

Object Oriented Programming Paradigm - Basic Concepts of OOP - Benefits of OOP. Class and object fundamentals and various visibility modes in class, Object as function arguments-pass by value and pass by reference. Constructor:-Special Characteristics, Declaration and Definition of a Constructor, Default Constructor, Overloaded Constructor, Copy Constructor and Constructor with default arguments.

Function Overloading:-Need and restrictions of overloaded functions, Steps involved in finding the best match, Default arguments versus overloading.

Destructor:- Special Characteristics, Declaration and Definition of a Destructor. Friend function and its characteristics and friend class.

UNIT-V

Introduction to Operator overloading - Rules for Operator overloading – overloading of binary and unary operators - Introduction to inheritance – Types of inheritance - Abstract Classes - new Operator and delete Operator - Pointers to Objects – this Pointer - Virtual Functions - Pure Virtual Functions - Introduction to Class Templates - Function Templates - Member Function Templates - Basics of Exception Handling - Types of exceptions - Exception Handling Mechanism - Throwing and Catching Mechanism - Rethrowing an Exception - Specifying Exceptions.

Learning Outcomes:-

Upon completing the course, students will be able to:

- To develop C++ programs using basic and advanced constructs that will solve real life problems.
- The course aims to understand the features of C++ supporting object-oriented programming.
- Apply the major object-oriented concepts to implement object-oriented programs in C++ i.e. encapsulation, inheritance and polymorphism.
- Understand advanced features of C++ specifically friends, pointers, virtual functions and operator overloading.

BOOKS RECOMMENDED:

[1] Coohoon and Davidson, C++ Program Design: An introduction to Programming and Object-Oriented Design (3rd edition), Tata McGraw Hill, New Delhi, 2003.
[2] Herbert Schildt, the Complete Reference, Tata McGraw Hill.
[3] E Balagurusamy, Object Oriented Programming with C++, McGraw Hill Education.
[4] Ravichandran, Programming With C++, Tata McGraw Hill.
[5] Dromey G, How to solve it by Computer, Prentice Halll – 1978.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SSR2S2:
Humanities</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper:
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</table>

Learning Objectives:

- To introduce students to understand and interpret the human experience from individual to entire culture.
- It also helps to understand how human beings across time and cultures understand happiness & suffering, understand good from bad, debate political questions.
- To understand that their actions have a Social, economic and environmental impact. To inspire ethical & moral course of thinking.

Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I

Man and society- Theories of man and society, Methodological individualism, structuralism, Society and its features- Social Institutions; Social Stratification and Change; Contemporary Indian Philosophy-its characteristics andCross-cultural Issues.

UNIT-II

Human Behavior: Biological Bases of Behavior, Methods for understanding human psychophysiology, Working of brain, Psychobiology of learning, memory, emotions and personality, Temperament and personality: trait structure and persistence, Extraversion/sociability, Aggression-hostility/agreeableness, Philosophy of Mind & Cognition.Concepts of good life – quality of life and subjective well-being; happiness, life satisfaction, and positive affect.

UNIT-III

Perspectives on Knowledge, Science and Technology, Technological Shaping of Society and Social Shaping of Technology and its Human roots, Role of Humanities in Engineering: Professionalism in Engineering; Professional Engineering Bodies.

UNIT-IV

Governance and Engineers: Political parties; Types & Forms of Governance; Utilitarianism; capitalism, socialism and communism; Marxist and neo-Marxist thoughts; democracy in public and private spheres.

UNIT-V

Engineering and Corporate Social responsibility- Ecology and Natural Resources, Role of corporations in the society, Morals, Values, Consciousness, Experience: Basic codes of Ethics; Engineering Ethics, Evolution of CSR, Strategic CSR, Role of stakeholders in CSR, Consumer awareness towards CSR,CSR as competitive advantage, the Global Competitiveness Index (GCI) & Sustainability , Issues in CSR- organizational, economic & social.

Learning Outcomes:

On successful completion of course we will have

- Aspire students to be world citizens of broad perspective who can make educated and ethical decisions.

- Students who articulate their own values & beliefs and can apply them in their personal & professional life.
- To become a model human being.

BOOKS RECOMMENDED:

[1] D J Kemper, Introduction to Engineering Profession, 2/e, Suanders Publication, 1998.
[2] A S Chauhan, A Text Book of Social Science Jain Brothers 9/e, 2008.
[3] R C Agrawal, Principle of Political Science.
[4] NPTEL
[5] W.B. Werther & D. Chandler, Strategic Corporate Social Responsibility, Thousand Oaks, 2011.

B.E (CBCS) ELECTRONICS AND INSTRUMENTATION ENGG.

Semester-III

S.No	**Sub_code**	**Sub_Name**	**Type**	**L-T-P**	**Credits**
1	AER3C1	APPLIED MATHEMATICS-III	PC	3-1-0	4
2	EIR3C2	DIGITAL ELECTRONICS	PC	3-1-1	4+1(P)
3	EIR3C3	DATA STRUCTURE	PC	3-1-1	4+1(P)
4	EIR3C4	NETWORK ANALYSIS	PC	3-1-1	4+1(P)
5	EIR3G1	ELECTRONIC DEVICES AND FABRICATION	GE	3-1-0	4
6	EIR3L1	ELECTRONIC WORKSHOP-I		0-0-1	1(P)
7	SIR3S3	EFFECTIVE COMMUNICATION SKILL		2-0-0	2
8	EIR3V3	COMREHENSIVE VIVA - III	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

Semester-IV

S.No	Sub_code	Sub_Name	Type	L-T-P	Credits
1	EIR4C1	COMPUTER ORGANIZATION AND ARCHITECTURE	PC	3-1-0	4
2	EIR4C2	ELCTRICAL AND ELECTRONIC MEASUREMENT	PC	3-1-1	4+1(P)
3	EIR4C3	ANALOG ELECTRONICS	PC	3-1-1	4+1(P)
4	EIR4C4	SENSOR & TRANSDUCER	PC	3-1-1	4+1(P)
5	EIR4G2	SIGNALS AND SYSTEMS	GE	3-1-0	4
6	EIR4L2	ELECTRONIC WORKSHOP-II		0-0-1	1(P)
7	SIR4S4	ENGG. ECONOMICS		2-0-0	2
8	EIR4V4	COMREHENSIVE VIVA - IV	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

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<tr><th colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</th><th colspan="4">II Year B.E. (Electronics and Instrumentation Engg.)
(Full Time)</th></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AER3C1
APPLIED MATHEMATICS-III</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

1. To develop an understanding of the underlying mathematics as a preparation for a specialist study of applications areas like electromagnetic and electrostatic field theory, control theory, communication and signal processing, power transmission, design of discrete-(time) systems, circuit analysis etc.
2. Numerical approach enables solution of a complex problem with a great number of very simple operations. It is useful to find the solution with use of computers making calculation easy and fast.

Prerequisites:

Basic knowledge of algebra of complex numbers, determinants, matrices, differentiation and integration of functions and probability theory.

COURSE CONTENTS

Unit-I

Function of Complex variables: Analytic functions, Cauchy's integral theorem and integral formulae, Taylor's and Laurent' series, Residue theorem, Solution of integrals.

Unit-II

Random variables, density function, stochastic process, autocorrelation, Markov chain, Multi-step in Markov chain. Basic concepts of reliability, failure laws, components in series and in parallel, Redundancy.

Unit-III

Interpolation: Finite difference operators, Newton's and Stirling's interpolation, Numerical differentiation, Numerical integration using Trapezoidal, Simpson's 1/3rd, Simpson's 3/8th and Weddle's rule.

Unit-IV

Numerical solutions of algebraic and transcendental equations-Bisection method, Regula-Falsi method, Newton-Raphson method. Solution of system of linear algebraic equation-Iterative methods: Gauss-Seidel and Gauss-Jacobi's iterative methods.

Numerical Solutions of differential equations - single and multi-step methods.

Unit-V

Fourier series, sine and cosine series, change of intervals, continuous-time and discrete-time Fourier series, Fourier Integral.

Learning Outcomes:

Upon completing the course, students will be able to:

1. Apply the concept of complex analysis, Fourier analysis and stochastic process in various subjects of engineering like electromagnetic and electrostatic field theory, control theory, signal processing, power transmission and so on.
2. Learn that many problems were analytical methods seems to fail, like solving highly nonlinear equation, numerical methods works very well.

BOOKS RECOMMENDED:

[1]. B.S.Grewal, Engineering Mathematics, Khanna Publishers, 42/e, 2015.

[2]. Erwin. Kreyszig, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.

[3]. Gupta P.P. & Malik G.S., Calculus of Finite Differences and Numerical Analysis, Krishna Prakashan Mandir, Meerut, 21/e, 2006.

[4]. Kasana H.S., Complex Variables: Theory and Applications, Prentice-Hall of India Pvt. Ltd, 2nd edition, 2005.

[5]. T. Veerarajan, Probability, Statistics and Random Processes, Tata McGraw - Hill Education, 2002.

[6]. K. S. Trivedi, Probability and Statistics with Reliability, Queuing, and Computer Science Applications, John Wiley & Sons, 2006.

[7]. G. Paria, Statistics and Stochastic Processes Part II, Scholar’s Publication, Indore.

[8]. A.R. Vasishtha and R.K. Gupta, Integral Transforms, Krishna Prakashan Media Ltd, Meerut, India, 2000.

[9]. Murray R. Spiegel, Schaum’s Outline of Fourier Analysis, McGraw-Hill, New York, 2004.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR3C2
DIGITAL ELECTRONICS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

1. Provide student knowledge of different number systems and conversion among them.
2. Familiarize students with different logic families and characteristics of Digital IC's
3. Familiarize students with different Combinational IC's.
4. Develop skills to design various Combinational circuits
5. Familiarize students with different Counter IC's
6. Develop skills to design various Sequential circuits
7. Develop ability to implement digital circuits in various practical applications.

Prerequisites: Knowledge of Transistor, Diodes, Switching property, Boolean algebra.

COURSE CONTENTS

Unit –I

Foundation: Number system, Arithmetic operations using 1's,2's complement, various codes, Review of basic gates, universal gate application, Logic Families: - RTL, DTL, TTL &MOS, CMOS families for NOR/NAND gate, characteristics of Digital IC's-speed of operation, power dissipation, Fan-in, Fan-out, Noise margin, Current and Voltage parameters

Unit-II

Combinational Circuits: Boolean laws & algebra , Sum Of Product & Product Of Sum expression, K-Map and Tabular method of minimization, Combinational devices like Multiplexer, Demultiplexer, Decoders, Encoders,Tri -state Devices

Unit-III

Combinational & Sequential Circuits: Combinational circuit design for Adder, Subtractor, Comparator, Multiplier, various Code converters
Latches and Flip-Flops SR, D, T, JK, Master-slave, Flip- Flop conversions

Unit-IV

Counter and Registers: Synchronous counter, Asynchronous counter, Up-Down Counter, Shift Registers -serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out, Universal Shift Register

Unit-V

Digital to Analog Conversion Technique as Binary Weighted DAC, R-2R Ladder, DAC808 IC, Analog to Digital Conversions as Flash type, Counter type , Successive Approximations type A/D converter, Specifications of A/D converters, ADC 804 and 808 IC, Monostable, Bistable & Astable multivibrator using IC555.

Learning Outcomes:

Upon completing the course, students will be able to:

1. Understand driving capacity of a gate and voltage-current parameters.
2. Implement digital circuit for arithmetic operations.
3. Implement digital circuit with optimize hardware.
4. Design and Analyse any combinational digital circuit

5. Design and Analyse any sequential circuit
6. Using analog to digital and digital to analog IC's for data conversion.
7. Design circuit to generate clock and pulses of desired frequency.

BOOKS RECOMMENDED:

[1] Mano M. Morris, “Digital Design”, 3rd edition, Pearson Education 2006.
[2] William H.Gothmann,*Digital Electronics: An Introduction to Theory and Practice*, Eastern Economy Edition , Prentice-Hall of India Private Limited,NewDelhi.,2001
[3] William I. Fletcher, *An Engineering Approach to Digital Design*, Pearson Education
[4] S Salivahan,S Arivazhagan "Digital Circuit and Design" Vikas Publication ,2013

List of Practical Assignments: During the learning of course, students need to do assignments:

1. To implement various gates using universal NAND/NOR IC's.
2. To Design and Implement various combinational circuits using gate IC's.
3. To Design and Implement various combinational circuits using Mux, D-Mux, Encoder, Decoder IC's.
4. To learn and analyze different Flip-Flops.
5. To Design and Implement various sequential circuits using Flip-Flop.
6. To learn and analyse Counter IC's.
7. To Design and Implement various sequential circuits.
8. To Design and Implement circuit to generate clock waveform of desired frequency using IC555.
9. Learn to use ADC and DAC IC's for data conversion.

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<tr><td rowspan="2">EIR3C3
DATA STRUCTURE</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
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</table>

Learning Objectives:

1. To provide the knowledge of basic data structures and their implementations.
2. To understand importance of data structures in context of writing efficient programs.
3. To develop skills to apply appropriate data structures in problem solving.

Prerequisites: Computer Programming knowledge, C Language

COURSE CONTENTS

UNIT-I

Arrays and List: Array: Definition, Representation, Address Calculation; Searching: Linear search, Binary search; Sorting: Bubble sort, Insertion sort, Selection sort, Radix sort, Shell sort; List: Introduction, Implementation as Linked list, Circular linked List, Doubly linked list, Applications of linked list.

Unit-II

Stacks: Definition, Representations: static and dynamic, Implementation of stack, Applications of stack: Polish notation representation and conversion, Tower of Hanoi problem, Implementation of recursion, Quick sort and Merge sort.

Unit-III

Queues and Hashing: Definition, Representations, Static and dynamic, Circular Queue, Double ended Queue, Priority Queue, Implementation of Priority Queue using Heap data structure, Heap Sort, applications of queues. Hash Structures: Representation, Search and Implementation and other issues.

Unit-IV

Trees: Definition, Basic terminology, Binary tree, Complete Binary Tree, representations: Static and dynamic, Traversal techniques in binary tree, Heap tree, Binary Search tree, AVL tree, M-way search trees, B-tree & its variations.

Unit-V

Graphs: Definition, Basic terminology, Graph Types, Representations: static, dynamic; Implementations, Searching in graphs, Shortest path in graphs, Applications.

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Learn the basic types for data structure, implementation and application.
2. Know the strength and weakness of different data structures.
3. Use the appropriate data structure in context of solution of given problem.

4. Develop programming skills which require to solve given problem.

BOOKS RECOMMENDED:

[1] E. Horowitz & Sahni,Fundamental Data Structure, Galgotia Book Source, 1983.
[2] A. Tannenbaum, Data Structure Using C, Pearson Education, 2003.
[3] Kruz, Data Structure and Programming Design, 1987.
[4] N. Wirth, Algorithms +Data Structure = Program, Prentice Hall of India, 1979.
[5] Goodrich & Tamassia, Data Structures and Algorithms in C++, 2nd Edition, John Wiley & Sons, 2011.

List of Practical Assignments:

During the learning of course, students need to do assignments:

1. Implementation of searching and sorting techniques.
2. Implementation of list using array and linked list.
3. Implementation of push and pop operation on stack
4. Implementation of polish notation and its conversion
5. Write a program to solve the problems using iteration/recursion
6. Program for recursion removal using stack
7. Program for insertion /deletion operation on various queue & Implementation of priority queue for process scheduling
8. Program for storing data as tree structure and implementation of various traversal techniques
9. Program for storing data as graph structure and implementation of various traversal techniques
10. Program for finding shortest path in graph

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>EIR3C4</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>NETWORK ANALYSIS</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:
1. To learn techniques of solving circuits involving different active and passive elements.
2. To analyze the behavior of the circuit's response in time domain.
3. To analyze the behavior of the circuit's response in frequency domain.
4. To understand the significance of network functions.

Prerequisites: Basic course in Electrical

COURSE CONTENTS

UNIT-I

Circuit fundamental and tools of analyzing Network: Elements, Sources, their characteristics, source transformations, Kirchhoff's law, node and loop analysis, D-Y transformation, Network Theorems: Superposition, Reciprocity, Thevenin's, Norton's , Millman and Maximum Power Transfer Theorem, Coupled circuits, Graph Theory

UNIT-II

Time domain analysis of circuits: Transient and steady state analysis of first order and second order systems, initial and final conditions in networks, Solution of I, II and Higher order differential equation

UNIT-III

Two Port Networks: Various network parameters, two port parameters – z-parameter, y-parameter, transmission parameter and hybrid parameter, relationships, Interconnection of two-two port networks, terminated two port networks.

UNIT-IV

Laplace Transforms and Fourier analysis: Basic theorems for Laplace transform, solution of circuit problems using Laplace transform, Waveform synthesis, Theorem in transform domain, Fourier analysis of complex waves, symmetries, introduction to Fourier transforms.

UNIT-V

Network Synthesis: Network functions, significance of poles and zeros, Physical realizability condition, Hurwitz test, Synthesis of one port network, properties of LC immittances, foster realization of LC circuits, ladder development and Cauer forms, properties of RC immittances and synthesis of RC circuits.

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Understand behavior of different circuits and their response using various circuit analysis tools and theorems
2. Understand the analysis in time domain and frequency domain.
3. Understand basic concepts regarding the system definition mathematically and associated network function.
4. Understand the concept of Network synthesis.

BOOKS RECOMMENDED:

[1] M.E.Van Valkenburg, Network Analysis, 3/e, Pearson Education.
[2] Franklin F.Kuo, Network Analysis and Synthesis, 2/e, John Wiley & Sons, 2003
[3] Donald Scott, An Introduction to Circuit Analysis: A System Approaches, Electrical Engineering Series, McGraw-Hill International Editions., 1987
[4] T.S.K.V. Iyer, Theory and Problem in Circuit Analysis, TMH Outline Series, Tata McGraw-Hill Publishing Company Ltd, New Delhi., 2000
[5] Gyanendra K.Mithal & Ravi Mithal, Network Analysis including Transmission Line, 14/e, Khanna Publishers, New Delhi., 2001

List of Practical Assignments:

During the learning of course, students need to do assignments:

1. Introduction to various components used in circuit analysis laboratory.
2. Experimental verification of Kirchoff's voltage law and Kirchoff's current law.
3. Experimental verification of Thevenin's theorem.
4. Experimental verification of Nortan's theorem.
5. Experimental verification of Superposition theorem.
6. Experimental verification of Maximum Power transfer theorem.
7. Experimental verification of Reciprocity theorem.
8. Calculation of z-parameters for a two port network.
9. Calculation of y-parameters for a two port network.
10. Calculation of ABCD-parameters for a two port network.
11. Experimental verification for series and parallel interconnection of a two port network.
12. Transient response analysis of a first order and second order circuit.
13. Experimental verification for Fourier series.

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<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

1. To familiarize the student with the principle of operation, analysis and design of Junction diode, BJT amplifier circuits, and transistors.
2. To understand basic fabrication steps of semiconductor device manufacturing.
3. To study basic principle of filter circuits and various types

Prerequisites: Basic Electronics

COURSE CONTENTS

Unit I

Foundation**:** The Semiconductor in Equilibrium: Statistical Mechanics, Charge Carriers in Semiconductor, Dopant Atoms and Energy Levels, The Extrinsic Semiconductor, Statistic of Donors and Accepters, Charge Neutrality, Position of Fermi Energy Level.

Unit II

Carrier Transport Phenomena: Carrier Drift, Drift Current Density, Mobility Effect, Conductivity, Velocity Saturation, Diffusion Current Density, Total current density, Carrier Generation and Recombination, Quasi Fermi Level, Excess Carrier Life time.

Unit III

PN Junction: Basic Structure of PN Junction, PN Junction under Zero Bias, Built in Potential barriers, Electric Field, Space Charge Width, PN Junction Under Forward and reverse Bias, minority and majority carrier distribution, Space charge width and electric field in forward and reverse bias, Junction Capacitances, one sided Junctions, Junction breakdowns. PN Junction Current, Small Signal Model of PN Junction.

Unit IV

The Bipolar transistor: Bipolar principal of operation, the modes of operation, Minority carrier distribution, Low frequency Common Base Current Gain, nonideal effects, equivalent circuit models, Frequency Limitations, Current voltage characteristics, BJT as an Amplifier, Small Signal Operation and Models.

Unit V

Single Crystal Structure, Defects in silicon structure, specification of silicon wafer, Crystal growth, CZ method, Oxidation, Diffusion, Ion Implantation, Metallization, Lithography, Process steps for PN Junction Diode, BJT fabrication.

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Acquire Knowledge and understanding of Electronics Devices and its operation.
2. Apply acquired knowledge in designing state of art circuits.

3. Able to know the manufacturing steps for Electronics devices

BOOKS RECOMMENDED:

[1].Donald Neamen and Dhrubes Biswas, Semiconductor Physics and Devices, Mc graw Hill Education, 4e.

[2]. Gouranga Bose, “IC Fabrication Technology”, Mc Graw Hill Education, Edition 2014.

[3]. Adel S Sedra and Kenneth C. Smith, “Microelectronics Circuits Theory and Application”, Oxford, Edition Sixth.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR3L1
ELECTRONIC WORKSHOP-I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">1</td><td rowspan="2">1</td></tr>
<tr><td>Duration of Theory Paper:</td></tr>
</table>

Learning Objectives:

This course gives the basic introduction of electronic hardware systems and provides hands-on training with familiarization, identification, testing, assembling, dismantling, fabrication and repairing such systems by making use of the various tools and instruments available in the Electronics Workshop.

List of Exercises / Experiments (Minimum of 8 mandatory)

1. Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.)
2. Drawing of electronic circuit diagrams using BIS/IEEE symbols and introduction to EDA tools, Interpret data sheets of discrete components and IC's, Estimation and costing.
3. Familiarization/Application of testing instruments and commonly used tools. [Multimeter, Function generator, Power supply, CRO etc.] [Soldering iron, De-soldering pump, Cutters, Wire strippers, Screw drivers, Hot air soldering and desoldering station etc.]
4. Testing of electronic components [Resistor, Capacitor, Diode, Transistor, UJT and JFET using multimeter.]
5. Inter-connection methods and soldering practice. [Bread board, Soldering - types - selection of materials and safety precautions, soldering practice in connectors and general purpose PCB, Crimping.]
6. Printed circuit boards (PCB) [Types, Single sided, Double sided, Processing methods, Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.]
7. Assembling of electronic circuit/system on general purpose PCB, test and show the functioning (**Any Four circuits)**
   A. Fixed voltage power supply with transformer, rectifier diode, capacitor filter, zener/IC regulator.
   B. LED blinking circuit using a stable multi-vibrator with transistor BC 107.
   C. Square wave generation using IC 555 timer in IC base.
   D. Sine wave generation using IC 741 OP-AMP in IC base.
   E. RC coupled amplifier with transistor BC 107.

Learning Outcomes: Student can identify the active and passive electronic components. Student gets hands-on assembling, testing, assembling, dismantling, fabrication and repairing systems by making use of the various tools and instruments available in the Electronics Workshop.

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<tr><td rowspan="2">SIR3S3
EFFECTIVE COMMUNICATION SKILL</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

To develop effective communication skills in engineers for expressing the technical ideas and for discussing the technical issues with confidence.

Prerequisites: Technical English

COURSE CONTENTS

Unit-I

Fundamentals of Communication: The Importance of Communication; the Basic forms of Communication; The Process of Communication; Types of Communication; Art of Communication.

Unit-II

Inter-personal skills: Building Positive Relationships; Giving Praise; Dealing with Criticism; Managing Conflicts.;Telephone speaking skills and Cross-cultural communication skills

Unit-III

Fundamentals of public Speaking- Speeches on topics of current concern ,listening- The importance of listening; Barriers to Effective Listening; Approaches to Listening; How to be a Better Listener; What speakers can do to ensure better listening.

Unit-IV

Interviews: Points to be remembered as an interviewer or an interviewee; Commonly asked questions; Types of interviews; Do's and Don'ts.

Unit-V

Making Presentations: Speech Purpose- General and Specific; Methods of Speaking; Analyzing the Audience; Nonverbal Dimensions of Presentation, Group Discussions: Importance; Process; Points to be kept in mind while participating; Do's and don'ts.

Note: There shall be seminars and practice sessions by students.

Learning Outcomes:

Upon Completing the Course, Student will able to deliver the ***seminars and making presentation.***

BOOKS RECOMMENDED:

[1] P D Chaturvedi, P.D. & M Chaturvedi, *Business Communication: Concepts, Cases and Applications*, PearsonEducation, Singapore Pvt. Ltd, 2004.

[2] ICMR, *Business Communication*, Feb 2001.

[3] J Davies, *Communication Skills: A Guide for Engineering and Applied Science Students*, 2/e Pearson Education,2006.

[4] Lecture material given by the course teacher.

B.E (CBCS) ELECTRONICS AND INSTRUMENTATION ENGG.

Semester-III

S.No	Sub_code	Sub_Name	Type	L-T-P	Credits
1	AER3C1	APPLIED MATHEMATICS-III	PC	3-1-0	4
2	EIR3C2	DIGITAL ELECTRONICS	PC	3-1-1	4+1(P)
3	EIR3C3	DATA STRUCTURE	PC	3-1-1	4+1(P)
4	EIR3C4	NETWORK ANALYSIS	PC	3-1-1	4+1(P)
5	EIR3G1	ELECTRONIC DEVICES AND FABRICATION	GE	3-1-0	4
6	EIR3L1	ELECTRONIC WORKSHOP-I		0-0-1	1(P)
7	SER3S3	EFFECTIVE COMMUNICATION SKILL		2-0-0	2
8	EIR3V3	COMREHENSIVE VIVA - III	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

Semester-IV

S.No	Sub_code	Sub_Name	Type	L-T-P	Credits
1	EIR4C1	COMPUTER ORGANIZATION AND ARCHITECTURE	PC	3-1-0	4
2	EIR4C2	ELCTRICAL AND ELECTRONIC MEASUREMENT	PC	3-1-1	4+1(P)
3	EIR4C3	ANALOG ELECTRONICS	PC	3-1-1	4+1(P)
4	EIR4C4	SENSOR & TRANSDUCER	PC	3-1-1	4+1(P)
5	EIR4G2	SIGNALS AND SYSTEMS	GE	3-1-0	4
6	EIR4L2	ELECTRONIC WORKSHOP-II		0-0-1	1(P)
7	SER4S4	ENGG. ECONOMICS		2-0-0	2
8	EIR4V4	COMREHENSIVE VIVA - IV	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Electronics and Instrumentation Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
EIR4C1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
COMPUTER ORGANIZATION AND ARCHITECTURE	**3**	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To understand the structure, function and characteristics of computer systems.
- To understand the design of the various functional units and components of computers.
- To identify the elements of modern instructions sets and their impact on processor design To explain the function of each element of a memory hierarchy,
- To identify and compare different methods for computer I/O.

Prerequisite(s): Knowledge of logic circuits - combinational and sequential

COURSE CONTENTS

Unit I: Computer Organization

Computer types, Structure with basic computer components, Function in brief with instruction fetch and execute, Interrupts and I/O communication, Interconnection structure, bus interconnection, Multiple Bus hierarchies, Elements of bus design Performance metrics and measurement

Unit II: Computer Memory System

Characteristics of memory system, Memory hierarchy, Cache Memory- Cache memory principles, Elements of cache design- cache address, size, mapping functions, replacement algorithms, write policy, Internal Memory- semiconductor memory, External Memory- Hard Disk organization, RAID

Unit III: Input and Output System

I/O modules- Module function and I/O module structure, Programmed I/O , Polling I/O, Interrupt driven I/O , DMA function, Synchronous and Asynchronous serial data communication, Computer peripherals like keyboard, mouse, printer, scanner and display devices

Unit IV: Processor Organization

Evolution of Intel processor architecture- 4 bit to 64 bit, Control unit Hardwired and micro programmed, concept of pipelining , Study of microprocessor 8085,Functional pins and Register organization, Memory mapped I/O and I/O mapped I/O schemes,

Unit V: Instruction Set and Assembly Language Programming

Addressing modes and Formats- immediate, direct, indirect, register, register indirect, displacement and stack, Instruction Cycle machine cycle and Data flow, 8085 instruction set and assembly programming, Time delay concept , stack and subroutines, Interrupt handling, Instruction set architecture RISC and CISC

Learning Outcomes:

On completion of the course, student will be able to :

- Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os.
- Analyze the performance of commercially available computers.
- To develop logic for assembly language programming

BOOKS RECOMMENDED

[1] William Stallings, "*Computer Organization and Architecture*", Prentice Hall of India, Sixth Edition.
[2] A. Tannenbaum, "*Structured Computer Organization*", Pearson Education, 2002.
[3] Patterson & Hennessy, "*Computer Organization and Design*", Morgan Kaufmann, 2007
[4] Ramesh S. Gaonkar, "*Microprocessor, Architecture, Programming, and Applications with the 8085"*, Penram International Publication, 5/e

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<tr><td rowspan="2">EIR4C2
ELECTRICAL AND ELECTRONIC MEASUREMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
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Learning Objectives:

- To introduce students to monitor, analyze and control any physical system.
- To understand students how different types of meters work and their construction.
- To provide a student a knowledge to design and create novel products and solutions for real life problems.
- To introduce students a knowledge to use modern tools necessary for electrical projects.

Prerequisites(s): Basic Electrical Engg and Basic Electronics

COURSE CONTENTS

UNIT-I

Basic concept of Measurements and Instruments, Measurement Methods, Generalized measurement System, Classification of Instruments, Static & Dynamic Characteristics, Errors & Uncertainty measurement of system, Linear & Non-linear Systems.

UNIT-II

Operation principles of Analog Instruments - Moving coil, Moving iron, PMMC, Dynamometer and
Induction type instruments, Measurement of Voltage, Current, Power, Power Factor, Energy, Instrument Transformer - current and potential transformer, Measurement of Phase & Frequency.

UNIT-III

Measurement of Resistance- low, medium and high resistance measurement, A.C. Bridges- general equation, Potentiometer- DC potentiometer, Multi-range potentiometer, AC potentiometer and their applications, High Frequency Measurement , Twin T & Bridge Networks, Q-meter and its applications.

UNIT-IV

Display Devices I- Construction & working of Basic CRO, its Components (Deflection plates, Screen, Aquadag, Time Base Generator, Oscilloscope Amplifiers), Measurements of phase and frequency (Lissajous Patterns), Types of CRO, Special types of CRO, Types of CRO Probes.

UNIT-V

Display Devices II- Digital Voltmeter (ramp type DVM, Integrating and Potentiometric type DVMs, Signal Generator, Function Generator, Wave Analyzer, Distortion Analyzer, Spectrum Analyzer, Frequency Counter, Display Devices & Recorders.

Learning Outcomes: Upon Completing the Course, Student will able to:

- To use the techniques and skills for electrical projects.
- Design a system, component or process to meet desired needs in electrical engineering.
- Measurement of R,L,C ,Voltage, Current, Power factor , Power, Energy.

- Ability to balance Bridges to find unknown values.
- Ability to measure frequency, phase with Oscilloscope.
- Ability to use Digital voltmeters

BOOKS RECOMMENDED:

[1] A.K.Sawhney & Puneet Sawhney, "*A Course in Electrical And Electronic measurements and Instrumentation"*, 7/e, Dhanpat Rai & Co.(P) Ltd.,2005

[2] Albert D.Helfrick & William D.Cooper, "*Modern Electronic Instrumentation and measurement Technique"*,Low Price Edition, Pearson Education, 2005

[3] Ernest O.Doebelin, "*Measurement Systems Application and Design"*, 5/e, Tata McGraw –Hill Publishing Company Ltd., 2004

[4] H.S.Kalsi, "*Electronic Instrumentaion"*, Technical Education Series, Tata McGraw – Hill Publishing Company Ltd.,2001

[5] Alan S.Morris, "*The Essence of Measurement"*, Eastern Economic Edition, Prentice Hall of India Private Limited.,1997

List of Practical Assignments:

1. To calibrate test Ammeter with reference Ammeter and hence detection of deviation of the test ammeter from reference ammeter using comparison method.

2. To calibrate test Voltmeter with reference Voltmeter and hence detection of deviation of the test Voltmeter from reference Voltmeter using comparison

3. To calibrate test Wattmeter with reference Wattmeter and hence detection of deviation of the test Wattmeter from reference Wattmeter using comparison method.

4. To calibrate test Energy meter with reference Energy meter and hence detection of deviation of the test Energy meter from reference Energy meter using comparison method.

5. To study Hay's Bridge and hence determination of unknown value of Self Inductance of given coil using Hay's Bridge.

6. To study Anderson Bridge and hence determination of unknown value of Self Inductance of given coil using Anderson Bridge.

7. To study Schering's Bridge and hence determination of unknown value of Capacitance of given coil using Schering's Bridge.

8. To study Maxwell's Bridge and hence determination of unknown value of Inductance of given coil using Maxwell's Bridge.

9. To study Wien's Bridge and hence determination of unknown value of Capacitance of given coil using Wien's Bridge.

10. To study De Sauty Bridge and hence determination of unknown value of Capacitance of given coil using De Sauty Bridge.

11. To study Kelvin's Bridge and hence determination of unknown value of very low resistance of given coil using Kelvin's Bridge.

12. To study the construction detail of CRO including measurement of voltage, Phase and frequency with the help of CRO.

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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To recall various BJT parameters, connections and configurations.
- To Explain and Demonstrate BJT Amplifier, Hybrid Equivalent and Hybrid Models.
- To explain construction and characteristics of JFETs and MOSFETs.
- To explain various types of FET biasing, and demonstrate the use of FET amplifiers.
- To Demonstrate and Construct Frequency response of BJT and FET amplifiers at various frequencies.
- To Define, Demonstrate and Analyze Power amplifier circuits in different modes of operation.
- To Demonstrate and Apply Feedback and Oscillator circuits using FET.

Prerequisites: Basic knowledge and understanding of semiconductor devices and operation required.

COURSE CONTENTS

Unit I

BJT AC Analysis: BJT AC Analysis:

BJT Transistor Modeling, The re transistor model, Common emitter fixed bias, Voltage divider bias, Emitter follower configuration. Darlington connection-DC bias; The Hybrid equivalent model, Approximate Hybrid Equivalent Circuit Fixed bias, Voltage divider, Emitter follower configuration; Complete Hybrid equivalent model, Hybrid πModel.

Unit II

Field Effect Transistors: Construction and Characteristics of JFETs, Transfer Characteristics, Depletion type MOSFET, Enhancement type MOSFET. **FET Amplifiers:** JFET small signal model, Fixed bias configuration, Self-bias configuration, Voltage divider configuration, Common Gate configuration. Source-Follower Configuration, Cascade configuration.

Unit III

BJT and JFET Frequency Response:

Logarithms, Decibels, Low frequency response – BJT Amplifier with RL, Low frequency response FET Amplifier, Miller effect capacitance, High frequency response – BJT Amplifier, High frequency response-FET Amplifier, Multistage Frequency Effects.

Unit IV

Feedback and Oscillator Circuits:

Feedback concept, Feedback connection types, Voltage Series, Voltage Shunt, Current Series, Current Shunt, practical feedback circuit Phase shift oscillator, wien bridge oscillator, colpitts Oscillator, hartely oscillator, Crystal Oscillator.

Unit V

Power Amplifiers:

Definition and amplifier types, Series fed class A amplifier, Transformer coupled class A amplifier, Class B amplifier operation and circuits, Amplifier distortion, Class C and Class D amplifiers. Voltage regulators: Discrete transistor voltage regulation - Series and Shunt Voltage regulators.

Learning Outcomes: After studying this course, students will be able to:

- Acquire knowledge of and Working principles, characteristics and basic applications of BJT and FET.
- Single stage, cascaded and feedback amplifier configurations and Frequency response characteristics of BJT and FET.
- Analyze the performance of FET amplifier in CS configuration and Power Amplifiers and Oscillator circuits.
- Interpretation of performance characteristics of transistors amplifiers, frequency Response and Oscillators.
- Apply the knowledge gained in the design of transistorized circuits, amplifiers and Oscillators.

BOOKS RECOMMEDED

[1]. Adel S. Sedra and Kenneth C. Smith, "*Micro Electronic Circuits Theory And Applicatication,*" 5th Edition ISBN:0198062257

[2]. Behzad Razavi, "*Fundamentals of Microelectronics*", John Weily ISBN 2013 978-81-265-2307-8

[3]. J.Millman & C.C.Halkias, "*Integrated Electronics*", 2nd edition, 2010, TMH. ISBN 0- 07-462245-5

[4]. K. A. Navas, "*Electronics Lab Manual*", Volume I, PHI, 5th Edition, 2015, ISBN:9788120351424.

List of Practical Assignments:

1. Realize BJT Darlington Emitter follower with and without bootstrapping and determine the gain, input and output impedances.
2. Design and set up the BJT common emitter amplifier using voltage divider bias with and without feedback and determine the gain bandwidth product from its frequency response.
3. Plot the transfer and drain characteristics of a JFET and calculate its drain resistance, mutual conductance and amplification factor.
4. Design, setup and plot the frequency response of Common Source JFET/MOSFET amplifier and obtain the bandwidth.
5. Plot the transfer and drain characteristics of n-channel MOSFET and calculate its parameters, namely; drain resistance, mutual conductance and amplification factor.
6. Set-up and study the working of complementary symmetry class B push pull power amplifier and calculate the efficiency.
7. Design and set-up the RC-Phase Shift Oscillator using FET, and calculate the frequency of output waveform.
8. Design and set-up the following tuned oscillator circuits using BJT, and determine the frequency of oscillation. (a) Hartley Oscillator (b) Colpitts Oscillator
9. Design and set-up the crystal oscillator and determine the frequency of oscillation

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">II Year B.E. (Electronics and Instrumentation Engg.)
(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR4C4
SENSOR AND TRANSDUCERS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives: To develop good understanding on the principle of operation and the important characteristics of Sensor & Transducers commonly used in industry. Knowledge of recent developments in the field of Sensor & Transducers. Criterion for selection, installation of suitable sensing elements and to design the appropriate signal conditioning circuit for their specific measurement applications.

COURSE OF CONTENTS

Unit 1: Transducer Fundamentals

Basic concept of Sensors and transducer, their comparisons, Classification of Transducer, Working of transducers used for measurement of Displacement- resistive, inductive and capacitive method, Linear and Angular Velocitymoving coil and moving magnet method, various tachometers and stroboscope, Acceleration- seismic and peizo electric accelerometer, Working principle of Capacitive Transducer, Piezo-Electric Transducer, and LVDT.

Unit 2: Strain and Temperature Measurement

Strain Gauges- strain measurement technique, resistance strain gauge and its types, Signal conditioning of strain gauges, Transducers for Temperature Measurement- non- electrical and electrical method, Bimetallic Thermometer, Resistance Thermometer like RTD, Thermistor and Thermocouple, Radiation and Optical Pyrometer.

Unit 3: Pressure Measurement

Transducers for Measurement of Pressure: - Manometers types (like Single column, inclined, U-tube), Mechanical Types (Bourdon, bellows and diaphragm), Elastic Types transducers, Low Pressure measurement gauges (Ionization, McLeod etc.).

Unit 4: Flow Measurement

Transducers for Measurement of Flow: - Types of flow meters, Theory of variable head constant area meter and its types, theory of constant head variable area meter and its types, theory of variable head variable area meter and its types, Special flow meters- Electromagnetic, Hot wire Anemometer, Turbine meter and Ultrasonic flow meter.

Unit 5: Miscellaneous Measurement and Smart Sensor

Transducer for Level Measurement:- direct and indirect method, resistive method, Ultrasonic, Capacitive and Gamma Ray level Gauges. Measurement of Humidity and Moisture- basic definitions, psychometric method,
Smart sensors - Fibre optic sensors, MEMS – Nano sensors, proximity sensor.

Learning Outcomes: After successful completion of this course, students should

1. Understand the fundamental principles of various types of sensors including thermal, mechanical, electrical, electromechanical and optical sensors.
2. Understand their general characteristics, terminologies, sensing and transduction principles;
3. Be familiar with criteria for sensors and transducers selection and choose appropriate measurement methods for engineering tasks and scientific researches.

BOOKS RECOMMENDED:

[1].A.K.Sawhney & Puneet Sawhney, A Course in Mechanical Measurements and Instrumentation, 12/e, , Dhanpat Rai & Co. (P) Ltd.,2004
[2].B.C.Nakra & K.K.Chaudhary,Instrumentation Measurement And Analysis, Tata McGraw-Hill Publishing Company Ltd, New Delhi.,1996
[3].D.Patranabis, Principles of Industrial Instrumentation, 2/e, Tata McGraw-Hill Publishing Company Ltd, New Delhi.,1998
[4].James W. Dally, William F. Riley & Kenneth G.McConnell, Instrumentation for Engineering Measurements,2/e,Wiley Student Edition, John Wiley & Sons,INC,2003.
[5].John P.Bentley, Principles of Measurement Systems, Low Price Edition, Pearson Education Asia,2000
[6].Dr.D.S.Kumar, Mechanical Measurements and Control, 3/e, Reprint-2004, Metropolitan Book Co. Private Ltd.,2004
[7]. Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press, 2005.

List of Practical's:

1. Measurement of Temperature using Thermocouple.
2. Measurement of Temperature using Thermistor.
3. Measurement of Temperature using RTD.
4. To measure linear displacement using LVDT.
5. To study the principle and functioning of Load Cell (Cantilever type).
6. To study the principle and functioning of Load Cell (Strain gauge type).
7. To measure angular displacement using Capacitive Gauge.
8. To study the functioning of capacitive based digital water level indicator.
9. To study the conductivity meter
10. To measure pressure using Manometer.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR4G2
SIGNAL & SYSTEMS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:
This course aims to provide detailed description Signals and System Analysis. Fourier series and Fourier transform, Laplace and Z Transform along with respect to SISO systems and State variable analysis for MIMO systems.
Prerequisite(s): Engineering Mathematics
COURSE CONTENTS
UNIT-I Fundamentals of Signals & Systems:
All basic Continuous time signals. Energy signal and Power signal. Continuous time systems, Discrete time signals and Discrete time systems. Linear Time invariant system theory and its significance to continuous time and discrete time system analysis. Linear convolution Integral and Linear convolution sum.
UNIT-2 Fourier series and Fourier Transform:
Fourier series, Different forms of Fourier series, Dirchlet conditions, Wave symmetry, Parseval theorem. Fourier Transform; its properties and applications. Symmetry properties of Fourier transform. System analysis with Fourier transform. Ideal Filters.
UNIT-3 Laplace Transform and its applications:
Laplace Transform and its properties. Region of convergence, Laplace Transform of some common functions, Initial value and Final value theorem. Inverse Laplace Transform, Transfer function, Characteristics of transfer function, Poles and Zeros, System analysis using Laplace Transform.
UNIT-4 State Variable Techniques:
Introduction, State Variable Concept, Form of state equations, State space representation of continuous time and discrete time LTI systems, solution of state equation, state transition matrix.
UNIT -5 Discrete Time Signal/Systems and Z-Transform:
Introduction, Z-Transform definition, Region of Convergence, Z-Transform of some common sequences, properties of Z-Transform, Inverse Z-Transform, System function of discrete time, LTI Systems, Convolution Theorem, Complex Convolution Theorem.
Learning Outcomes:
On Completion of this course the students will be able to:

- The focus of this course is to familiarize the students with the concept of Fourier transform & Fourier series.
- Analyze the spectral characteristics of signals using Fourier analysis.
- Classify systems based on their properties and determine the response of LTI
- Identify system properties based on impulse response and Fourier analysis.
- Apply transform techniques to analyze continuous-time and discrete-time

BOOKS RECOMMENDED:

[1] Rodger E. Ziemer, William H.Tranter, D. Ronald Fannin, “*Signals and Systems*”, Pearson 4th Edition
[2] Hwei P. Hsu (Schaum's Outline Series), “*Signals and Systems*”, TMH Edition
[3] A. Anand Kumar, “*Signals and Systems*”, PHI 3rd Edition
[4] A.V.Oppenheim et al, “*Signals and Systems*”, 2nd Edition, Pearson 2003
[5] Smarajit Ghosh, “*Signals and Systems*”, Pearson
[6] Simon Haykin , “*Signals and Systems*” 2nd edition, Wiley, 2008.
[7] B P Lathi, “*Digital and Analog Communication Systems*” 4th edition, Oxford University Press, 2000

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR4L2
ELECTRONIC WORKSHOP II</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">1</td><td rowspan="2">1</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To familiarize students with various Electronic devices and their specifications.
- Develop skill for Design and Testing of different types of Electronic subsystems using Analog and Digital IC's
- Familiarize students with PCB layout tool to prepare PCB print for assigned project.
- Develop skills of writing a structured technical document for project and its presentation.
- Develop ability to diagnose faults and their rectification.

COURSE CONTENTS

List of Exercises / Experiments

1. Familiarization /Identification of electronic components with specification and Functionality, type, size, colour coding, package, symbol, cost etc. Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.

2. Drawing of electronic circuit diagrams using EDA tools, Interpret data sheets of discrete components and IC's, Estimation and costing.

3. Familiarization/Application of testing instruments and commonly used tools like Multimeter, Function generator, Power supply, CRO etc. Soldering iron, De-soldering pump, Cutters, Wire strippers, Screw drivers, Hot air soldering and desoldering station etc.

4. Testing of electronic components Resistor, Capacitor, Diode, Transistor, UJT and JFET using multimeter and different IC's using IC tester.

5. Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.]

6. Assembling electronic circuit/system on general purpose PCB, testing and show the functioning (Total two projects. **Any one from 1-13 and one from 14-18 project list)**

List of Projects

1. Fastest Finger First Indicator Project
2. Fire Alarm Circuit
3. Plant Watering Watching Indicator
4. Clap switch for operating electric equipment like fan, bulb
5. Mobile Battery Charger
6. 7 Segment Counter
7. Metal Detector
8. Electronic letter box
9. Traffic Light circuit
10. Light-Sensitive Fire Alarm
11. Infrared Motion-Sensing Relay Switch
12. LPG Leakage Detector
13. Motion Detector Using NE555 Timer
14. Design and implement a single stage voltage amplifier using BJT in common emitter configuration for a gain of 10 to amplify input voltage 10 mVp-p, 10-100 KHz. Also tabulate the results for different input range.
15. Design and implement a two stage R-C coupled amplifier using BJT in common emitter configuration for a gain of 100 to amplify input voltage 1mVp-p, 10-100 KHz. Also tabulate the results for different input range.
16. Design and implement LOW PASS, HIGH PASS filter using OP-AMP with cut off frequency 10 KHz and a bandpass filter with passband of 100 KHz.
17. Design and implement variable frequency and variable amplitude triangular waveform generator using OP-AMP. Tabulate the frequency range and amplitude range for the implemented circuit.
18. Design and implement variable frequency and variable amplitude square waveform generator using OP-AMP. Tabulate the frequency range and amplitude range for the implemented circuit.

Learning Outcomes:

Upon completing the course, students will be able to design, test and implement any Analog or Digital circuit by making use of the various tools and instruments available in the Electronics Workshop.

BOOKS RECOMMENDED:

[1] K. A. Navas, “*Electronics Lab Manual*”, Volume I, PHI, 5th Edition, 2015, ISBN: 9788120351424
[2] R.A Penfold, “*Electronic Projects in Workshop*”, Newnes Technical Books
[3] T.K Hamingway, “*Electronic Designer’s Handbook*”, Business Books Limi

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Electronics and Instrumentation Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
	L	**T**	**P**	**L**	**T**	**P**	**Total**
SER4S4 ENGINEERING ECONOMICS	**0**	**0**	**1**	**0**	**0**	**1**	**1**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To make fundamentally strong base for decision making skills by applying the concepts of economics.
- Educate the students on how to systematically evaluate the various cost elements of a typical manufactured product, an engineering project or service, with a view to determining the price offer.
- Prepare engineering students to analyze profit/revenue data and carry out make economic analysis in the decision making process to justify or reject alternatives/projects.

COURSE CONTENTS

Unit-I

Introduction to Engineering Economics: Definitions, Nature and Scope of Economics; Difference between Microeconomics and Macroeconomics; Concepts of Engineering Economics- Engineering Efficiency and Economic Efficiency.

Consumer Demand Analysis: Meaning, Features and Determinants of demand; Law of Demand and its Exceptions; Reasons for Law of Demand; Importance of Law of Demand; Elasticity of Demand.

Unit-II

Supply Analysis: Meaning, Supply Function, Law of Supply, Determinants of Supply, and Fluctuation of supply; Elasticity of supply and its measurement.

Unit-III

Theory of Production: Production Function, Factors of Production; Law of Variable Proportions; Law of returns to scale Cost, Revenue and Profit Analysis: Cost Classifications for Predicting Cost Behavior; Concept of Profit, Gross Profit and Net Profit; Break Even Point (BEP).

Unit-IV

National Income: Circular Flow of Income, Meaning and Concept of National Income: GNP/GNI, NNP/NNI, Personal Income and Disposable Income; Methods of Computing National Income - Production Method, Income Method, Expenditure Method.

Unit-V

Economic Stabilization: Monetary Policy- Meaning, Objectives, Tools; Fiscal Policy- Meaning, Objectives, Tools.

Learning Outcomes:

- Upon completing the course, students will be able to:
- Understand major principles of economic analysis for decision making among alternative courses of action in engineering.
- Apply economic principles to prices and quantities in competitive supply and demand for goods and for money.
- Solve economic problems involving comparison and selection of alternatives by using analytical techniques including benefit-cost ratio and breakeven analysis.

BOOKS RECOMMENDED:

[1] C S Park, "*Contemporary Engineering Economics*", Pearson Education, 2002.
[2] J S Chandan, "*Statistics for Business and Economics*", Vikas Publishing.
[3] H. L. Ahuja, "*Principles of Microeconomics*", S. Chand (G/L) & Company Ltd, 2002.
[4] D. N. Dwivedi, "*Macroeconomics Theory and Policy*", Tata McGraw-Hill Publishing Company, 2010.
[5] S Damodaran, "*Managerial Economics*", Oxford University Press, 2010.

List of Assignments (Theory):

During the learning of course students are required to research and submit an outline of the past, present and future position of a company of their choice. The outline must include at least one properly labelled table and figure and at least two references

CBCS system

B.E. III YEAR Electronics & Instrumentation Engg. (4 YDC)

Semester-V

S.No	Sub_code	Sub_Name	Type	L-T-P	Credits
1	EIR5C1	OBJECT ORIENTED PROGRAMMING	PC	3-1-0	4
2	EIR5C2	ANALOG & DIGITAL COMMUNICATION	PC	3-1-1	4+1(P)
3	EIR5C3	POWER ELECTRONICS	PC	3-1-1	4+1(P)
4	EIR5E1	MICROCONTROLLER (AVR)	PE	3-1-1	4+1(P)
		RANDOM PROCESSES			
		INTRODUCTION TO MEMS			
		FUZZY LOGIC AND NEURAL NETWORK			
		ROBOTICS			
5	SER5S5	PRINCIPLES OF MANAGEMENT	OS	2-0-0	2
6	EIR5G3	DIGITAL SIGNAL PROCESSING	GE	3-1-0	4
7	EIR5L3	SOFTWARE WORKSHOP-II		0-0-1	1(P)
8	EIR5V5	COMREHENSIVE VIVA -V	VIRTUAL	0-0-4	4
TOTAL CREDITS					30

S.No	Sub_code	Sub_Name	Type	L-T-P	Credits
1	EIR6C1	VLSI DESIGN	PC	3-1-0	4
2	EIR6C2	MEDICAL AND ANALYTICAL INSTRUMENTATION	PC	3-1-1	4+1(P)
3	EIR6C3	CONTROL SYSTEM	PC	3-1-1	4+1(P)
4	EIR6E1	LINEAR INTEGRATED CIRCUIT	PE	3-1-1	4+1(P)
		MULTIMEDIA COMMUNICATION			
		MOBILE AND WIRELESS COMMUNICATION			
		MODELING AND SIMULATION			
		TELECOM AND SWITCHING NETWORKS			
5	SER6S6	ENTERPRENEURSHIP AND IPR DEVELOPMENT	OS	2-0-0	2
6	EIR6G4	COMPUTER NETWORK	GE	3-1-0	4
7	EIR6L4	DESIGN WORKSHOP		0-0-1	1(P)
8	EIR6V6	COMPREHENSIVE VIVA - VI	VIRTUAL	0-0-4	4
TOTAL CREDITS					30

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics & Instrumentation Engg.)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
EIR5C1 **Object Oriented Programming**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: **3 Hours**							

Learning Objective: To learn about object oriented concepts through Java programming.

Prerequisites (if any): basics of computer programming

COURSE CONTENTS

UNIT-I

Introduction to Object Oriented Programming:

Object oriented concepts, Need for object oriented programming, Principles of object oriented programming- Abstraction, Encapsulation, Polymorphism, Inheritance; Procedural language vs OOPs, Salient features of Java, Development of Java programming, Access modifiers, Introduction to object model, concept of object initialization, simple Java program structure,

UNIT-II

Introduction to Java classes and objects

Java data types, data type conversions and type casting, operators and their precedence, Types of operators, conditional statements- if—else, switch case, ternary operator, Iteration statements- for loop, while expression, do-while, branching mechanism, introduction to classes-class members and member functions, constructors, constructor overloading, String handling, wrapper classes, Arrays and vectors.

UNIT-III

Inheritance and Polymorphism

Inheritance basics, Types of inheritance, merits and demerits, application of keyword Super, method overriding and overloading, Inhibiting inheritance of class using Final, Dynamic method dispatch, runtime polymorphism, abstract classes, Interfaces, implementing interfaces, Packages in Java, importing packages and classes into programs, user defined packages

UNIT-IV

Exception handling and Multi-threading

Introduction to exceptions, need for exceptions, exception handling techniques, exception types, Using try-catch, finally, throw and throws keywords, user defined exceptions,, Multi-threading in Java, Thread class, the Main Thread, creation of new Threads, Thread states, Thread priority, Thread synchronization.

UNIT-V

Java I/O, Applets and Event Handling

Basic I/O classes, byte streams and character streams, class File, reading and writing Bytes, Applet basics, Applet architecture, Applet class and methods, Applet life cycle, event handling in Java, Delegation event model, types and sources of events, event listeners.

Learning Outcomes:
Upon completing the course, Student would be able to:

- Understand the basic concepts of Java programming
- familiarize with the declaration of classes, arrays, operations with arrays, process of inheritance.
- Learn the implementation of interfaces, importing packages, handling exceptions and creating applets.
- learn how to write, compile and get results of simple application programs in Java

BOOKS RECOMMENDED:

[1] Herbert Schildt, Java The complete reference, McGraw Hill Education private limited, 2013.
[2] Anita Seth, B.L.Juneja, Java One Step Ahead, Oxford University press, 2017.
[3] Timothy, Budd, Object Oriented Programming, 3/E Pearson Education, 2002.
[4] Cay S.Horstmann, Core Java, vol-1,8/E, Pearson Education, 2008.

List of Practical Assignments:

1. Write a program that converts inches to centimeters.
2. Write a program in which the program gives output numbers 1 to 10 along with their square roots.
3. Write a program to find the average of five double numbers.
4. Write a program to determine the area of a sector of circle of radius r and angle subtended by the sector at the centre, a. The values of these variables are entered by the user.
5. Write a program that finds the greatest of 4 integer numbers using ternary operator. The number values are entered by the user of the program.
6. Write a program in which a sample of 8 random numbers is generated and an average value is determined by the user.
7. *Make a program which uses a for loop to calculate and display squares and cubes of numbers from1 to 8.*
8. Write a program that finds the greatest of 4 integer numbers using ternary operator. The number values are entered by the user of the program.
9. Write a program in which a sample of 8 random numbers is generated and an average value is determined.
10. Write a program in which a class is declared to deal with the characteristics of regular polygons and declare methods for determining area and perimeter. The length of the side and number of sides are declared public.
11. Write a program in which a method is declared to determine volume of a box with length, width and height as variables. The arguments should be passed on by reference.
12. Create a class Circle. Write a program to calculate:

(i) CircumCircle() - to compute the circumference of a circle.

(ii) ArcLenght – to compute the length of the arc for a given angle.

13. Within the main method of the class Circle, create an object of the class Circle. Compute Circle's circumference when the radius is 10 and arc lenght when the angle is 45.
14. Write an applet program to display strings in different colors that declares an array of type double and finds out the square roots of the array elements.
15. Write a program to demonstrate the multiplication of two matrices.
16. Write a program in which method overriding is implemented. The super class declares two instance variables i.e. radius and height, and define a method to determine the volume. The sub class determines the volume of cone and cylinder.
17. Make program to determine the trigonometric functions sin(), cos() and tan() by using methods of Math class for angles 30, 60, and 90 degrees.
18. Declare an interface with a method to calculate volume with one double parameter. Implement the same for finding volume of sphere and volume of a cube.
19. Make an applet program to display strings in different colors.
20. Make an applet program to draw a filled hexagon in orange color.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR5C2
Analog & Digital Communication</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- The course contents are aimed to provide the basics of signals and linear time invariant systems used in communication systems
- To review the basic Fourier techniques and its application in these processes.
- To provide knowledge of basic principles of analog and digital communication.
- To introduce the various processes like sampling, digital coding techniques, modulation and channel coding techniques that are used in modern telecommunication system.

Prerequisites: The basic knowledge of signals and systems and probability theory.

COURSE CONTENTS

UNIT-I

Signals and Systems: Types of signals-deterministic & random, periodic & non-periodic, analog & discrete, energy & power signals, Fourier series, Fourier transform & its properties, convolution, signal transmission through LTI systems, auto correlation, cross correlation, energy and power spectral density, their relationship with correlation function, probability, random variables & their moments, Gaussian probability density functions, its mean and variance.

UNIT-II

Amplitude Modulation: need of modulation in a communication system, block schematic of a typical communication system, AM modulation system, modulation index, generation (square law & switching modulator) & detection (envelope & square law detector) of AM wave, side bands & power content in an AM wave, a brief review of DSB-SC, SSB, VSB, AM transmitter block diagram, super heterodyne radio receivers and its advantages.

UNIT-III

Frequency Modulation: relationships between phase & frequency modulation, narrowband FM, wide band FM & their spectrum, transmission bandwidth of FM and PM signals, FM generation methods (direct & indirect) & FM detection methods (discriminators: balanced, phase shift and PLL detector), pre-emphasis & de-emphasis, FM transmitters, FM receivers (block diagram), comparison with AM systems in presence of noise, frequency division multiplexing.

UNIT-IV

Sampling, Digital encoding & Line coding: sampling theorem, types of sampling, quantization, digital encoding techniques PCM, DPCM, DM, ADM, line coding techniques NRZ, RZ, Biphase, Duo Binary, their comparison based on various desirable properties.

UNIT-V

Digital modulation & Channel coding: A brief overview of generation, detection, constellation points of digital modulation techniques, ASK, FSK, PSK, MSK, introduction to optimum filter, matched filter. Channel coding techniques: error detection and correction codes, parity check code, minimum distance, hamming distance, overview of linear block code, cyclic code, convolutional code and their applications.

Learning Outcomes:

Upon completing the course, students will be able to:

- Understand basics of signals, frequency domain analysis & its importance.
- Understand the working of transmitter and receiver in analog & digital communication system.
- Understand about the digital data transmission using line coding.
- Understand how to detect and correct the errors introduced during the transmission.

BOOKS RECOMMENDED:

[1] Lathi B.P., *Analog and Digital Communication Systems*, 3/e, Oxford Press, 2007
[2] Proakis and Salehi, *Fundamentals of Communication Systems*, Pearson Education, 2005
[3] Taub & Schilling, *Principles of Communication Systems*, 4/e, McGraw Hill, 2013
[4] Bernard Sklar, *Digital communication*, 2/e, Pearson Education, 2007.
[5] Haykins Simon, *Analog and Digital Communication*, 3/e Willey Publication, 2007.
[6] Singh R.P. & Sapre, *Communication systems Analog & Digital*, TMH, 2007
[7] Carlson, *Communication Systems*, McGraw Hill, 2004

List of Practical Assignments:

1. To study the working of sampling and reconstruction techniques for various sampling frequencies.
2. To study even/odd parity check code for single bit error detection.
3. To perform time division multiplexing and de- multiplexing.
4. Study and analysis of pulse code modulation and demodulation.
5. To study various data formatting schemes (unipolar, polar, AMI etc.).
6. Study and analysis of amplitude modulation & demodulation for different modulation index values.
7. Study and analysis of frequency modulation and demodulation.
8. Study and analysis of ASK modulation and demodulation.
9. Study and analysis of BPSK modulation and demodulation.
10. Study and analysis of QPSK modulation and demodulation.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (E&I)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
EIR5C3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Power Electronics	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To prepare the students to analyze & design different power converter circuits.
- To acquire knowledge about various application of power electronics.

Prerequisites: Basic Electronics

COURSE CONTENTS

UNIT-I
Static Power Devices
Power semiconductor diodes & transistors, Thyristors, Construction, Characteristics, Ratings, Protection, Heating, Cooling, Mounting, Turn on methods, Gate characteristics, Firing circuits of thyristor, Introduction to other members of thyristor family like PUT, SUS, SCS, DIAC, TRIAC.

UNIT-II
Converters
Thyristor commutation techniques, Phase controlled rectifiers, Principal of phase control, Full wave controlled converters, Single-phase full wave converters, Three-phase thyristor converter circuits, Basic principle & power circuit of Dual converter & AC voltage controller.

UNIT-III
DC to DC Converter
Choppers: Basic principal of chopper operation, Control strategies, Step-up chopper, Different types of chopper circuits, Thyristor chopper circuits, Performance analysis.

UNIT-IV
Inverter
Single-Phase voltage source inverters, Principal of operation, Fourier analysis of single-phase inverters, Force-commutated thyristor inverters, Current source inverters, Pulse-width Modulated Inverters.

UNIT-V:
Industrial application of Power Electronics, SMPS, UPS, static switches, circuit breakers, solid state relays, concept of Electric drive.

Learning Outcomes:
Upon Completing the Course, Student will able to:

- Design the Inverter, chopper, rectifiers for high voltage.
- Apply design concepts for industrial applications.

BOOKS RECOMMENDED:

[1] Muhammad H. Rashid, *Power Electronics Circuits, Devices & Applications*, 3/e. 2004, PHI
[2] Cyril W. Lander, *Power Electronics*, 3/e.1993, The McGraw-Hill
[3] Dr. P.S. Bimbhra, *Power Electronics,* 4/e. 2006, Khanna Publishers
[4] P.C. Sen, *Power Electronics,*
[5] Ned Mohan, *Power Electronics, Converters, Application & Design*, 2/e. 1995, John Wiley
[6] Joseph Vithayathil, *Power Electronics, Principles & Applications*, 6/e. 2010, McGraw Hill

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Electronics & Instrumentation Engg.)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR5E1
Microcontroller</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Prerequisite: Students should have in depth knowledge of Digital Logic Design, Microprocessor architecture as well as logical ability and programming skills to develop the code

Learning Objectives:

: The knowledge of microcontroller is very essential for a student of BE in Electronics and Communication/instrumentation Engineering as the world is migrating towards automation rapidly in each and every fields. The students studying the subject are supposed to learn the architecture and programming of typical microcontroller. Students will be taught the basic use of an assembly as well as embedded C programming environment to control peripheral devices. Students will also understand the interfacing of various peripheral elements with microcontroller to design an automated system. The course will cover AVR, 8-bit Microcontroller in detail with sufficient exposure to design an automated system.

Unit 1: Introduction To Microcontroller

Microcontrollers and Embedded processors, Microcontroller survey, Overview of AVR family, AVR Microcontroller architecture, Register, status register, ROM space and other hardware modules, ATmega32 pin configuration &function of each pin.

Unit 2: AVR Assembly Language Programming

Addressing modes of AVR, Different instructions, assembly language programs, I/O Port Programming, Time delay loop, BCD, ASCII conversion Program, Look-up table, Bit addressability, MACROs.

Unit 3: AVR Programming in C

Data types, I/O programming, logic operations, Intel HEX file, Timer programming in assembly and C, Input capture and Wave Generator, PWM programming

Unit 4 : Interrupt & Serial port programming

Interrupt environment ,Interrupt programming and applications, Serial Port programming and applications

Unit 5 : Peripheral Interfacing

LCD and Keyboard Interfacing, ADC, DAC and sensor interfacing, Relay, Opto-isolator and Stepper Motor Interfacing, DC motor control, SPI protocol and Display interfacing, I2C Protocol and RTC interfacing

Course Outcome:
After learning the course the students should be able to:
1. Understand the architecture of AVR 8-bit Microcontroller.
2. Describe the importance and function of each pin of AVR ATmega32 Microcontroller.
3. Write, debug and simulate assembly as well as embedded C language programs.
4. Understand Timer operation, Interrupt environment and Serial Communication.
5. Interface I/O peripheral devices with microcontroller.
6. Summarize the functionality of I2C and SPI protocol.

Reference Books:
1. The AVR Microcontroller and Embedded Systems Using Assembly and C, By Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, Pearson Education.

2. Programming and Customizing the AVR Microcontroller, By Dhananjay Gadre, McGraw Hill Education

3. AVR ATmega32 data sheet

List of Open Source Software/learning website:
1. Open source AVR simulator.
2. www.atmel.com
3. http://www.arduino.cc/

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Electronics & Instrumentation)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">Digital Signal Processing (EIR5G3)</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
</table>

Learning Objectives:To provide the analysis techniques like for discrete time systems analyze the discrete time systems in time and frequency domain using Z- Transform and Fourier transforms to learn the signal processing tool box of MATLAB for implementing the basic problems of DSP designing of digital filters.

Prerequisite(s): Awareness about the analysis of analog signals and systems and analog filter design.

COURSE OF CONTENTS

Unit-I

Introduction to signal processing , Discrete time signals and sequence operations , Discrete time systems properties ,Linear time invariant systems ,convolution ,properties of LTIV systems ,Inverse system .Frequency domain representation of discrete time signals and systems(DTFT), properties,Representation of sequences by Fourier transforms.

Unit-II

Introduction to Z- transforms , properties , Inverse Z – transform, ,block diagram representation of linear constant coefficient difference equation,Signal flow graph representation of LCCDE, Basic structures for IIR systems ,Basic structures for FIR systems. Representation of periodic sequences , the discrete Fourier series ,properties of DFS, Fourier transform of periodic signals, properties,circular convolution ,linear convolution using DFT, Implementing LTIV systems using DFT.

Unit-III

Efficient computation of DFT , Goertzel algorithm , decimation in time FFT algorithm, In place computation, alternative forms , decimation in frequency FFT algorithm , In place computation, alternative forms.

Unit IV

Filter design techniques ,Design of discrete time IIR filters from continuous time filters, filter design by impulse invariance , bilinear transformation ,design of FIR filters by windowing properties of commonly used windows.

Unit V

Introduction of DSP Processor.Types of Digital signal processors , Applications.

Learning Outcomes:

Upon Completing the Course, Student will be able to:

1.Understand the concept of fourier transform & fourier series.
2. Acquire Knowledge and understanding of Filter design.
3. Able to know the functioning of DSP processors.

BOOKS RECOMMEDED

[1] Oppenheim and Schafer, Discrete time signal processin, 2/E PHI, 2005.
[2] Proakis and Manolakis, Discrete time signal processing, PHI, 2005.
[3] S. Mitra, Discrete time signal processing, Pearson Education.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Electronics & Instrumentation Engg.)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR5L3
Software Workshop</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Only Practical examination will be held</td></tr>
</table>

Learning Objective: To familiarize students about Java based application programs

Prerequisites (if any): basics of Java programming

COURSE CONTENTS

UNIT-I

Introduction to Object Oriented Programming, Java based application programs related to topics such as conditional statements, iteration statements with a focus on problems related to electronics and telecommunication.

UNIT-II

Introduction to string handling, Arrays, Java based application programs related to these topics with a focus on problems related to electronics and telecommunication.

UNIT-III

Introduction to Inheritance and Polymorphism, Java based application programs related to these topics with a focus on problems related to electronics and telecommunication.

UNIT-IV

Exception handling and Multi-threading, Java based application programs related to these topics with a focus on problems related to electronics and telecommunication.

UNIT-V

Java I/O, Applets and Event Handling, creating GUIs in AWT windows, Java based application programs related to these topics with a focus on problems related to electronics and telecommunication.

Learning Outcomes:

Upon completing the course, Student would be able to:

- Write Java based application programs
- Learn to apply the concepts relating to various topics

BOOKS RECOMMENDED:

[1] Herbert Schildt, Java The complete reference, McGraw Hill Education private limited, 2013.
[2] Anita Seth, B.L.Juneja, Java One Step Ahead, Oxford University press, 2017.
[3] Timothy, Budd, Object Oriented Programming, 3/E Pearson Education, 2002.
[4] Cay S.Horstmann, Core Java, vol-1,8/E, Pearson Education, 2008.

CBCS system

B.E. III YEAR Electronics & Instrumentation Engg. (4 YDC)

Semester-V

S.No	Sub_code	Sub_Name	Type	L-T-P	Credits
1	EIR5C1	OBJECT ORIENTED PROGRAMMING	PC	3-1-0	4
2	EIR5C2	ANALOG & DIGITAL COMMUNICATION	PC	3-1-1	4+1(P)
3	EIR5C3	POWER ELECTRONICS	PC	3-1-1	4+1(P)
4	EIR5E1	MICROCONTROLLER (AVR)	PE	3-1-1	4+1(P)
		RANDOM PROCESSES			
		INTRODUCTION TO MEMS			
		FUZZY LOGIC AND NEURAL NETWORK			
		ROBOTICS			
5	SER5S5	PRINCIPLES OF MANAGEMENT	OS	2-0-0	2
6	EIR5G3	DIGITAL SIGNAL PROCESSING	GE	3-1-0	4
7	EIR5L3	SOFTWARE WORKSHOP-II		0-0-1	1(P)
8	EIR5V5	COMREHENSIVE VIVA -V	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

Semester-VI

S.No	Sub_code	Sub_Name	Type	L-T-P	Credits
1	EIR6C1	VLSI DESIGN	PC	3-1-0	4
2	EIR6C2	MEDICAL AND ANALYTICAL INSTRUMENTATION	PC	3-1-1	4+1(P)
3	EIR6C3	CONTROL SYSTEM	PC	3-1-1	4+1(P)
4	EIR6E1	LINEAR INTEGRATED CIRCUIT	PE	3-1-1	4+1(P)
		MULTIMEDIA COMMUNICATION			
		MOBILE AND WIRELESS COMMUNICATION			
		MODELING AND SIMULATION			
		TELECOM AND SWITCHING NETWORKS			
5	SER6S6	ENTERPRENEURSHIP AND IPR DEVELOPMENT	OS	2-0-0	2
6	EIR6G4	COMPUTER NETWORK	GE	3-1-0	4
7	EIR6L4	DESIGN WORKSHOP		0-0-1	1(P)
8	EIR6V6	COMPREHENSIVE VIVA -VI	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

PC : Program compulsory
PE: Program Elective
GE:General Elective
OS: Other skill

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="6">III Year BE
Branch Electronic &
Telecommunication /
Electronics & Instrumentation</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="6">Marks</td></tr>
<tr><td rowspan="2">EIR6C1 : VLSI Design</td><td>L</td><td>T</td><td>P</td><td></td><td>TH</td><td>CW</td><td></td><td></td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">----</td><td>Max</td><td>60</td><td>40</td><td>--</td><td>--</td><td></td></tr>
<tr><td>Duration of paper: 3 hrs</td><td>Min</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Course Objective: This course presents the fundamental of Digital CMOS VLSI design with different VLSI design methodologies and combinational, sequential and semiconductor memory circuit design. It also covers the limitations of CMOS in NANO technology with introduction to the NANO Technology.

Prerequisite: Knowledge of Digital Circuit and Basics of Semiconductors is required.

COURSE OF CONTENTS

Unit I

VLSI design flow, VLSI design style, introduction to the basic fabrication processes (wafer preparation, oxidation, diffusion, etching, metallization and lithography, etc.), Fabrication process Flow: basic Steps, the CMOS n-well Process. Metal oxide semiconductor (MOS) structure, Types of MOSFET: Enhancement and Depletion. Structure and operation of MOS transistor.

Unit II

Threshold voltage equation and energy band diagram of MOSFET, controlling of threshold voltage, MOSFET current – Voltage Characteristics. Transconductance, Drain conduction. Aspect ratio, process parameters, second order effects, MOS small signal and Large signal model, MOS capacitances. Stick diagram rules for nMOS and CMOS technology, lambda based and micron based design rules. Layout design for CMOS inverter

Unit III

Analysis of different types of inverter circuit, CMOS inverter, transfer characteristic, calculation of propagation delay, rise time, fall time, noise margin and power dissipation for CMOS Inverter. Effect of threshold voltage and supply voltage on Delay and power dissipation. Limitations of CMOS in NANO scale circuit design.

Unit IV

CMOS logic**,** Complex Logic Circuits, pseudo NMOS logic, pass transistor logic, Transmission Gate logic and Dynamic logic circuit design. Designing of Combinational logic circuit using CMOS and analysis of various design parameters.

Unit V

Sequential MOS Logic circuits , SR Latched circuits, clocked latch and Flip Flop Circuits, CMOS D latch and Edge Triggered Flip Flop, Design of the Schmitt trigger circuit, Dynamic random access and Static random access memory cell design and analysis, Sense amplifier and row and column decoder circuit.

Learning outcomes:

1. Design building blocks of digital IC using Gate level Modeling.
2. Design building blocks of digital IC using Dataflow Modeling.
3. Design stimulus blocks to test the functionality of the designs.

References:

[1]. Sung-mo Kang and Yusuf Leblebici, *CMOS Digital* Integrated Circuit analysis and Design, Tata McGraw-Hill, 3/e.

[2]. R. Jacob Baker, Harry W. Li and David E. Boyce, *CMOS Circuit design, layout and Simulation*, PHI,IEEE press, Series Edition,

[3]. Yuan Taur and Tak H. Ning, *Fundamentals of Modern VLSI Devices*, Cambridge university Press, Special Edition, 1998

[4]. Neil H.E. Weste and Kamran Esharhian, *Principal of CMOS VLSI design*, PHI, 2/e

[5]. Jan M. Rabaey, Digital Integrated Circuit, PHI, 2/e

Scheme CBCS for B.E. III (Electronics & Telecommunication/ Electronics & Instrumentation)

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. Medical & Analytical Instrumentation			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
EIR6C2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Medical & Analytical Instrumentation	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives: To understand the linkage between Medical Science & Engineering.

Prerequisites: Knowledge of Basic Electronics and Fundamentals of biology & chemistry.

COURSE CONTENTS

UNIT-I

Sources of biomedical signals, Medical instrumentation system, General constraints in design of medical instrumentation system, Patient safety, Electric shock hazards, Effects of electric current on human body, Precautions to minimize electric shock hazards, Leakage current & its types, Testing of biomedical equipment.

UNIT-II

Origin & types of bioelectric signals, Electrodes used for ECG, EEG, EMG, Electrical conductivity of electrode jellies & cream, Microelectrodes, Biomedical recorders: ECG, EEG, EMG, PCG, VCG, Lasers used in medical field, Bedside patient monitoring system, Biomedical telemetry & Telemedicine.

UNIT-III

X-ray machine & Digital radiography, Principles & system components of Computed-Tomography, Magnetic Resonance Imaging: Principles of NMR, its Components & Biological effects, Ultrasonic

& Thermal imaging systems.

UNIT-IV

Cardiac pacemaker like External, Implantable pacemaker, Artificial kidney, Dialyzers, Haemodialysis machine, Stone disease problem, Lithotriptor system, Principle of surgical diathermy, Surgical diathermy machine, Electro-surgery techniques, Electrodes used with surgical diathermy, Introduction to Defibrillators, Mechanics of Respiration, Artificial ventilation, Types of ventilators.

UNIT-V

Fundamentals of analytical instruments, Electromagnetic radiation and its interaction with matter, Laws of spectroscopy, Various components of Absorption instruments, Ultraviolet & Visible absorption spectroscopy, Different types of Photometers and Spectrophotometers, Infrared & FTIR spectroscopy, Nuclear magnetic resonance spectroscopy: Principal & its types, Introduction to chromatography: Gas & Liquid, Computer-based analytical instruments.

Learning Outcomes:

Upon Completing the Course, Student will able to:

- Understand the various sources of bioelectric signals & their processing.
- Describe the fundamentals of various recording & diagnostic instruments.
- Acquire & develop skills for preventive maintenance and repairing of medical instruments.
- Study & understand the fundamentals of medical & analytical laboratory instrumentation.

BOOKS RECOMMENDED:

[1] R.S.Khandpur, *Handbook of Biomedical Instrumentation,* 2/e, Tata McGraw-Hill, 2007
[2] John G. Webster, *Medical Instrumentation,* 4/e, Wiley, 2015
[3] Carr Brown, *Introduction to Biomedical Equipment Technology, 4/e,* Pearson, 2007
[4] R.S.Khandpur, *Handbook of Analytical Instruments,* 2/e, Tata McGraw-Hill, 2012
[5] H.H Willard, *Instrumental Methods of Analysis,* 7/e, Publisher Name, 1988

List of Practical Assignments:

1. Study of ECG Simulator for understanding the ECG signal & its generation process.
2. Using ECG Amplifier & CRO measure the amplitude, frequency & nature of ECG signal.
3. Study of EEG Simulator for understanding the EEG signal & its generation process.
4. Using EEG Amplifier & CRO measure the amplitude, frequency & nature of EEG signal.
5. Study of EMG Simulator for understanding the EMG signal & its generation process.
6. Using EMG Amplifier & CRO measure the amplitude, frequency & nature of EMG signal.
7. Study of Heart & Pacemaker.
8. Study of Defibrillator system.
9. Study of Respiratory system.
10. Experimental study of ph meter & UV-Spectrophotometer.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Electronics & Instrumentation Engineering)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>EIR6C3</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Control System</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To provide the fundamental knowledge of control system engineering and the concept of mathematical modelling of the physical system.
- The subject gives various classical analysis tools for design and stability of system in time and frequency domain.

Prerequisites (if any): Knowledge of Laplace transforms, Z-transform, Basics of MATLAB & Simulink.

COURSE CONTENTS

UNIT-I: Introduction to the control system & Physical modelling

Basic component of control system (CS), open-loop CS (non-feedback system), close-loop CS (feedback CS), Types of feedback CS- linear and non-linear CS, time-invariant and time variant CS, single variable and multivariable control system.
Effect of feedback on-overall gain, stability, sensitivity, external disturbance or noise, Block diagram representation of CS, Block diagram reduction rules, Transfer function (TF), Poles-zero concept, Signal flow graph (SFG), Mason’s gain formula.
Modeling of CS- electrical networks, mechanical systems-translational and rotational mechanical system, analogy concept- force to voltage (F-V) and force to current (F-I) analogy.

UNIT-II: Time domain analysis & Stability

Time response of continuous-data system, Standard test signals, Time response of prototype first and second order CS, Performance specifications of prototype I & II order systems, Steady-state errors and error constants (positional, velocity, acceleration), Effect of adding Poles and Zeroes to open-loop and close-loop transfer function (TF), Concept of Dominant poles of TF.
Types of controllers and their control action-proportional (P), integral (I), derivative (D), PID control, and derivative feedback control, MATLAB based problems.
Stability-Concept of stability, Necessary conditions for stability, Absolute and relative stability, Algebraic Criterion of stability- Routh Hurwitze Criterion. The Root locus concept, Guidelines for sketching Root-locus, Root contour.

UNIT-III: Stability and Frequency domain analysis of CS

Frequency domain analysis- Concept of complex frequency, performance specification of frequency domain, Co-relation between time & frequency domain, Polar plot, Bode plot, Stability analysis in frequency domain- Nyquist Criterion, Stability margins-Gain and Phase margin, MATLAB Based Problems.

UNIT-IV: Design of Feedback CS & State Space Analysis of CS

Approach to system design, Preliminary considerations classical design, Realization of basic Compensators-Lead, Lag, and Lag-lead compensator, Design of compensators in Time and Frequency domain.
Concept of State, State Variable, and State Model, State model representation of an LTI system, co-relation between State Model and TF, Solution of State Equations, Transfer Matrix, Concept of Controllability & Observability, MATLAB based problems.

UNIT-V Digital Control Systems

Block diagram representation of Digital Control System, Sampling process, Mathematical analysis of sampling process, Reconstruction of sampled signal, Pulse Transfer Function, Zero-order and first order hold circuit, Mapping of s-plane to z-plane.

Learning Outcomes:

Upon Completing the Course, Student will able to:

- Understand the concept of LTI control systems, Importance of feedback in CS and stability concept.
- Able to Design a Stable Control System
- Understand the difference between Linear and Digital Control Systems.

BOOKS RECOMMENDED:

[1] B.C. Kuo, *Automatic Control System*, 7/E, PHI, 2006.
[2] I. J. Nagrath and M. Gopal, *Control Systems Engineering*, 5/E, New Age International Publishers, 2007.
[3] M. Gopal, *Control Systems (Principles & Design)*, 5/E, Tata McGraw Hill, 2007.
[4] Bishop & Dorf, *Modern Control System,* Addision Welseley.
[5] Ogata, *Discrete-Time Control System*, 2/e, PHI, 1995.

List of Practical Assignments:

1. Find the transfer function of various LTI control systems (open loop and close loop) using MATLAB command.
2. Write a program to plot the poles and zeroes for the different sets of transfer function using MATLAB.
3. Write a program to plot the time response of first and second order control system on impulse, unit-step, ramp and parabolic input signals using MATLAB. Also find the value of various transient response parameters.
4. To determine the position, velocity and acceleration error coefficient of given transfer functions using MATLAB.
5. Plot the root locus for various transfer functions using MATLAB command.
6. Plot the Nyquist plot for the given transfer function using MATLAB. Also comment on the systems stability.
7. Plot the Bode plot for the transfer function given below by using MATLAB.

2(s+0.25)

G(s)H(s) = ---------------------

s^2 (s+1) (s+0.5)

Also find (a) Phase cross over frequency (b) Gain cross over frequency
(c) Gain margin (d) Phase margin.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (E & TC)</td></tr>
<tr><td>Subject Code-EIR6E1
Subject Name-Linear Integrated Circuit</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">Duration of Theory Paper: 3 Hours</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
</table>

Learning Objectives:
In-depth knowledge of Operational Amplifier including its circuit analysis, design and application.
Prerequisites:
Analysis using R-parameter and feedback concept.

COURSE CONTENTS

UNIT I
Operational Amplifier Fundamentals: Amplifier Fundamentals, The Operational Amplifier ,Basic Op Amp Configurations, Ideal and practical Op Amp Circuit Analysis and characteristics ,Positive and Negative Feedback , Feedback in Op Amp Circuits , The Return Ratio and Blackman’s Formula , Op Amp Powering. Circuits with Resistive Feedback: Current-to-Voltage Converters, Voltage-to-Current Converters, Current Amplifiers, Difference Amplifiers, Instrumentation Amplifiers, Instrumentation Applications, Transducer Bridge Amplifiers. CMRR, offset error voltage and current.

UNIT II
Active filters I: The Transfer Function, First-Order Active Filters, Standard Second-Order Responses, *KRC* Filters, Multiple-Feedback Filters, State-Variable and Biquad Filters, Sensitivity. Active filters II: Filter Approximations, Cascade Design, Generalized Impedance Converters, Direct Design, The Switched Capacitor, Switched-Capacitor Filters, and Universal SC Filters

UNIT III
Static Op Amp Limitation: Simplified Op Amp Circuit Diagrams, Input Bias and Offset Currents, Low-Input-Bias-Current Op Amps, Input Offset Voltage, Low-Input-Offset-Voltage Op Amps, Input Offset Error and Compensation Techniques, Input Voltage Range/Output Voltage Swing, Maximum Ratings. Dynamic Op Amp limitation: Open-Loop Frequency Response, Closed-Loop Frequency Response, Input and Output Impedances, Transient Response,Effect of Finite GBP on Integrator Circuits, Effect of Finite GBP on Filters, Current-Feedback Amplifiers.

UNIT IV

Stability: The Stability Problem, Phase and Gain Margin Measurements, Frequency Compensation of Op Amps, Op Amps Circuits with a Feedback Pole, Input-Lag and Feedback-Lead Compensation, Stability in CFA Circuits.

UNIT V

Designing- Adder, Subtractor, Integrator, Differentiator, Voltage follower, Comparator, Zero Crossing detector, Schmitt trigger, Peak Detector. Signal Generator: Sin wave generator, multivibrators, triangular and saw tooth wave generator, Log/Antilog amplifiers.

BOOKS RECOMMENDED:

[1] Millman & Halkias - Integrated Electronics, Tata McGraw Hill.
[2] Franco-Design with Operational Amplifiers & Analog Integrated Circuits, TMH
[3] Schilling & Belove-Electronic Circuit, Discrete & Integrated , TMH
[4] Gayakwad R.A- Op-Amps and Linear IC's, Pearson .
[5] Coughlin and Driscoll – Operational Amplifier and Linear Integrated Circuits – Pearson Education
Asia.

List of Practical Assignments:

1) To measure the gain of inverting & non-inverting amplifier.
2) To analyze the voltage transfer characteristics of op-amp.
3) To study the inverting adder & Subtractor configuration of op-amp.
4) To study the non- inverting adder & Subtractor configuration of op-amp.
5) To study the differentiator configuration of op-amp.
6) To study the integrator configuration of op-amp.
7) To study the low pass & high pass filter.
8) To study the band pass & band reject filter.
9) To study the zero crossing detector.
10) To analyze the performance of comparator.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Information Technology (Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SER6S6
Entrepreneurship Development & IPR</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

1. To provide awareness about entrepreneurship.
2. To develop the skills of entrepreneurship & to encourage the students to become an entrepreneur.
3. To self motivate the students by making aware of different opportunities and successful growth stories
4. To impart the basics of Intellectual property Rights.

COURSE CONTENTS

UNIT I

Introduction to Entrepreneurship: Entrepreneurship- Concept, Nature, Functions and Importance; Entrepreneurs- Characteristics, Types and Motivation; Entrepreneurial process; Enterprise-Definition and Classification (MSME- Micro, Small & Medium Enterprises).

Case Study: Success and Failure stories of entrepreneurs and discussing their characteristics and reasons for success/failure.

UNIT II

Entrepreneurial Journey: Creativity and Innovation, Recognizing opportunities and Generating ideas, Feasibility analysis, Industry and Competitor analysis, developing effective business model.

Class Activity: Idea generation by students.

UNIT III

Business Plan for New Ventures in Respective Industry: Project Identification, Market Survey, Production plan, Operational plan, Marketing plan, Organizational plan and financial plan; writing a business plan.

Class Activity: Students asked to finalize on their ideas and start writing business plans

UNIT IV

Institutional Support to Entrepreneurs: Need for Institutional support different Government &Non Government institutions to support Entrepreneurs like, NSIC, SIDO, SSIB, SSIDC, SISIs , DTICs, industrial Estates, Specialized Institutions.

UNIT V

Intellectual Property Rights: Introduction of IPR, General Provisions & Basic principles of IPR, various perspective of IPR like Innovation & Creation, Innovators & Creators; Patents, Copyrights and Trademarks

Learning Outcomes:

At the end of the course, students should be able to do the following:

1. Learn how to start an enterprise and design business plans those are suitable for funding by considering all dimensions of business.
2. Understand entrepreneurial process by way of studying different cases and performing class activities.

BOOKS RECOMMENDED:

[1]. Robert D. Hisrich, Mathew J. Manimala, Michael P Peters and Dean A. Shepherd, “Entrepreneurship”, 9th Edition, Tata Mc-graw Hill Publishing Co.ltd.-new Delhi, 2014.

[2]. Bruce R. Barringer and R. Duane Ireland, “Entrepreneurship”, 4th Edition, Pearson Publications, New Delhi, 2011.

[3]. N.K. Acharya, *Text book on intellectual Property Rights*, Asha Law House New Delhi, New Edition, 2001.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Electronics and Instrumentation)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR6G4
COMPUTER NETWORKS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives: The content covers the different types of computer networks, the layered approach of protocol stack, its advantage, and protocols of each layer.

Prerequisite(s): Fundamental knowledge of data transmission

COURSE OF CONTENTS

Unit I

Computer network – Hardware, Software, Reference model, physical layer

Network and application, categories of network-LAN, MAN, WAN, Wireless Network, Internetwork, Reference models.– OSI,TCP/IP model and their comparison, Line configuration-point to point, multicast ,broadcast ,Network Topology – Mesh , Star ,Tree , Bus , Ring , Hybrid Physical Layer – Shannon's maximum data rate of a channel, Transmission media – Guided as Magnetic, Twisted Pair, coaxial cable, fiber optics etc., wireless as radio wave, microwave, infrared

Unit II

Data Link Layer

Framing techniques , Error detection-correction , Multiplexing-TDM ,FDM,WDM ; switching – circuit , message , packet switching , Repeaters, Hubs , Bridges ,switches ,routers and gateways ;Data link protocols-- unrestricted simplex protocol, stop & wait , sliding window ,Go-back- n ,selective repeat, data link layer in internet

Unit III

Medium Access control sublayer

Channel allocation, Multiple access protocols – ALOHA, CSMA, CSMA /CD, collision-free protocol

Ethernet- frame format, cabling, encoding, performance, fast Ethernet, gigabit Ethernet, Broadband and wireless LAN, Bluetooth

Unit IV

Network layer

Connectionless – connection oriented service, comparison of virtual circuit and datagram subnet, Routing algorithms- shortest path , flooding ,distance vector , hierarchical routing , congestion control and prevention ,Quality of service , network layer in internet- IP protocol and IP address, IPv6, OSPF, BGP routing protocol

Unit V

Transport layer and Application layer

Elements of transport protocol, internet transport protocol-UDP / TCP protocol, performance issues-Network performance measurement, system design for better performance

Domain name system, email, world wide web- architecture, HTTP

Learning Outcome:

After completing this course the student must demonstrate the knowledge and ability to:

1. Independently understand basic computer network technology.
2. Understand and explain Data Communications System and its components.
3. Identify the different types of network topologies and protocols.
4. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
5. Identify the different types of network devices and their functions within a network
6. Understand and building the skills of subnetting and routing mechanisms.
7. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

BOOKS RECOMMEDED

[1] Andrew S. Tannenbaum, Computer Networks, 4/E Pearson Education, 2003 ,

[2] William Stallings ,Data and Computer Communications , 8/E Prentice Hall India, 2007

[3] Behrouz A.Forouzan , Data Communications and Networking ,4/E Tata McGraw-Hill, 2000

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics and Instrumentation)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
EIR6L4	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
DESIGN WORKSHOP	**0**	**0**	**1**	**0**	**0**	**1**	**1**
Duration of Practical Paper: 2Hours							

DESIGN (Digital & Analog circuit)

Q.1 Design a 3 bit counter which counts in the sequence
: 001, 011, 010, 110, 111, 101, 001, ...
(a) Use clocked D flip-flops
(b) Use J-K flip-flop

Q.2 Design and Implement a 8-bit barrel shifter using 4 X 1 Multiplexers.

Q.3 Design a one-input, one-output serial 2's complementer. The circuit accepts a string of bits from the input and generates the 2's complement at the output. The circuit can be reset asynchronously to start and end the operation.

Q.4 Design a four-bit shift register with parallel load using D flip-flops. There are two control inputs: shift and load. When shift = 1, the content of the register is shifted by one position. New data are transferred into the register when load = 1 and shift= 0. If both control inputs are equal to 0, the content of the register does not change.

Q.5 Design a 16-bit Magnitude comparator using IC 7485 (4-bit Magnitude comparator).

Q.6 Design a hardware stack to hold a maximum of four values, each consisting of one bit.
The stack has the following input lines:

- Clock
- POP
- PUSH
- input data

and a single output line. The output line always reports the current top of the stack.
(Recall that a stack pushes data onto the top of the stack, and pops data from the top of the stack. In other words, last in, first out. If more than four values are pushed on, older values are discarded.) You may use AND, OR, XOR, and NOT gates, etc; flip-flops of any kind; and/or decoders, multiplexers, etc.

Analog Circuits

Q.1 Design a common-emitter amplifier with output impedance 10KΩ and a gain of 100 using a transistor of β=200 and a 24V power supply.

Q.2 Design a two stage RC coupled BJT amplifier to meet the following specifications.
Av ≥ 5000, Sico ≤ 10,Fl = 20Hz, *Vo*=2*Vo*, Vcc = 15V.
Calaulate Av, Ri and Ro of designed circuit.

Q.3 Design a cascode amplifier stage using bipolar transistors to drive a load resistor of 100 **Ω**. The amplifier output is to be time varying signal of ±600mV. The overall performance of the amplifier is specified as:
• Operating current for cascade stage collectors = 1,2mA
• Overall gain = -30
• DC power supply +15V

Q. 4 Design the basic BJT differential amplifier to provide a differential input resistance of at and a differential voltage gain of 100 V/V. The transistor β is specified to be at least 100. The available positive power supply is 5V.

Q.5 Design a CMOS cascode amplifier with the following specifications:
DC gain = 2500
Gain-Bandwidth product = 100MHz.
Load capacitance = 1 pF

Q.6 Design a saw tooth generator using a 555 timer having pulse duration of 10 sec and peak voltage of 5V.

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

SCHEMES OF EXAMINATION FOR B.E PROGRAMME

B. E. IV YEAR ELECTRONICS & INSTRUMENTATION ENGINEERING (CBCS) L -Lecture, T – Tutorial, P – Practical, PC-Programme core, PE-Programme Elective, CBCS- Choice based credit system

Semester-VII

S.No	Subject code	Subject Name	Type	L-T-P	Credits
1	EIR7C1	PROJECT PHASE-I	PC	0-0-7	7
2	EIR7C2	OPERATING SYSTEM	PC	3-1-0	4
3	EIR7C3	INTELLIGENT INSTRUMENTATION SYSTEM	PC	3-1-1	4+1(P)
4	EIR7C4	PROCESS INSTRUMENTATION AND CONTROL	PC	3-1-1	4+1(P)
PROGRAMME ELECTIVE (ANY ONE FROM LIST GIVEN BELOW)					
5	EIR7E1	CIRCUIT DESIGN USING HDL	PE	3-1-1	4+1(P)
	EIR7E2	DATA BASE MANAGEMENT SYSTEM			
	EIR7E3	ADVANCE CONTROL SYSTEM			
	EIR7E4	SPEECH AND IMAGE PROCESSING			
	EIR7E5	DATA ACQUITION SYSTEM			
6	EIR7V7	COMREHENSIVE VIVA -VII	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

Semester-VIII (For Students not opting for Internship)

S.No	Subject code	Subject Name	Type	L-T-P	Credits
1	EIR8P2	PROJECT PHASE-II	PC	0-0-7	7
2	EIR8C1	EMBEDDED SYSTEM	PC	3-1-0	4
3	EIR8C2	OPTICAL INSTRUMENTATION	PC	3-1-1	4+1(P)
4	EIR8C3	INTERNET OF THINGS	PC	3-1-1	4+1(P)
PROGRAMME ELECTIVE (ANY ONE FROM LIST GIVEN BELOW)					
5	EIR8E1	NETWORK SECURITY	PE	3-1-1	4+1(P)
	EIR8E2	MACHINE LEARNING			
	EIR8E3	IP NETWORKS			
	EIR8E4	MOBILE COMPUTING			
6	EIR8V8	COMPREHENSIVE VIVA	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

Semester-VIII (For Students opting for Internship)

S.No	Subject code	Subject Name	Type	L-T-P	Credits
1	EIR8I1	INTERNSHIP	PC	0-0-20	20
***Two Elective courses to be chosen from SVAYAM-NPTEL (Shortlisted by Departmental Committee)**					
3	EIR8G1		PE	3-0-0	3
4	EIR8G2		PE	3-0-0	3
5	EIR8VI	COMPREHENSIVE VIVA	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

***Courses from SVAYAM- NPTEL**
(JAN- APRL 2019)

1. **INTRODUCTION TO PHOTONICS (Enrollment end date: 4/2/19; Start date: 28/1/19 End date: 24/4/19)**
2. **CRYPTOGRAPHY AND NETWORK SECURITY (Enrollment end date: 27/2/19; Start date: 28/1/19 End date: 21/4/19)**

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">IV Year B.E. (Electronics &Instrumentation Engg.)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR7C1
PROJECT PHASE-I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>14</td><td>0</td><td>0</td><td>7</td><td>7</td></tr>
</table>

Learning Objective: To provide a comprehensive hands on experience to the students about the development of a complete project starting from analysis to testing. The students can also take a research project for innovating a new idea and its implementation.
Prerequisites: Electronics and Computer related subjects till III year.

COURSE CONTENTS

The major emphasis (but not limited to) shall be given on Microcontroller, Microprocessors, Analog and Digital Electronics ,VLSI and VHDL etc these are practice oriented areas of interest. The students shall be making the system, application or simulation packages depending upon the idea, technology chosen and expertise available. The architectural issues shall be important while the exposure to the technology needs to be gained by the students through thorough practice.
The students (in a batch) shall be required to be continuous interaction with the guide for the advice, guidance and facilities periodically and show the progress. They shall also be taking a certificate in the diary for satisfactory remarks or comments. Batch size shall be decided as per need and the quantum of the project.
The students shall make presentation and submit an originally drafted project reports periodically and at the end of the semester.

Learning Outcomes:
Upon completing the course, Student would be able to:
- Work in a team
- Develop small working projects through designing, analysis and testing of model
- Able to give presentation on the project developed

BOOKS RECOMMENDED:
[1] Reference books and web links of the relevant material the must be consulted as advised by the guide.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**IV Year B.E. (Electronics and Instrumentation)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
EIR7C2 OPERATING SYSTEM	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

The course contents are aimed to provide:

- Students will learn how Operating System is Important for Computer System.
- To make aware of different types of Operating System and their services.
- To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- To know virtual memory concepts.
- To learn secondary memory management

Prerequisites: Basic knowledge of Data Structures and Computer Organization.

COURSE CONTENTS

UNIT-I

Introduction: Role of OS: Types of OS, Batch Systems; Multiprogramming; Time Sharing; Distributed & Real time OS. Computer structure and OS: System Architecture – I/O, Storage, Processors; System components- OS Services, System Calls , System Programs; System Design, Implementation and Generation.

UNIT-II

Process Management: Concepts of process: Process status, Process description, Process model. Process Scheduling: Concepts, Scheduler organization, preemptive and non- preemptive scheduler strategies, scheduling algorithms: FCFS, SJN, Priority Scheduling, Round Robin Scheduling, Multiple Processor scheduling, Thread Concepts and Multiple threaded OS.

UNIT-III

Process Synchronization and Deadlock: Process Co-operation, Concepts of Inter-process communication, Process Synchronization, Synchronization Issues, Critical Section problem, Mutual exclusion Primitives and Algorithms, Process Synchronization with semaphores. Concepts of Deadlock, Conditions for Deadlocks, Resource Concepts & Abstractions, Deadlock Prevention, Avoidance and Recovery, Banker Algorithms for Deadlock Avoidance.

UNIT-IV

Memory Management and File system: Paging, Segmentation and Contiguous memory allocation. Virtual Memory: Demand Paging, Page replacement and Frame Allocation policies, Thrashing. File System: Concepts, Access Method, Directory Structure, and File System Management.

UNIT-V

Disk management and other issues: Disk management: Disk Structure and Scheduling. File systems, and operating system support for distributed systems. Protection and Security related issues. Case studies of contemporary operating systems.

Learning Outcomes:

Upon Completing the Course, Student will able to learn:

- Understands the different services provided by Operating System at different level.
- They learn real life applications of Operating System in every field.
- Understands the use of different process scheduling algorithm and synchronization techniques to avoid deadlock.
- They will learn different memory management techniques like paging, segmentation and demand paging etc.

BOOKS RECOMMENDED:

[1]. Silberschatz, Galvin and Gagne, Operating System Principles, 7th Ed. Addison Wesley.
[2]. Gary Nutt, Operating Systems, 3rd Ed. Pearson Education, India
[3]. Tanenbaum, Modern Operating Systems, PHI.
[4]. W. Stalling, Operating Systems, Macmillan.
[5]. H. M. Dietel, Operating Systems, Addison Wesley Longman.
[6]. Maurice J. Bach, The design of Unix Operating system, Pearson Education, India.
[7]. Sumitabha Das, Unix Concepts & Applications: includes SCO UNIX & Linux, Tata McGraw Hill.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR7C3
Intelligent Instrumentation System</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

To get students familiar with interfacing of computer systems with the control theory thus making it an automatic system and to learn the Lab View programming and its application in different process industries.

Prerequisites (if any):

Control System, Transducers & Applications, Computer networking, Communication Systems

COURSE CONTENTS

UNIT-I

Introduction: Introduction to intelligent instrumentation, Historical perspectives, Current status, Software based instruments. Virtual Instrumentation: Introduction to graphical programming, data flow and graphical programming techniques.

UNIT-II

Instrumentation Standard Protocol: HART protocol, Field Bus H1, GPIB, CAN, Industrial Ethernet: introduction, frame structure, programming, implementation, benefits, advantages and limitation.

UNIT-III

Introduction To SCADA: SCADA system, evolution, objectives, benefits and function of SCADA system. SCADA in process control, application, SCADA function, SCADA hardware: RTU, Single board RTU, Basic Operation, Features of SCADA, SCADA software: ISO model, DNP3 protocol, IEC60870 protocol, MODBUS protocol. Power System Automation: benefits, architecture classification, implementation, SCADA applications.

UNIT-IV

Distributed Control System: Introduction and overview, history, system architecture, system element. Difference between Centralized and Distributed Control System, Overall tasks of DCS. Displays: Group display, Overview display, Detail display. Local Control Units, mean time between failures, Data Highways, Fieldbuses, Multiplexers and remote sensing terminal units, I/O hardware, Set-point stations

UNIT-V

PC Hardware review and Instrumentation buses: structure, timing, interrupts, DMA, operation systems, ISA, PCI, USB, PCMCIA buses. IEEE488.1 and IEEE488.2 serials, SCXI and PXI.

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Understand the concept of intelligent instrumentation
2. Identify the optimized protocol selection according to the application area
3. Design complete automatic process control system
4. Analyze the DCS and SCADA systems In industry

BOOKS RECOMMENDED:

1. Liptak B.G, *Instrument Engineers Handbook*, Clinton Book Company, (1982)
2. D.Patranabis, *Principles of Industrial Instrumentation*, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1999.
3. SteveMackey, Edwin Wright, *Practical Industrial Data Network* I/e, Elsevier Publications, 2004
4. David Bailey, Edwin Wright, *Practical SCADA for Industry*, I/e, Elsevier Publications, 2003
5. Poppovik Bhatkar, *Distributed Computer Control for Industrial Automation*, Dekkar Publications.

List of Practical Assignments:

To perform the following operations using Lab View.

1. Basic arithmetic operations
2. Boolean operations
3. Sum of ‘n’ numbers using ‘for’ loop
4. Factorial of a give number using for loop
5. Sum of ‘n’ natural numbers using while loop
6. Factorial of a give number using while loop
7. Sorting even numbers using while loop in an array
8. Array maximum and minimum
9. Bundle and unbundle cluster
10. Flat and stacked sequence
11. Application using formula node
12. Median filter
13. Discrete cosine transform
14. Convolution of two signals
15. Windowing technique
16. Instrumentation of an amplifier to acquire an ECG signal
17. Acquire, analyse and present an eeg using virtual Instrumentation.

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR7C4
Process Instrumentation & control</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

The course aims to provide students with the knowledge about behaviour of industrial processes, builds the concepts related to operation and control of dynamic processes, and learns various strategies of processes control. Learn theoretical and practical aspects for the design and operation of process control systems.

Prerequisites (if any):

Control System, Sensor & Transducers

Course of Contents

UNIT-I: Introduction to process control

Objectives of Control, Process Characteristics: Process Equation, degrees of freedom, process and control lag, dead time, load disturbance and its effect on processes, analog control, digital control, Self regulating processes, final control elements, valves and actuators, their various characteristics, piping and instrumentation diagram,

UNIT-II: Control modes

Basic Control action, two position, multi-position, floating Control modes, Continuous controller modes: Proportional, integral, derivative, composite controller modes-I, P-D, P-I-D, comparisons of these control actions, design of various kinds of analog controllers, Parameters Adjustment, Controller tuning methods,

UNIT-III: Controllers- other modes

Modelling of simple systems-gas liquid and thermal systems, Concept of resistance and capacitance, Nozzle-flapper system, Pneumatic relays and amplifiers, Hydraulic systems, realization of various kinds of controllers for hydraulic and pneumatic applications.

UNIT-IV: Discrete state process control

Discrete state Control, Discrete state variables, Event sequence description, ladder diagram, relay sequencer, Programmable logic controller- Architecture, operation and programming

UNIT-V: Case studies

Cascade control, ratio control, feed-forward control, selective Control, Split range Control
Boiler Control: Combustion Control, Oxygen/CO trimming, Feedwater Control, Furnace Control, Steam temp. Control, Distillation column control

Recommended books:

1. D.P. Eckman "Automatic Process control" Wiley Publication.
2. Patranabies "Principles of Process control" Tata Mc Graw Hill Pub, (2006)
3. P. Harriott "Process control" McGraw-Hill: New York, 1964
4. Curtis Johnson "Process control Instrumentation Technology" Prentice Hall, New Delhi (2005)
5. B.G. Liptak "Hand Book of Process control" Taylor & Francis Ltd
6. Shinskey, "Process Control systems: Application, Design & Tuning" 4th Edition, McGraw Hill, Singapore (1996)

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Understand the basic principles, terminologies, mathematical analysis and block diagrams related to the industrial processes.
2. Comprehend the use of various components, instrumentation and strategies for controlling and fine tuning the process.
3. Develop skills for the efficient design of process control loops for process engineering plants.

List of Experiments

1. Study, design and fine tuning of a pressure based control loop.
2. Study, design and fine tuning of the flow based control loop.
3. Study the ratio control system for the mixing of two fluid.
4. Study cascade control based strategy for the control of liquid flow in a closed channel.
5. Design and development of advanced PC based multi process control system.
6. Study and implementation of various control strategies using temperature control system
7. Study of a PID controller.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR7E1
CIRCUIT DESIGN USING HDL</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objective:To enable the students to translate a functional system description into appropriate digital blocks coded in VHDL.Perform synthesis, place, and route of a digital design into a target FPGA.

Prerequisite: Digital Design, C language.

COURSE CONTENTS

Unit I Introduction to VLSI and HDL History of IC Design, IC Technology, Moore’s Law, IC Design Constraints, Feature Size, VLSI Family, Programmable Logic Devices, Designing with Programmable Logic- Design Entry, Simulation, Synthesis, Implementation, Device Programming, EDA Tools, IP Cores, Gjeski’s Y Chart.

Digital system design process, Hardware simulation, Levels of abstraction, VHDL requirements, Elements of VHDL Top down design, VHDL basic language Elements, VHDL operators, Timing, Concurrency, Objects and classes.

Unit II Behavioural Modelling

Signal assignments ,Concurrent and sequential assignments., Entity Declaration, Architecture Body, Behavioural Modelling, Process statement, Loop control statements, Multiple Processes, Delay Models, Signal Drivers.

Unit III Dataflow and Structural Modelling Techniques: Data flow Modelling, Concurrent Assignment statements, Block statements, Structural Modelling, Component declaration and Instantiation, Generate statements.

Unit IV Advance Topics in VHDL

Generics and Configuration, Subprogram, Overloading, Packages and Libraries, Design Libraries, Attributes.

Unit V Design for Synthesis

Language directed view of synthesis, Inference from CSA statements, Inference from within Process, Inference using Signals v/s variables, Latch v/s Flip Flop Inference, Wait statements, Synthesis Hints, Synthesis for dataflow and structural models.

Learning Outcomes:

At the end of the course, the students would be:

- Able to design digital systems through HDL language
- Simulation, synthesis and implementation of HDL code
- Implementation of code on FPGA/CPLD

BOOKS RECOMMENDED:

[1]. J. Bhasker, *VHDL* Primer, 3/e, Addison Wesley, 1999.

[2]. Sudhakar Yalamanchili, *Introductory VHDL-From Simulation to Synthesis*, Pearson Education, 3/e Indian Reprint.

[3]. Douglas Perry, *VHDL,* 3/e Edition, McGraw Hill 2001.

[4]. Peter.J.Ashenden, The Designer's Guide to *VHDL-AMS*,

[5]. Charles.H.Roth, *Digital system Design using VHDL*, Thompson Publishers, 2/e Edition, 2007.

[6]. Ben Cohen, *VHDL*-Coding style and Methodologies, Kluwer academic Publishers, 1995.

[7]. Volnei. A.Pedroni, *Circuit Design with VHDL*, *MIT* Press Cambridge, 2004.

List of Practical Assignments:

<u>VHDL Programming using Xilinx ISE</u>

Note: For Q1 to Q5 use behavioral modeling. For Q6 to Q7 use data flow modeling and for Q8 to Q10 use structural modeling.

Q.1 Write a VHDL code for a Full Adder.

Q.2 Write a VHDL code for 8X1 Multiplexer using if-elseif statement, case statement and nested if statement and compare their delay and area.

Q.3 Write a VHDL code for a 3X8 decoder using case statement.

Q.4 Write a VHDL code for a J-K flip-flop triggered at falling edge of clock pulse. Also include clear and reset pins synchronized with clock pulse.

Q.5 Write VHDL code for a synchronous 3-bit binary up-down counter. Include a selection line for selecting the mode of counting upwards or downwards.

Q.6 Design a combinational circuit with three inputs x, y, and z and three outputs A,B and C. when the binary input is 0,1,2, or 3 the binary output is one greater than the input otherwise the binary output is one less than the input.

Q.7 Write a VHDL code for a 3-bit binary code to 3-bit gray code conversion.

Q.8 Design a 4-bit ripple counter using T-Flip flop as basic component.

Q.9 Design a 4-bit Magnitude comparator using 1-bit Magnitude comparator as basic entity.

Q.10 Design a circuit of a 3-bit parity generator and the circuit of a 4-bit parity checker using an odd parity bit.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">IV Year B.E. (Electronics and Instrumentation)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR7E3
SPEECH AND IMAGE PROCESSING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives: Student will learn the basic principles and tools used to process speech, images and videos, and how to apply them in solving practical problems of commercial and scientific interests.

Prerequisites: Signals and systems, Digital signal processing

COURSE CONTENTS

UNIT I- Digital Speech Processing

The Fundamentals of Digital Speech Processing. A Review of Discrete -Time Signal & Systems , the Z-transform, the DFT, Fundamental of Digital Filters, FIR system, IIR Systems. Time–Domain Methods for Speech Processing. Time-Dependent Processing of speech, short -time energy and Average Magnitude, Short time Average Zero-Crossing Rate. Digital Representation of speech Waveform Sampling speech signals, statistical model, Instantaneous quantization, Instantaneous companding, quantization for optimum SNR, Adaptive quantization, Feed-forward Feedback adaptions.

UNIT II- Linear Predictive Coding of Speech

Block diagram of Simplified Model for Speech Production. Basic Principles of Linear Predictive Analysis-The Auto Correlation Method. The Prediction Error Signal. Digital Speech Processing for Man-Machine Communication by voice. Speaker Recognition Systems-Speaker verification and Speaker Identification Systems

UNIT III-Digital Image

Different stages of Image processing & Analysis Scheme. Components of Image Processing system, Multiprocessor Interconnections. A review of various Mathematical Transforms. Image Formation: Geometric Model, Photometric Model. Image Digitization: A review of Sampling and quantization processes. A digital image.

UNIT IV- Image Processing

Image Enhancement: Contrast Intensification, Smoothing, Image sharpening. Restoration: Minimum Mean –Square Error Restoration by Homomorphic Filtering. Image Compression: Schematic diagram of Data Compression Procedure, Lossless compression–coding. Multivalued Image Processing, Multispectral Image Processing, Processing of colour images

UNIT V- Case study on Speech and Image Processing

Learning Outcomes:

Upon Completing the Course, Student will able to:

- learn the theory behind fundamental processing tasks including image/video enhancement, recovery, and compression.
- learn how to perform these key processing tasks in practice using state-of-the-art techniques and tools like optimization toolboxes to statistical techniques.

BOOKS RECOMMENDED:

[1].Milan Sonya, Vaclav Hlavac & Roger Boyle, “Image Processing Analysis and Machine Vision”, Vikas Publishing House

[2].A.K. Jain, “Digital Image Processing”, Pearson Education

[3].Chanda, B. & Majumder, D. D, “Digital Image Processing & Analysis” , Prentice Hall (India)

List of Practical Assignments:

Practical based on Texas Instruments DSP Processor kit, it’s interfacing with different peripherals and communication to other systems.

<table>
<tr><td colspan="3">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="5">IV Year B.E. (Electronics & Instrumentation Engg.)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR8P2
PROJECT PHASE-II</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>14</td><td>0</td><td>0</td><td>7</td><td>7</td></tr>
</table>

Learning Objective: To provide a comprehensive hands on experience to the students about the development of a complete project starting from analysis to testing. The students can also take a research project for innovating a new idea and its implementation.

Prerequisites: Electronics and Computer related subjects till III year.

COURSE CONTENTS

The major emphasis (but not limited to) shall be given on Microcontroller, Microprocessors, Analog and Digital Electronics/Communication ,VLSI and VHDL etc these are practice oriented areas of interest. The students shall be making the system, application or simulation packages depending upon the idea, technology chosen and expertise available. The architectural issues shall be important while the exposure to the technology needs to be gained by the students through thorough practice.

The students (in a batch) shall be required to be continuous interaction with the guide for the advice, guidance and facilities periodically and show the progress. They shall also be taking a certificate in the diary for satisfactory remarks or comments. Batch size shall be decided as per need and the quantum of the project.

The students shall make presentation and submit an originally drafted project reports periodically and at the end of the semester.

Learning Outcomes:

Upon completing the course, Student would be able to:

- Work in a team
- Develop small working projects through designing, analysis and testing of model
- Able to give presentation on the project developed

BOOKS RECOMMENDED:

[1] Reference books and web links of the relevant material the must be consulted as advised by the guide.

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR8C1
EMBEDDED SYSTEM</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective:

- The goal of the course is to teach the concepts C Language and object oriented programming, PIC architecture and peripheral interfacing.
- To read and understand the C and C++ programming, PIC microcontroller architecture and programming and RTOS.
- The course focuses on how to write program and peripheral interfacing of PIC microcontroller and develop the applications.

Prerequisite: Knowledge of C language, Computer architecture and Microcontroller.

COURSE CONTENTS

UNIT I -Introduction to Embedded systems: Embedded systems, processor embedded into a system, embedded hardware units and devices in a system, embedded software in a system, examples of embedded systems, embedded SOC and use of VLSI circuit design technology, Complex systems design and processors, Design process in embedded system, formalization of system design, design process and design examples, classification of embedded systems, skills required for an embedded system designer.

UNIT II- Microcontrollers: PIC 16 Series family overview, an architecture overview of the 16F84A, Status register, 16F84A memory, Some issues of timing, Power-up and Reset, PIC 16F84A parallel ports, 16F84A clock oscillator, 16F84A operating conditions, 16F84A interrupt structure.

UNIT III-Larger systems and the PIC 16F873A:The main idea –the PIC 16F87XA, The 16F873A block diagram and CPU, 16F873A memory and memory maps, 16F873A interrupts, 16F873A oscillator, reset and power supply, 16F873A parallel ports.

UNIT IV-RTOS: Basic design using RTOS, Micro/OS-II and Vxworks, windows CE, OSEK, real-time Linux functions,

UNIT V- Case study: Digital camera hardware and software architecture, embedded systems in automobile, embedded system for a smart card, mobile phone software for key inputs.

Learning Outcome:

After learning the course the students should be able to

- Understand the fundamentals of embedded systems
- Understanding of C and basics of C Understand the OOP concepts of classes, objects, methods,
- constructors, destructors in C++
- Understand the microcontroller architecture (PIC)

- Understand and able to write the assemble language program.
- Understand and able to write the I/O and timers/counter programming

BOOKS RECOMMENDED:

[1]. Embedded Systems Architecture Programming and Design by Raj Kamal, II edition, Tata MCGraw-Hill.
[2]. Designing Embedded Systems with PIC Microcontroller s: principles and applications by Tim Wilmshurst, Elsevier.
[3]. Embedded Systems Design by Steve Heath, II edition, Newnes publications
[4]. Embedded Systems Architecture: A Comprehensive Guide for Engineers and
[5]. Programmers by Tammy Noergaard, Elsevier

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR8C2
OPTICAL INSTRUMENTATION</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives: To understand fundamentals of optical communication system, its various elements, and optical networking

Prerequisites: Basic knowledge of electromagnetic theory

COURSE CONTENTS

UNIT-I

Introduction to optical fiber communication system, Advantages of optical fiber communication over conventional electrical communication, review of optical fiber fundamentals, ray theory transmission, electromagnetic mode theory for optical propagation in optical waveguides, Types of optical fibers: step index fibers, graded index fibers, single mode fibers etc., cut off wavelength

UNIT-II

Transmission characteristics: fiber attenuation, absorption and scattering losses, fiber bend loss, fiber dispersion, intermodal and intra-modal dispersion, overall fiber dispersion, dispersion shifted fibers, dispersion flattened fibers, non-zero-dispersion shifted fibers, polarization maintaining fibers.

UNIT-III

Optical sources: Lasers and LEDs: basic concepts, injection laser, characteristics, temperature dependence, dynamic response, noise, reliability, Optical detection principle, absorption, quantum efficiency, responsivity, large wavelength cut off, pin photodiode, avalanche photodiode, receiver: basic concepts and types of noise.

UNIT-IV

Optical networks: Basic principles and components, couplers, isolators, circulators, multiplexers: gratings, Fabry perot filters, multilayer dielectrics, Mach-Zehnder interferometer, Acousto-optic tunable filters, Optical amplifiers-Semiconductor optical amplifiers, Erbium doped fiber amplifiers, wavelength converters, optical switches, optical add-drop multiplexers

UNIT-V

Optical networks: architecture, Synchronous optical network/ synchronous digital hierarchy-elements, multiplexing, layers, frame structure, WDM network architectures, broadcast and select networks, wavelength routed networks, routing and wavelength assignment (RWA), access networks, Optical OFDM, Flexible optical networks

Learning Outcomes:

Upon completing the course, students will be well versed with the fundamental concepts of optical instrumentation, and will be able to contribute to the current and upcoming advances in the technology.

BOOKS RECOMMENDED:

[1] John M Senior, Optical fiber Communication: Principles and Practice, Pearson Education -2006

[2] Gerd Keiser, Optical fiber communication, Fifth Edition McGraw Hill Education (India), 2013

[3] Rajiv Ramaswami and Kumar N. Sivarajan, "Optical Networks : A Practical Perspective", Harcourt Asia Pte Ltd., Second Edition 2004.

[4] C. Siva Ram Moorthy and Mohan Gurusamy, "WDM Optical Networks : Concept, Design and Algorithms", Prentice Hall of India, Ist Edition, 2002

List of Practical Assignments:

1) To set-up a fiber optic analog link
2) To set up a fiber optical digital link
3) To obtain intensity modulation of an analog signal, transmit it over a fiber cable and demodulate it at the receiver and to get back original signal
4) To obtain intensity modulation of a digital signal, transmit it over a fiber cable and demodulate it at the receiver and to get back original signal
5) To study the frequency modulation in case of fiber optic communication system.
6) To undertake the pulse width modulation in case of fiber optic communication system.
7) To determine the propagation losses in case of optical fiber communication system.
8) To evaluate bending losses in case of optical fiber communication system.
9) To determine the numerical aperture of an optical fiber
10) To study the characteristics of frequency modulation in case of fiber optic communication system.
11) To plot the electrical to optical conversion characteristics

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR8C3
INTERNET OF THINGS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective:

- Assess the genesis and impact of IoT applications, architectures in real world.
- Illustrate diverse methods of deploying smart objects and connect them to network.
- Compare different Application protocols for IoT.
- Infer the role of Data Analytics and Security in IoT.
- Identify sensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry.

Prerequisite: Computer Network, C Language

COURSE CONTENTS

Unit I

IoT Introduction, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.

Unit II

Smart Objects: The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.

Unit III

IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.

Unit IV

Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of IoT Security, Common Challenges in IoT Security, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment

Unit V

IoT Physical Devices and Endpoints - Building iot with Arduino: Arduino – Interfaces - Arduino IDE – Programming , RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.

Learning Outcomes:

At the end of the course, the students would be:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

BOOKS RECOMMENDED:

[1]. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1 st Edition, Pearson Education

[2]. Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017.

[3]. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1 st Edition, VPT, 2014.

[4]. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017.

List of Practical Assignments:

1. To study the architecture of application board of Raspberry Pi.
2. To demonstration the OS (Debian) for RPi in a SD card preparation, configuration of Raspberry Pi during first booting and use of remote SSH like putty
3. To demonstrate the basic linux commands on Raspberry pi.
4. To create a database & Store the value in Raspberry Pi.
5. To install Android on Raspberry Pi.
6. To Setup R Pi first time without using screen, mouse, keyboard.
7. To interface ADC at GPIOs of Raspberry Pi for measuring analog voltage.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Electronics & Instrumentation Engg.)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
EIR8E1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
NETWORK SECURITY	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To understand the fundamentals of Cryptography.
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To design security applications in the field of Information technology

Prerequisite: Computer Network

COURSE CONTENTS

Unit I

An overview of network system & OSI model, concept of security- approaches and principles , attacks, cryptography technique, encryption & decryption, substitution & transport technique, symmetric & asymmetric cryptography,

Unit II

An overview of symmetric key cryptography algorithm types and modes, data encryption standard (DES), Advanced encryption standard(AES)-criteria, transformation , International data encryption algorithm (IDEA).

Unit III

Asymmetric key cryptography, RSA cryptosystem-, Digital signature -process ,service &scheme, Knapsack algorithm, ElGamal algorithm, public key exchange, attacks on RSA, attacks on digital signature.

Unit IV

Digital certificates ,private key management, public key cryptography standards, XML ,PKI & security,, internet security protocols, SSL,TSL,SHTTP, secure electronic Transaction, email, security, security in 3G, GSM,IEEE802.11,

Unit V

User authentication mechanism, Biometric authentication, Kerberos, Password, Authentication tokens, IP security overview & policy, Firewall characteristic, VPN, Malicious software,Intruder, Email security.

Books Recommended:

[1]. Williams Stallings; Cryptography & Network Security; 3rd Edition, Pearson Education.Pearson Education, 2006.

[2]. Atul kahate ; Cryptography & Network Security, Third edition ,McGraw hill education

[3]. Behrouz A. Forouzan, Cryptography & Network Security, Tata McGraw hill, 2007.

[4]. Matt Bishop ,"Computer Security art and science ", Second Edition, Pearson Education, 2002.

Learning Outcomes:

At the end of this course, students will be able to:

- Implement basic security algorithms required by any computing system.
- Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- Analyze the possible security attacks in complex real time systems and their effective countermeasures.
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical derivation, modeling, and simulations.
- Formulate research problems in the computer security field.

List of Practical Assignments:

1) Design and implementation of a simple client/server model and running application using sockets and TCP/IP.
2) To make students aware of the insecurity of default passwords, printed passwords and password transmitted in plain text.
3) To teach student how to use SSH for secure file transfer or for accessing local computer using port forwarding technique.
4) Comparison between Telnet and SSH for Secure Connection

<table>
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<tr><th>Subject Code & Name</th><th colspan="3">Instructions Hours per Week</th><th colspan="4">Credits</th></tr>
<tr><td>EIR8E2</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>MACHINE LEARNING</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives: The field of machine learning is concerned with the question of how to build computer programs able to construct new knowledge or to improve already possessed knowledge by using input information. The goal of this course is to introduce the theoretical foundations of machine learning, to provide practical experience of applying machine learning techniques and to investigate new problems where machine learning techniques can do better

Prerequisites: Basic knowledge of a programming language and Basic knowledge of probabilities and statistics is required.

COURSE CONTENTS

Unit-I Introduction:
Definition, Applications of machine learning, Importance of machine learning, Aspects of developing a learning system: training data and test data, Issues in machine learning, Types of learning: supervised, unsupervised and Reinforcement learning, Concept learning, General-to-specific ordering of hypotheses. Version spaces and the candidate elimination algorithm.

Unit-II Supervised Learning:
Classification and Regression learning methods, Decision Tree Learning: Representing concepts as decision trees, ID3 algorithm. Picking the best splitting attribute, searching for simple trees and computational complexity. Regression and function approximation, linear regression and best fit, Order of polynomial, Polynomial regression, Cross validation.

Unit-III Unsupervised Learning:
Introduction to unsupervised learning -Clustering -Classification of clustering algorithms, Computational Learning theory, PAC Learning, VC dimension. Artificial Neural Networks Learning: Neural Network Representation, Perceptron, Backpropagation algorithm.

Unit-IV Language Learning:
Classification problems in language: word-sense disambiguation, Formal Language learning, introduction to Hidden Markov models (HMM's).
Support Vector Machines: Maximum margin linear separators. Quadratic programming solution to finding maximum margin separators..

Unit-V Genetic Algorithms (GAs):

Motivation, Representing Hypotheses, Genetic operators, fitness Function and Selection, Working of Genetic Algorithm, Evolutionary Programming and Genetic Programming, Case studies of Machine Learning data sets .

Learning Outcomes:

Upon Completing the Course, students will have knowledge of various machine learning techniques useful for solving the real world problems.

BOOKS RECOMMENDED:

[1].Tom Mitchell, Machine Learning, McGraw-Hill, 1997.

[2] Richard O. Duda, Peter E. Hart & David G. Stork, Pattern Classification, Wiley & Sons, 2001.

[3] Ethem Alpaydin, Introduction to Machine Learning, MIT Press, 2004.

[4] David E. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Kluwer Academic Publishers, Boston, MA, 1989.

[5] Zbigniew Michalewicz, Genetic Algorithms + Data Structures = Evolution Programs, Springer, 1999.

List of Practical Assignments:

List of Assignment in Machine Learning Lab:

1) Problem based on different machine Learning algorithm
2) Works on different machine learning Tools
3) Case Study on different data sets

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR8G1
Introduction To Photonics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

The Above Course EIR8G1 Introduction to photonics is as per the course available at

MOOC/SWAYAM Course - I
Applications

They will be offered in self study/ MOOCS mode for students who have opted for internship and went at other institutions/organization.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR8G2
Cryptography &Network Security</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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DEVI AHILYA VISHWAVIDYALAYA, INDORE

FACULTY OF ENGINEERING

SCHEME OF EXAMINATION (CBCS)
&
COURSE OF CONTENTS

BE I Year Programme
(Common to All Branches)
Effective from July 2015

INSTITUTE OF ENGINEERING & TECHNOLOGY
(www.iet.dauniv.ac.in)

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

CBCS SCHEMES OF EXAMINATION FOR BE I PROGRAMME
(Subject to Revision)

B. E. I YEAR (Common to all branches)

(Computer Engineering, Information Technology and Civil Engineering*)

SEM - 1				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR1C1	Applied Mathematics-I	3-1-0	PC1
2.	ACR1C2	Chemistry & Environment Science	3-1-1	PC2
3.	MER1C3	Elements of Mechanical Engineering	3-1-1	PC3
4.	ETR1C4	Basic Electronics	3-1-1	PC4
5.	MER1C5	Workshop Practice	0-1-2	PC5
6.	SSR1S1	Technical English	3-1-0	SS1
7.	BER1V1	Comprehensive Viva I	0-0-4	Viva1
Total Credit for SEM I			**26 actual + 4 Virtual credits**	

SEM – 2				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR2C1	Applied Mathematics-II	3-1-0	PC1
2.	APR2C2	Applied Physics	3-1-1	PC2
3.	MER2C3	Engineering Drawing	2-1-2	PC3
4.	EIR2C4	Electrical Engineering	3-1-1	PC4
5.	COR2C5	Computer Programming in C++	3-1-1	PC5
6.	SSR2S2	Humanities	2-0-0	SS2
7.	BER2V2	Comprehensive Viva II	0-0-4	Viva2
Total Credit for SEM II			**26 actual + 4 Virtual credits**	

*Semester 1 for three branches and Semester 2 for other three branches for the teaching load balancing.

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

CBCS SCHEMES OF EXAMINATION FOR BE I PROGRAMME
(Subject to Revision)

B. E. I YEAR (Common to all branches)

(Mechanical Engineering, Electronics & Telecommunication Engineering and Electronics & Instrumentation Engineering*)

SEM - 2				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR2C1	Applied Mathematics-II	3-1-0	PC1
2.	APR2C2	Applied Physics	3-1-1	PC2
3.	MER2C3	Engineering Drawing	2-1-2	PC3
4.	EIR2C4	Electrical Engineering	3-1-1	PC4
5.	COR2C5	Computer Programming in C++	3-1-1	PC5
6.	SSR2S2	Humanities	2-0-0	SS2
7.	BER2V2	Comprehensive Viva II	0-0-4	Viva2
Total Credit for SEM II			**26 actual + 4 Virtual credits**	

SEM – 1				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR1C1	Applied Mathematics-I	3-1-0	PC1
2.	ACR1C2	Chemistry & Environment Science	3-1-1	PC2
3.	MER1C3	Elements of Mechanical Engineering	3-1-1	PC3
4.	ETR1C4	Basic Electronics	3-1-1	PC4
5.	MER1C5	Workshop Practice	0-1-2	PC5
6.	SSR1S1	Technical English	3-1-0	SS1
7.	BER1V1	Comprehensive Viva I	0-0-4	Viva1
Total Credit for SEM I			**26 actual + 4 Virtual credits**	

* Semester 1 for three branches and Semester 2 for other three branches for the teaching load balancing.

Semester 1

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE-I Year (Common to all branches)
Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AMR1C1:
Applied Mathematics-I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Course Objectives: To introduce the mathematical concepts of calculus for solving engineering problems that shall be used in various branches of engineering.
Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT-I
Differential Calculus: Review of Successive differentiation, Leibnitz theorem and problems; Expansion of functions by Taylor's and Maclaurin's Theorem; Asymptotes; Curvature in Cartesian and Polar Coordinates; Envelopes; Evolutes and Involutes.

UNIT-II
Advanced Differential Calculus: Function of Several Variables; Partial Differentiation; Approximations and errors; Jacobians; Taylor's Series of Two Variables; Maxima and Minima of Function of Two and More Variables; Lagrange's Method of Undetermined Multipliers.

UNIT-III
Integral Calculus: Beta and Gamma functions; detailed study of tracing of curves-Cartesian, polar and parametric curves; Area; Length of Curve; Volume; Surface of Revolution; Theorems of Pappus and Guldin and problems.

UNIT-IV
Advanced Integral Calculus: Multiple integrals: Double and Triple Integration; Change of Order of Integration; Area; Volume; Centre of Gravity; Moment of Inertia.

UNIT-V
Vector Calculus: Differentiation of a Vector; Gradient; Divergence; Curl; Integration of a Vector Function; Gauss's, Green's and Stoke's Theorems.

BOOKS RECOMMENDED

[1] B.S.Grewal, Engineering Mathematics, 39/e, Khanna Publishers, 2006.
[2] Erwin. Kreyszig, Advanced Engineering Mathematics, 8^{th} edition, John Willy and sons Publications, 1999.
[3] Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.
[4] C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co. Ltd., 6/e, 2003.
[5] H.K.Das, Higher Engineering Mathematics, S.Chand New Delhi.
[6] E Mendelson, G J Hademenos, F Ayres, Schaum's Easy Outline: Calculus, McGraw-Hill, 2000.
[7] R C Wrede, M Spiegel, Schaum's Outline of Advanced Calculus, 2/e, McGraw-Hill, 2002.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE -I Year (Common to all branches) Semester- 1			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ACR1C2:	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Applied Chemistry & Environmental Science	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Objectives: This course is designed with two objectives: first to learn chemistry of various engineering materials, their properties, testing, structure-property relationship and their applications in various technologies. Secondly to aware with various environmental issues and pollution and control studies in modern society.
Prerequisite: Nil

COURSE OF CONTENTS

UNIT-I WATER AND ITS APPLICATIONS

Sources, impurities, applications, Hardness- its expression and determination; Boiler troubles and their causes; Industrial water requirement, Treatment of water for industrial purpose; De-ionization of water; Analysis of water; Water quality parameters, Numerical problems on water analysis and water treatment processes.

UNIT-II ENGINEERING MATERIALS AND TESTING

Introduction, classification and requirement of engineering materials. Material testings.
Polymers: Chemistry of polymer materials and their diversification; Types of polymerization and their brief account; Examples of polymers.
Cement, Glass and Refractories: Different types, composition, properties and uses.

UNIT-III LUBRICANTS

Introduction, Principle and functions of lubrication, Types of lubricants, Properties, tests and applications of solid, semi-solid and liquid lubricants; Synthetic lubricants and lubricating emulsions.

UNIT-IV INSTRUMENTAL TECHNIQUES IN MATERIAL CHARACTERIZATION

Classification, Lamberts and Beers Law; Introduction, Principle and applications of Colorimetry, IR, UV-Vis, NMR and Mass spectroscopy; Chromatographic Techniques and applications, Numerical Problems on spectroscopic techniques.

UNIT-V ENVIRONMENTAL SCIENCE

Components of Environment and their interactions, Natural resources, Ecosystem, Impacts of development of environment, Environment protection act, EIA, Sustainable development.
Pollution and its types, Description, effects and control measures of Air, Water, Land and Noise pollution, Chemical toxicology, Global warming, Depletion of ozone layer, Acid rains, Eutrophication, Rain water harvesting, Pollution case studies.

BOOKS RECOMMENDED:

[1] Jain & Jain, Engineering Chemistry, Dhanpat Rai Publications, 2007.
[2] S. S. Dara, A Text Book of Engineering Chemistry, S. Chand & Company, 2007.
[3] B.Joseph, Environmental Studies, Tata McGraw Hill.
[4] A.K. De, Environmental Chemistry, New Age International, 1996.
[5] Shashi Chawala, A Text Book of Engineering Chemistry, Dhanpat Rai Publications, 2006.

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Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>MER1C3:</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Elements of Mechanical Engineering</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Course Objectives: To understand the basic fundamentals of Mechanical Engineering in light of thermal engineering and production engineering and to provide an insight about the basic thermal and production processes, materials, components and applications.
Prerequisites: Nil.

COURSE OF CONTENTS

UNIT I

Thermodynamics and energy, Temperature and Zeroth law of thermodynamics, Systems and control volume, Properties of a system, Energy transfer by heat and work, First law of thermodynamics, Energy analysis of closed systems, Internal energy and enthalpy of ideal gases, Energy analysis of steady flow systems, Analysis of some steady flow engineering devices, Relevant review problems.

UNIT II

Properties of pure substance, p-v and T-s diagram for a pure substance, Mollier diagram for a pure substance, Quality or dryness fraction, Steam tables, Methods for measurement of steam quality, Relevant review problems.

UNIT III

Basic considerations in the analysis of power cycles, Air standard assumptions, Overview of reciprocating engines, Thermodynamic analysis of Otto cycle: Ideal cycle for spark ignition engines, Thermodynamic analysis of Diesel cycle: Ideal cycle for compression ignition engines, Comparison of Otto and Diesel cycles, Effect of Specific Heat and Dissociation on the performance of the cycles, Relevant review problems.

UNIT IV

Metal Casting: Classification and overview of metal casting processes: sand casting, expandable mould casting and permanent mould casting; Patterns, cores and moulding; Elements of gating systems; Heating, pouring and solidification; Casting quality: cleaning, finishing and defects.

UNIT V

Welding and Machining: Fundamentals of welding and overview of welding processes: Oxy-Acetylene gas welding, Arc welding: TIG, MIG, SAW etc., Resistance welding; Soldering & Brazing; weld quality and defects; Fundamentals of metal machining and introduction to turning and related operations; Constructional features of lathe, Geometry of single point cutting tool and cutting tool materials.

BOOKS RECOMMENDED:

[1] Nag P K, Engineering Thermodynamics, The McGraw-Hill Companies, Fourth Edition.
[2] P N Rao, Manufacturing Technology, Vol. I and Vol.2 Tata McGraw-Hill, 4th Edition, 2014.
[3] Hajra & Chaudhary, Work Shop Technology, Vol. 1 & 2, 12th Edition, Media Promoters & Pub, 2007.
[4] Cengel Y A, Boles M A, Thermodynamics-An Engineering Approach, The McGraw-Hill Companies, Fifth Edition.
[5] Mikell P. Groover, Fundamentals of Modern manufacturing, 3rd Edition, John Wiley and Sons.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR1C4:
Basic Electronics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Course Objectives: To introduce the basic concepts of electronics along with the understanding of working fundamental circuit devises such as diode, transistors and opamp.
Prerequisite(s): nil

COURSE OF CONTENTS

UNIT I
Discrete electronic devices: Diode, zener diode, BJT (Bipolar junction transistor), LED, photodiode phototransistor, varactor; characteristic and operation (qualitative description and quantitative behaviour with black box approach)

UNIT II
Diode circuits; clipper, clamper circuits, DC power supply: rectifier-half wave, full wave (center tapped, bridge), zener regulated power supply, regulation (with regulator IC-LM317)

UNIT III
BJT characteristics; BJT biasing; CE-biasing circuits: operating point; h-parameter model of transistor; large/small signal models (concept);large/small signal models of CE-BJT amplifier, Design of amplifier; Differential amplifier (using BJT).

UNIT IV
Operational amplifier: basic model; virtual ground concept; inverting amplifier; non-inverting amplifier; integrator; differentiator; Schmitt trigger; astable multivibrator, Simple active filters: low pass, high pass, bandpass, notch filter

UNIT V
Basic feedback theory; +ve and -ve feedback; concept of stability; oscillator, Waveform generator using op-amp schimitt trigger for Square wave, triangular wave Wien bridge oscillator for sinuisoidal waveform

BOOKS RECOMMENDED:

[1] Ralph J.Smith, R.C.Dorf circuits, devices and systems, john Wiley, 1992.
[2] R.L.Boylestad, L. Nashelsky, Electronic devices, and circuit theory, Prentice Hall, 2002.
[3] A. S. Sedra, K.C. Smith, Microelectrinic circuits, Oxfort University Press, 1998
[4] R.A. Gayakwad, OP-amps and linear integrated circuits, Prentice Hall of India.
[5] Millman, Grabel, Microelectronics, Mc-Graw-Hill.
[6] De Carlo, and Lin, Linear circuit analysis, Oxford Univesity Press, 2001 (second edition).
[7] Hayt, Kammerly and Durbin, Engineering Circuit Analysis, Tata McGraw Hill, sixth edition.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
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<tr><td rowspan="2">SSR1S1:
Technical English</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Course Objectives: To develop the English/communication skills in terms of reading, writing and understanding of engineering terms with the improved technical English and to be able to express the technical ideas.
Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT I
Basic of technical communication: Meaning of technical communication; process of communication; Forms of communication: Verbal and Non-verbal; technology-enabled communication; Barriers to communication; Essentials of effective communication; Types of communication; Defining audiences for technical communication; Aspects of communication: Global, Ethical and Legal.

UNIT II
Professional correspondence: Qualities of professional correspondence: Goodwill techniques; Types of correspondence: Letters, Memos, E-mails; Business Letters: Elements of a Letters, Basic Letter Formats; Types of Business Letters: Positive Letters, Negative Letters, Inquiry Letters, Sales Letters, Complain and Adjustment Letters. Memos: Meaning and Format of Memos. Writing job application letters & Designing Resumes; Meeting and Minutes.

UNIT III
Technical Writing: Meaning & Concept of Technical Writing: Process of Technical Writing: Forms of Technical Writing: Technical Description, Summaries, Instructions & User Manuals: Technical Reports: Meaning and Essentials of Good Report Writing: Classification of Reports; Report Formats: Formal and Informal; Common Informal Technical Reports: Progress Reports, Lab Reports, Feasibility reports, Problem Solving Reports.

UNIT IV
Reading Comprehension; Precis Writing; Expansion of an idea; Dialogue Writing; Paragraph Writing (Related to Technical Communication).

UNIT V
Foreign Words & Phrases; Antonyms and Synonyms; Transitional Words and Phrases; Articles, Use of Prepositions, Modal Verbs, Connectives, Relative Clauses, Noun/Nominal Compounds: Correction of Sentences and Homophones; Punctuation, Abbreviations, Capitalization and Number Usage; Use of Technical Words and Jargons.

BOOKS RECOMMENDED:

[1] A. Esenberg, A Beginner’s Guide to Technical Communication, McGraw-Hills.
[2] A. J. Rutherford, Basic Communication Skills for Technology, Pearson Education Asia.
[3] C. L. Bovee, J. V. Thill & B Schatzman, Business Communication Today, 7/e, Pearson Education, 2002.
[4] R. V. Lesikar, J. D. Perrit, Jr., & ME Flately, Lesikar’s Basic Business Communication.
[5] R. C. Sharma and K. Mohan, Business Correspondence and Report Writing, Tata McGraw-Hill, 2002.

Semester 2

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AMR2C1:
Applied Mathematics-II</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Course Objectives: To introduce the mathematical concepts of Matrix Algebra, Probability, and Differential Equation for solving engineering problems that shall be used in various branches of engineering.

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT-I

Matrix Algebra: Review of Matrices; Elementary Operations on Rows and Columns; Normal Form; Linear Dependence; Rank; Application of Rank Theory in Solving System of Linear Equations; Linear Transformation; Orthogonal, Unitary and Hermitian Matrices; Characteristic Equation; Eigen- Values and Eigen-Vectors; Caley-Hamilton Theorem; Quadratic and Linear forms.

UNIT-II

First Order Ordinary Differential Equation: Exact Differential Equation; Equations Solvable for x, y and p; Clairaut's Form; Application to Simple Problems.

Higher Order Ordinary Differential Equation: Linear Differential Equations with Constant & Variable Coefficients; Method of Variation of Parameters, Simultaneous Differential Equations; Application to Simple Problems.

UNIT-III

First Order Partial Differential Equations: Formation of Partial Differential Equations; Partial Differential Equations of First Order and First Degree i.e. Pp + Qq = R.

Higher Order Partial Differential Equations: Linear Homogenous Partial Differential equations of n^{th} order with constant coefficients; method of Separation of variables; their Simple applications.

UNIT-IV

Probability and Statistics: Conditional Probability, Baye's Theorem; Binomial, Poisson and Normal distributions and their Mean and Variance, Methods of least squares and curve fitting, Correlation and Regression Analysis.

UNIT-V

Theory of Equations: Polynomial equations, relation between root and coefficients, symmetric functions of roots, cube roots of unity, Cardon's method for solution of cubic equations.

Fuzzy sets: Membership function, definition, Operations on Fuzzy sets, Properties of Fuzzy sets.

BOOKS RECOMMENDED:

[1] B.S.Grewal, Engineering Mathematics, 39/e, Khanna Publishers, 2006.

[2] Erwin. Kreyszig, Advanced Engineering Mathematics, 8^{th} edition, John Willy and sons Publications, 1999.

[3] Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.

[4] C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co. Ltd., 6/e, 2003.

[5] H.K.Das, Higher Engineering Mathematics, S.Chand New Delhi.

[6] Zafar Ahsan, Differential Equation and their Applications, Prentice Hall of India Pvt. Ltd., New Delhi, 2004.

[7] S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical statistics, Sultan Chand & Sons., 2000.

[8] Freund John E, Mathematical Statistics, PHI, N.D., 7th Ed., 2010.
[9] G. J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PHI, New Delhi, 2005.
[10] H. J. Zimmerman, Fuzzy Set Theory and its Applications, Allied Publishers, 1996.
[11] Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd Edition, John Wiley & Sons, Inc., 2010.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">APR2C2:
Applied Physics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Course Objectives: To introduce the fundamental concepts of physics that are useful in solving problems of engineering especially for semiconductors, optics, electromagnetism and quantum mechanics.
Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I

Optics-I: Interference of Light Waves: Thin film, Newton’s Ring experiment, Michelson interferometer; Diffraction of Light Waves: Fresnel’s & Fraunhoffer diffraction, Zone plate, Single slit experiment, diffraction by double slit, Diffraction at Circular aperture, Plane transmission Grating.

UNIT-II

Optics-II: Polarization of Light Waves, Double refraction, Nicol Prism, Half Wave & Quarter Wave plates, Circularly & elliptically polarized light, Polarimeter; LASER: Stimulated & spontaneous emission, Population Inversion, Optical Resonator, Einstein’s coefficients, He-Ne Laser, Co_2 Laser, Semiconductor Laser; Optical Fiber: types of Fibers (material, refractive index, mode), Acceptance angle, Numerical aperture, V-Number, Propagation of Light through Fibers, Applications.

UNIT-III

Crystal Structure and Semiconductors: Symmetry & properties of Simple crystal structure, Miller’s Indices, Interplanar spacing, production and properties of x-ray, Bragg’s law; Semiconductors: Band theory of Semiconductors, Intrinsic & extrinsic semiconductors, Fermi level , pn junction diode, LED, Zener diode, npn & pnp Transistors.

UNIT-IV

Electromagnetism: Continuity equation for Charge & Current, Inconsistency of Ampere’s law for time varying field, Concept of Displacement current, Maxwell’s equations; Wave equations for E & H, Propagation of one dimensional electromagnetic waves in dielectric medium, Energy density in electromagnetic field: Poynting Vector.

UNIT-V

Quantum Physics: Plank’s law, Compton’s effect, Concept of Matter Waves, Devison & Germer’s experiment, Phase velocity & Group velocity, Heisenberg’s Uncertainty Principle; Schrodinger ‘s Wave Equation, Interpretation of Wave function Ψ, Time dependent & Time Independent equations, Schrodinger’s Wave equation for a free particle in a box.

BOOKS RECOMMENDED:

[1] R K Gaur & S L Gupta, Engineering Physics, Dhanpat Rai & Sons, 2006
[2] H.K. Malik & A.K.Singh, Engineering Physics, Tata McGraw Hill, 2011
[3] N. Gupta & S.K. Tiwary , A Text Book of Engineering Physics, Dhanpat Rai & Co. 2009.
[4] W. T. Silfast, Laser Fundamentals Cambr. Un. Press, 1996,
[5] D Halliday & R Resnick, Physics Vol-II, Wiley Eastern, 1993
[6] H White, Modern Physics: Van Nostrand; 15/e.
[7] D P Khandelwal, Optics and Atomic Physics.
[8] R Feyaman,Feyaman Lectures on Physics, /e, Narosa Publication, 1998.
[9] S.O. Pillai, Solid State Physics, New Age International Publication, 2010.

[10] R.S. Sedha, A Text Book of Applied Electronic, S. Chand & company Lmt. 2005.
[11] R.P. Goyal, Unified Physics-II,,and III Shivlal Agrawal & Co. ,1994.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER2C3:
Engineering Drawing</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">1</td><td rowspan="2">4</td><td rowspan="2">2</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Course Objectives: To understand the concepts of imagining, envisioning and visualizing the objects & machine parts and drawing them with the instruments & tools.

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT-I

Introduction, need & Classification of Engineering Drawings, Drawing Instruments and their uses, Indian Standards for Drawing, Drawing Sheet Layout, Various conventions used in drawing, Technical Lettering, Dimensioning, Basic Geometrical Constructions. Engineering Scales & Engineering Curves

UNIT - II

Orthographic Projections, Isometric Projections, Oblique Projections, Perspective Projections & Missing Views.

UNIT - III

Projection of Points, Straight Lines and Plane Surfaces.

UNIT - IV

Projection of Solids, Section of Solids and Development of Surfaces.

UNIT - V

Interpenetration of Solids / Intersection of Surfaces, Introduction to Computer Aided Drawings, Drawing of Machine elements like Riveted Joints, Screw fasteners and Welded Joints.

BOOKS RECOMMENDED:

[1] Bhatt N D, Engineering Drawing, Charoter Publishing House, Anand, Gujrat Agrawal B, and Agrawal C M, Engineering Drawing, Tata McGraw-Hill Publishing Company Limited.
[2] French T E, Vierck C J, Foster R J, Engineering. Drawing and Graphic Technology Mc Graw-Hill International, Singapore, Low Price Edition.
[3] Luzadder W J, Duff J M, Fundamentals of Engineering Drawing, Prentice- Hall India, New Delhi.
[4] Dhananjay A Jolhe, Engineering drawing, Tata McGraw Hill.
[5] Shah M B and Rana B C, Engineering Drawing, Pearson Education, New Delhi.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR2C4:
Electrical Engineering</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Course Objectives: To understand the concepts and practical ideas of AC/DC circuits, Electromagnetic Circuits, Transformers and Electric Machines those are basic to all the engineering streams.
Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I
AC circuits: Generation of EMF, Phasor Quantities, RMS, Average, Form Factor, Peak Factor Etc, Phasor Diagrams; Single Phase AC Circuits: R, L, C And Combinations, Resonance, Q-Factor, Bandwidth; Three Phase AC Circuits: Generation, EMF, Phase Sequence, Analysis of Star and Delta Connections, and Power Measurement In Single Phase& Three Phase Circuit.

UNIT-II
Circuit analysis tools: Kirchoff's laws, Analysis of DC and AC circuits, Thevenin's theorem, Norton's theorem, Max power transfer theorem, Superposition theorem, and Source transformation .

UNIT-III
Magnetic Circuits: Electromagnetism, Magnetic flux, Magnetic flux density, Intensity of magnetization, B-H curves, hysteresis and eddy current losses, Magnetic circuit calculations, laws of Electro-magnetic induction, Magnetic induction, Lifting power of an electromagnet.

UNIT-IV
Transformer: Construction, principle, ideal transformer, EMF equations, Analysis of transformer on no load and load conditions, Equivalent resistance and reactance, voltage regulations, transformer losses Transformer testing, transformer efficiency, Types of transformer, Cooling methods, Auto transformer.

UNIT-V
Rotating electric Machines: Construction, working principles, EMF equations, Characteristics, Torque equations of DC machines (generators & motors), 3-phase synchronous and induction motor, single phase induction motor.

BOOKS RECOMMENDED:

[1] V Del Toro, Electrical Engineering Fundamentals, 2/e, PHI, 2000.
[2] D P Kothari, I J Nagrath, Basic Electrical Engineering, 2/e, Tata McGraw Hill, 2002 (Fifth Reprint 2003).
[3] A Sudhakar, Network Theory, 2/e, Tata McGraw Hill, 2004
[4] P S Bimbhara, Electrical Machinery, 7/e, Khanna Publishers, New Delhi, 2006.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">COR2C5:
Computer Programming in C++</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Course Objectives: To provide introduction to problem solving with computers using a modern language C++, Perform object oriented programming and to demonstrate relevance of object oriented programming in developing solutions to engineering problems demonstrating usage of data abstraction, encapsulation, and inheritance, To learn exception handling techniques.

Prerequisites: Nil.

COURSE OF CONTENTS

UNIT-I

Introduction to flowcharts and problem solving. Types of programming languages, Programming with C++:- C++ Data Types:-auto, bool, int, char, float, double, void. Variables and Constants, Operators, Arithmetic and Logical Expressions, Assignment Statements and Type Casting. Control structures- Iteration statements, Jump Statements and Selective statements. Common C++ Header files, Generation of Random numbers in C++.

UNIT-II

Functions: Introduction - Call by Value and Call by Reference – return values – recursion – Arrays - Introduction to Arrays - Initialization of Array - Multi dimensional Arrays - passing arrays to functions – Strings - Arrays of Strings - Standard Library String Functions.

Structures: Structure elements, Nested Structures, Array of Structures, Array within structures and passing structures to functions.

Unit- III

Pointers:-Declaration and Initialization of Pointers, Dynamic Memory allocation/deallocation operators:-new and delete. Pointers and Arrays:-Array of Pointers, Pointer to an array, Function returning a pointer, Reference variables and use of alias. Invoking functions by passing pointers. Files – Introduction – File Structure - File handling functions - File Types - Error Handling.

UNIT-IV

Object Oriented Programming Paradigm - Basic Concepts of OOP - Benefits of OOP. Class and object fundamentals and various visibility modes in class, Object as function arguments-pass by value and pass by reference. Constructor:-Special Characteristics, Declaration and Definition of a Constructor, Default Constructor, Overloaded Constructor, Copy Constructor and Constructor with default arguments.

Function Overloading:-Need and restrictions of overloaded functions, Steps involved in finding the best match, Default arguments versus overloading.

Destructor:- Special Characteristics, Declaration and Definition of a Destructor. Friend function and its characteristics and friend class.

UNIT-V

Introduction to Operator overloading - Rules for Operator overloading – overloading of binary and unary operators - Introduction to inheritance – Types of inheritance - Abstract Classes - new Operator and delete Operator - Pointers to Objects – this Pointer - Virtual Functions - Pure Virtual Functions - Introduction to Class Templates - Function Templates - Member Function Templates - Basics of Exception Handling - Types of exceptions - Exception Handling Mechanism - Throwing and Catching Mechanism - Rethrowing an Exception - Specifying Exceptions.

BOOKS RECOMMENDED:

[1] Coohoon and Davidson, C++ Program Design: An introduction to Programming and Object-Oriented Design (3rd edition), Tata McGraw Hill, New Delhi, 2003.
[2] Herbert Schildt, the Complete Reference, Tata McGraw Hill.
[3] E Balagurusamy, Object Oriented Programming with C++, McGraw Hill Education.
[4] Ravichandran, Programming With C++, Tata McGraw Hill.
[5] Dromey G, How to solve it by Computer, Prentice Halll – 1978.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE-I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SSR2S2:
Humanities</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Course Objectives: To learn the human values and ethical values that are essential for an Engineer to practice in the day to day life during the field work while working with the society.
Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I
Man and society- Theories of man and society, Methodological individualism, structuralism, Society and its features- Social Institutions; Social Stratification and Change; Contemporary Indian Philosophy-its characteristics andCross-cultural Issues.

UNIT-II
Human Behavior: Biological Bases of Behavior, Methods for understanding human psychophysiology, Working of brain, Psychobiology of learning, memory, emotions and personality, Temperament and personality: trait structure and persistence, Extraversion/sociability, Aggression-hostility/agreeableness, Philosophy of Mind & Cognition.Concepts of good life – quality of life and subjective well-being; happiness, life satisfaction, and positive affect.

UNIT-III
Perspectives on Knowledge, Science and Technology, Technological Shaping of Society and Social Shaping of Technology and its Human roots, Role of Humanities in Engineering: Professionalism in Engineering; Professional Engineering Bodies.

UNIT-IV
Governance and Engineers: Political parties; Types & Forms of Governance; Utilitarianism; capitalism, socialism and communism; Marxist and neo-Marxist thoughts; democracy in public and private spheres.

UNIT-V
Engineering and Corporate Social responsibility- Ecology and Natural Resources, Role of corporations in the society, Morals, Values, Consciousness, Experience: Basic codes of Ethics; Engineering Ethics, Evolution of CSR, Strategic CSR, Role of stakeholders in CSR, Consumer awareness towards CSR,CSR as competitive advantage, the Global Competitiveness Index (GCI) & Sustainability , Issues in CSR- organizational, economic & social.

BOOKS RECOMMENDED:
[1] D J Kemper, Introduction to Engineering Profession, 2/e, Suanders Publication, 1998.
[2] A S Chauhan, A Text Book of Social Science Jain Brothers 9/e, 2008.
[3] R C Agrawal, Principle of Political Science.
[4] NPTEL
[5] W.B. Werther & D. Chandler, Strategic Corporate Social Responsibility, Thousand Oaks, 2011.

DEVI AHILYA VISHWAVIDYALAYA, INDORE

FACULTY OF ENGINEERING

SCHEME OF EXAMINATION
&
COURSE OF CONTENTS

B.E II Year Programme (CBCS)
(ELECTRONICS & TELECOMMUNICATION ENGINEERING)

INSTITUTE OF ENGINEERING & TECHNOLOGY
(www.iet.dauniv.ac.in)

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

SCHEMES OF EXAMINATION FOR B.E PROGRAMME

B. E. II YEAR ELECTRONICS & TELECOMMUNICATION ENGINEERING (CBCS) L- Lecture, T –Tutorial, P – Practical, PC-Programme Core, GE-Generic Elective, CBCS- Choice based credit Scheme

Semester-III

S.No	Subject code	Subject Name	Type	L-T-P	Credits
1	ATR3C1	APPLIED MATHEMATICS-III	PC	3-1-0	4
2	ETR3C2	DIGITAL ELECTRONICS	PC	3-1-1	4+1(P)
3	ETR3C3	DATA STRUCTURE	PC	3-1-1	4+1(P)
4	ETR3C4	NETWORK ANALYSIS	PC	3-1-1	4+1(P)
5	ETR3G1	ELCTRONIC DEVICES AND FABRICATION	GE	3-1-0	4
6	ETR3L1	ELECTRONIC WORKSHOP-I		0-0-1	1(P)
7	STR3S3	EFFECTIVE COMMUNICATION SKILL		2-0-0	2
8	ETR3V3	COMREHENSIVE VIVA -III	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

Semester-IV

S.No	Subject code	Subject Name	Type	L-T-P	Credits
1	ETR4C1	COMPUTER ORGANIZATION AND ARCHITECTURE	PC	3-1-0	4
2	ETR4C2	ELECTRICAL AND ELECTRONIC MEASUREMENT	PC	3-1-1	4+1(P)
3	ETR4C3	ANALOG ELECTRONICS	PC	3-1-1	4+1(P)
4	ETR4C4	ANALOG COMMUNICATION	PC	3-1-1	4+1(P)
5	ETR4G2	SIGNALS AND SYSTEMS	GE	3-1-0	4
6	ETR4L2	ELECTRONIC WORKSHOP-II		0-0-1	1(P)
7	STR4S4	ENGINEERING ECONOMICS		2-0-0	2
8	ETR4V4	COMREHENSIVE VIVA -IV	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">II Year B.E. (Electronics and Telecommunication Engg.)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
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APPLIED MATHEMATICS-III</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To develop an understanding of the underlying mathematics as a preparation for a specialist study of applications areas like electromagnetic and electrostatic field theory, control theory, communication and signal processing, power transmission, design of discrete times ystems, circuit analysis etc.
- Numerical approach enables solution of a complex problem with a great number of very simple operations. It is useful to find the solution with use of computers making calculation easy and fast.

Prerequisites:

Basic knowledge of algebra of complex numbers, determinants, matrices, differentiation and integration of functions and probability theory.

COURSE CONTENTS

Unit-I

Function of Complex variables: Analytic functions, Cauchy's integral theorem and integral formulae, Taylor's and Laurent' series, Residue theorem, Solution of integrals.

Unit-II

Random variables, density function, stochastic process, autocorrelation, Markov chain, Multi-step in Markov chain. Basic concepts of reliability, failure laws, components in series and in parallel, Redundancy.

Unit-III

Interpolation: Finite difference operators, Newton's and Stirling's interpolation, Numerical differentiation, Numerical integration using Trapezoidal, Simpson's $1/3^{rd}$, Simpson's $3/8^{th}$ and Weddle's rule.

Unit-IV

Numerical solutions of algebraic and transcendental equations-Bisection method, Regula-Falsi method, Newton-Raphson method. Solution of system of linear algebraic equation-Iterative methods: Gauss-Seidel and Gauss-Jacobi's iterative methods.

Numerical Solutions of differential equations - single and multi-step methods.

Unit-V

Fourier series, sine and cosine series, change of intervals, continuous-time and discrete-time Fourier series, Fourier Integral.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply the concept of complex analysis, Fourier analysis and stochastic process in various subjects of engineering like electromagnetic and electrostatic field theory, control theory, signal processing, and power transmission.
- Learn that many problems were analytical methods seems to fail like solving highly nonlinear equation.

BOOKS RECOMMENDED:

[1]. B.S.Grewal, "*Engineering Mathematics*", Khanna Publishers, 42/e, 2015.
[2]. Erwin. Kreyszig, "*Advanced Engineering Mathematics*", 8th edition, John Willy and sons Publications, 1999.
[3]. Gupta P.P. & Malik G.S., "*Calculus of Finite Differences and Numerical Analysis*", Krishna Prakashan Mandir, Meerut, 21/e, 2006.
[4]. Kasana H.S., "*Complex Variables: Theory and Applications*", Prentice-Hall of India Pvt. Ltd, 2nd edition, 2005.
[5]. T. Veerarajan, "*Probability, Statistics and Random Processes*", Tata McGraw - Hill Education, 2002.
[6]. K. S. Trivedi, "*Probability and Statistics with Reliability, Queuing, and Computer Science Applications*", John Wiley & Sons, 2006.
[7]. G. Paria, "*Statistics and Stochastic Processes Part II*", Scholar's Publication, Indore.
[8]. A.R. Vasishtha and R.K. Gupta, "*Integral Transforms*", Krishna Prakashan Media Ltd, Meerut, India, 2000.
[9]. Murray R. Spiegel, "*Schaum's Outline of Fourier Analysis*", McGraw-Hill, New York, 2004.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Electronics and Telecommunication Engg.)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR3C2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
DIGITAL ELECTRONICS	**3**	**1**	**1**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- Provide student the knowledge of different number systems and conversion among them.
- Familiarize students with different logic families and characteristics of Digital ICs
- Familiarize students with different Combinational ICs.
- Develop skills to design various Combinational circuits
- Familiarize students with different Counter ICs
- Develop skills to design various Sequential circuits
- Develop ability to implement digital circuits in various practical applications.

Prerequisites:

Knowledge of Transistor, Diodes, Switching property, Boolean algebra.

COURSE CONTENTS

Unit –I

Foundation: Number system, Arithmetic operations using 1's,2's complement, various codes, Review of basic gates, universal gate application, Logic Families: - RTL, DTL, TTL &MOS, CMOS families for NOR/NAND gate, characteristics of Digital IC's- speed of operation, power dissipation, Fan-in, Fan-out, Noise margin, Current and Voltage parameters

Unit-II

Combinational Circuits: Boolean laws & algebra , Sum Of Product & Product Of Sum expression, K-Map and Tabular method of minimization, Combinational devices like Multiplexer, Demultiplexer, Decoders, Encoders,Tri -state Devices

Unit-III

Combinational & Sequential Circuits: Combinational circuit design for Adder, Subtractor, Comparator, Multiplier , various Code converters
Latches and Flip-Flop- SR, D, T, JK, Master-slave , Flip- Flop conversions.

Unit-IV

Counter and Registers: Synchronous counter, Asynchronous counter, Up-Down Counter, Shift

Registers -serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out, Universal Shift Register

Unit-V
Digital to Analog Conversion Technique as Binary Weighted DAC, R-2R Ladder, DAC808 IC Analog to Digital Conversions as Flash type, Counter type, Successive Approximations type A/D converter, Specifications of A/D converters, ADC 804 and 808 IC, Schmitt trigger, Monostable & Astable Multivibrator using IC555.

Learning Outcomes:

Upon completing the course, students will be able to:

- Understand driving capacity of a gate and voltage-current parameters.
- Implement digital circuit for arithmetic operations.
- Implement digital circuit with optimized hardware.
- Design and Analyse any combinational digital circuit
- Design and Analyse any sequential circuit
- Using analog to digital and digital to analog IC's for data conversion.
- Design circuit to generate clock and pulses of desired frequency.

BOOKS RECOMMENDED:

[1] Mano M. Morris, "*Digital Design*", 3rd edition, Pearson Education 2006.
[2] William H.Gothmann,"*Digital Electronics: An Introduction to Theory and Practice*, Eastern Economy Edition , Prentice-Hall of India Private Limited,NewDelhi.,2001
[3] William I. Fletcher, "*An Engineering Approach to Digital Design"*, Pearson Education
[4] S Salivahan,S Arivazhagan *"Digital Circuit and Design*" Vikas Publication ,2013

List of Practical Assignments:

During the learning of course, students need to do assignments:

1. To implement various gates using universal NAND/NOR ICs.
2. To Design and Implement various combinational circuits using gate ICs.
3. To Design and Implement various combinational circuits using Mux, D-Mux, Encoder, Decoder ICs.
4. To learn and analyze different Flip-Flops.
5. To Design and Implement various sequential circuits using Flip-Flop.
6. To learn and analyse Counter IC's.
7. To Design and Implement various sequential circuits.
8. To Design and Implement circuit to generate clock waveform of desired frequency using IC555.
9. Learn to use ADC and DAC IC's for data conversion.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">II Year B.E. (Electronics and Telecommunication Engg.)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR3C3
DATA STRUCTURE</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

Prerequisites:

Computer Programming knowledge, C Language

COURSE CONTENTS

UNIT-I

Arrays and List: Array: Definition, Representation, Address Calculation; Searching: Linear search, Binary search; Sorting: Bubble sort, Insertion sort, Selection sort, Radix sort, Shell sort; List: Introduction, Implementation as Linked list, Circular linked List, Doubly linked list, Applications of linked list.

Unit-II

Stacks: Definition, Representations: static and dynamic, Implementation of stack, Applications of stack: Polish notation representation and conversion, Tower of Honoi problem, Implementation of recursion, Quick sort and Merge sort.

Unit-III

Queues and Hashing: Definition, Representations, Static and dynamic, Circular Queue, Double ended Queue, Priority Queue, Implementation of Priority Queue using Heap data structure, Heap Sort, applications of queues. Hash Structures: Representation, Search and Implementation and other issues.

Unit-IV

Trees: Definition, Basic terminology, Binary tree, Complete Binary Tree, representations: Static and dynamic, Traversal techniques in binary tree, Heap tree, Binary Search tree, AVL tree, M-way search trees, B-tree & its variations.

Unit-V

Graphs: Definition, Basic terminology, Graph Types, Representations: static, dynamic; Implementations, Searching in graphs, Shortest path in graphs, Applications.

Learning Outcomes:

Upon Completing the Course, Student will be able to:

- Learn the basic types for data structure, implementation and application.
- Know the strength and weakness of different data structures.
- Use the appropriate data structure in context of solution of given problem.
- Develop programming skills which require to solve given problem.

BOOKS RECOMMENDED:

[1] E. Horowitz & Sahni," *Fundamental Data Structure*", Galgotia Book Source, 1983.

[2] A. Tannenbaum, "*Data Structure Using C*", Pearson Education, 2003.

[3] Kruse, "*Data Structure and Programming Design*", Prentice Hall, 1987.

[4] N. Wirth, "*Algorithms +Data Structure = Program*", Prentice Hall of India, 1979.

[5] Goodrich & Tamassia, "*Data Structures and Algorithms in C++",* 2nd Edition, John Wiley & Sons, 2011.

List of Practical Assignments:

During the learning of course, students need to carry out folowing assignments:

1. Implementation of searching and sorting techniques.
2. Implementation of list using array and linked list.
3. Implementation of push and pop operation on stack
4. Implementation of polish notation and its conversion
5. Write a program to solve the problems using iteration/recursion
6. Program for recursion removal using stack
7. Program for insertion /deletion operation on various queues & implementation of priority queue for process scheduling
8. Program for storing data as tree structure and implementation of various traversal techniques
9. Program for storing data as graph structure and implementation of various traversal techniques
10. Program for finding shortest path in graph.

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR3C4
NETWORK ANALYSIS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To learn techniques of solving circuits involving different active and passive elements.
- To analyze the behavior of the circuit's response in time domain.
- To analyze the behavior of the circuit's response in frequency domain.
- To understand the significance of network functions.

Prerequisites: Basic course in Electrical Engineering.

COURSE CONTENTS

UNIT-I

Circuit fundamental and tools of analyzing Network: Elements, Sources, their characteristics, source transformations, Kirchhoff's law, node and loop analysis, D-Y transformation, Network Theorems: Superposition, Reciprocity, Thevenin's, Norton's , Millman and Maximum Power Transfer Theorem, Coupled circuits, Graph Theory

UNIT-II

Time domain analysis of circuits: Transient and steady state analysis of first order and second order systems, initial and final conditions in networks, Solution of I, II and Higher order differential equation

UNIT-III

Two Port Networks: Various network parameters, two port parameters – z-parameter, y-parameter, transmission parameter and hybrid parameter, relationships, Interconnection of two-two port networks, terminated two port network.

UNIT-IV

Laplace Transform and Fourier analysis: Basic theorems for Laplace transform, solution of circuit problems using Laplace transform, Waveform synthesis, Theorem in transform domain, Fourier analysis of complex waves, symmetries, introduction to Fourier transform.

UNIT-V

Network Synthesis: Network functions, significance of poles and zeros, Physical realizability condition, Hurwitz test, Synthesis of one port network, properties of LC immitance, foster realization of LC circuits, ladder development and Causer forms, properties of RC immitance and synthesis of RC circuits.

Learning Outcomes:

Upon Completing the Course, Student will be able to:

- Understand the behavior of different circuits and their response using various circuit analysis tools and theorems
- Understand the analysis in time domain and frequency domain.
- Understand basic concepts regarding the system definition mathematically and associated network function.
- Understand the concept of Network synthesis.

BOOKS RECOMMENDED:

[1] M.E.Van Valkenburg, "*Network Analysis*", 3/e, Pearson Education.
[2] Franklin F.Kuo, "*Network Analysis and Synthesis*", 2/e, John Wiley & Sons, 2003
[3] Donald Scott, "*An Introduction to Circuit Analysis*: A System Approaches, Electrical Engineering Series", McGraw-Hill International Editions. 1987
[4] T.S.K.V. Iyer, "*Theory and Problem in Circuit Analysis*", TMH Outline Series, Tata McGraw-Hill Publishing Company Ltd, New Delhi. 2000
[5] Gyanendra K.Mithal & Ravi Mithal, "*Network Analysis including Transmission Line*", 14/e, Khanna Publishers, New Delhi., 2001

List of Practical Assignments:

During the learning of course, students need to do following assignments:

1. Introduction to various components used in circuit analysis laboratory.
2. Experimental verification of Kirchoff's voltage law and Kirchoff's current law.
3. Experimental verification of Thevenin's theorem.
4. Experimental verification of Nortan's theorem.
5. Experimental verification of Superposition theorem.
6. Experimental verification of Maximum Power transfer theorem.
7. Experimental verification of Reciprocity theorem.
8. Calculation of z-parameters for a two port network.
9. Calculation of y-parameters for a two port network.
10. Calculation of ABCD-parameters for a two port network.
11. Experimental verification for series and parallel interconnection of a two port network.
12. Transient response analysis of a first order and second order circuit.
13. Experimental verification for Fourier series.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**II Year B.E. (Electronics and Telecommunication Engg.)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR3G1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
ELECTRONIC DEVICES AND FABRICATION	**3**	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To familiarize the student with the principle of operation, analysis and design of Junction diode, Transistors and BJT amplifier circuits
- To understand the basic fabrication steps of semiconductor device manufacturing.
- To study basic principle of filter circuits.

Prerequisites:

Basic Electronics

COURSE CONTENTS

Unit I

Foundation**:** The Semiconductor in Equilibrium: Statistical Mechanics, Charge Carriers in Semiconductor, Dopant Atoms and Energy Levels, The Extrinsic Semiconductor, Statistic of Donors and Accepters, Charge Neutrality, Position of Fermi Energy Level.

Unit II

Carrier Transport Phenomena: Carrier Drift, Drift Current Density, Mobility Effect, Conductivity, Velocity Saturation, Diffusion Current Density, Total current density, Carrier Generation and Recombination, Quasi Fermi Level, Excess Carrier Life time.

Unit III

PN Junction: Basic Structure of PN Junction, PN Junction under Zero Bias, Built in Potential barriers, Electric Field, Space Charge Width, PN Junction Under Forward and reverse Bias, minority and majority carrier distribution, Space charge width and electric field in forward and reverse bias, Junction Capacitances, one sided Junctions, Junction breakdowns. PN Junction Current, Small Signal Model of PN Junction.

Unit IV

The Bipolar transistor: Bipolar principal of operation, the modes of operation, Minority carrier distribution, Low frequency Common Base Current Gain, nonideal effects, equivalent circuit models, Frequency Limitations, Current voltage characteristics, BJT as an Amplifier, Small Signal Operation and Models.

Unit V

Single Crystal Structure, Defects in silicon structure, specification of silicon wafer, Crystal growth, CZ method, Oxidation, Diffusion, Ion Implantation, Metallization, Lithography, Process steps for PN Junction Diode, BJT fabrication.

Learning Outcomes:

Upon Completing the Course, Student will be able to:

- Acquire Knowledge and understanding of Electronics Devices and its operation.
- Apply acquired knowledge in designing state of art circuits.
- Able to know the manufacturing steps for Electronics devices

BOOKS RECOMMENDED:

[1].Donald Neamen and Dhrubes Biswas, "*Semiconductor Physics and Devices*", Mc graw Hill Education, 4e.
[2]. Gouranga Bose, "*IC Fabrication Technology*", Mc Graw Hill Education, Edition 2014.
[3]. Adel S Sedra and Kenneth C. Smith, "*Microelectronics Circuits Theory and Application*", Oxford, Edition Sixth.

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR3L1
ELECTRONIC WORKSHOP-I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper:</td></tr>
</table>

Learning Objectives:

This course gives the basic introduction of electronic hardware systems and provides hands-on training with familiarization, identification, testing, assembling, dismantling, fabrication and repairing such systems by making use of the various tools and instruments available in the Electronics Workshop.

Prerequisites:

None

COURSE CONTENTS

List Experiments

1. Familiarization/Identification of electronic components with specification: Functionality, type, size, colour coding, package, symbol, cost etc. Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.
2. Drawing of electronic circuit diagrams using BIS/IEEE symbols and introduction to EDA tools, Interpretation of data sheets of discrete components and ICs, Estimation and costing.
3. Familiarization/Application of testing instruments and commonly used tools : Multimeter, Function generator, Power supply, CRO etc. , Soldering iron, De-soldering pump, Cutters, Wire strippers, Screw drivers, Hot air soldering and desoldering station etc.
4. Testing of electronic components: Resistor, Capacitor, Diode, Transistor, UJT and JFET using multimeter.
5. Inter-connection methods and soldering practice. : Bread board, Soldering - types - selection of materials and safety precautions, soldering practices in connectors and general purpose PCB, Crimping.

6. Printed circuit boards (PCB) : Types, Single sided, Double sided, Processing methods, Design and fabrication of a single sided PCB for a simple circuit with manual etching using Ferric chloride and drilling.
7. Assembling of electronic circuit/system on general purpose PCB, test and demonstration of functioning (**Any Four circuits)**
   A. Fixed voltage power supply with transformer, rectifier diode, capacitor filter, Zener/IC regulator.
   B. LED blinking circuit using a stable multi-vibrator with transistor BC 107.
   C. Square wave generation using IC 555 timer.
   D. Sine wave generation using IC 741 OP-AMP.
   E. RC coupled amplifier with transistor BC 107.

Learning Outcomes:

Student can identify the active and passive electronic components. Student gets hands-on experience on assembling, testing, dismantling, fabrication and repairing systems by making use of the various tools and instruments available in the Electronics Workshop.

BOOKS RECOMMENDED:

[1] R S Khandpur, "*Printed Circuit Boards - Design Fabrication, Assembly and Testing*", Tata Mc Graw Hill Publishing Company Limited, Ist edition 2008.
[2] Horowitz and Hill, "*The Art of Electronics 2nd Edition",* 1989/1990 Cambridge University Press

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Electronics and Telecommunication Engg.)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
STR3S3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
EFFECTIVE COMMUNICATION SKILL	**2**	**0**	**0**	**2**	**0**	**0**	**2**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

To develop effective communication skills in engineers for expressing the technical ideas and for discussing the technical issues with confidence.

Prerequisites: Technical English

COURSE CONTENTS

Unit-I

Fundamentals of Communication: The Importance of Communication; the Basic forms of Communication; The Process of Communication; Types of Communication; Art of Communication.

Unit-II

Inter-personal skills: Building Positive Relationships; Giving Praise; Dealing with Criticism; Managing Conflicts.; Telephone speaking skills and Cross-cultural communication skills

Unit-III

Fundamentals of public Speaking- Speeches on topics of current concern ,listening- The importance of listening; Barriers to Effective Listening; Approaches to Listening; How to be a Better Listener; What speakers can do to ensure better listening.

Unit-IV

Interviews: Points to be remembered as an interviewer or an interviewee; commonly asked questions; Types of interviews; Do’s and Don’ts.

Unit-V

Making Presentations: Speech Purpose- General and Specific; Methods of Speaking; Analyzing the Audience; Nonverbal Dimensions of Presentation, Group Discussions: Importance; Process; Points to be kept in mind while participating; Do's and don'ts.

Note: There shall be seminars and practice sessions by students.

Learning Outcomes:

Upon Completing the Course, Student will able to:

- Enhance the competency for Group discussion and Personal interviews.
- Prepare for GRE, GATE, and TOEFL etc.
- Develop their syntax, vocabulary and expression power.
- Comprehension power will increase by WPM (words per minute)

BOOKS RECOMMENDED:

[1] P D Chaturvedi, P.D. & M Chaturvedi, "*Business Communication: Concepts, Cases and Applications"*, PearsonEducation, Singapore Pvt. Ltd, 2004.
[2] ICMR, "*Business Communication"*, Feb 2001.
[3] J Davies, "*Communication Skills: A Guide for Engineering and Applied Science Students*, 2/e" Pearson Education, 2006.
[4] Lecture material given by the course teacher.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**II Year B.E. (Electronics and Telecommunication Engg.)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR4C1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
COMPUTER ORGANIZATION AND ARCHITECTURE	**3**	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To understand the structure, function and characteristics of computer systems.
- To understand the design of the various functional units and components of computers.
- To identify the elements of modern instructions sets and their impact on processor design.
- To explain the function of each element of a memory hierarchy,
- To identify and compare different methods for computer I/O.

Prerequisite(s): Knowledge of logic circuits - combinational and sequential

COURSE CONTENTS

Unit I: Computer Organization

Computer types, Structure with basic computer components, Function in brief with instruction fetch and execute, Interrupts and I/O communication, Interconnection structure, bus interconnection, Multiple Bus hierarchies, Elements of bus design Performance metrics and measurement

Unit II: Computer Memory System

Characteristics of memory system, Memory hierarchy, Cache Memory- Cache memory principles, Elements of cache design- cache address, size, mapping functions, replacement algorithms, write policy, Internal Memory- semiconductor memory, External Memory- Hard Disk organization, RAID

Unit III: Input and Output System

I/O modules- Module function and I/O module structure, Programmed I/O , Polling I/O, Interrupt driven I/O , DMA function, Synchronous and Asynchronous serial data communication, Computer peripherals like keyboard, mouse, printer, scanner and display devices

Unit IV: Processor Organization

Evolution of Intel processor architecture- 4 bit to 64 bit, Control unit Hardwired and microprogrammed, concept of pipelining , Study of microprocessor 8085,Functional pins and Register organization, Memory mapped I/O and I/O mapped I/O schemes,

Unit V: Instruction Set and Assembly Language Programming

Addressing modes and Formats- immediate, direct, indirect, register, register indirect, displacement and stack, Instruction Cycle machine cycle and Data flow, 8085 instruction set and assembly programming, Time delay concept , stack and subroutines, Interrupt handling, Instruction set architecture RISC and CISC

Learning Outcomes:

On completion of the course, student will be able to :

- Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os.
- Analyze the performance of commercially available computers.
- To develop logic for assembly language programming

BOOKS RECOMMENDED

[1] William Stallings, "*Computer Organization and Architecture*", Prentice Hall of India, Sixth Edition.
[2] A. Tannenbaum, "*Structured Computer Organization*", Pearson Education, 2002.
[3] Patterson & Hennessy, "*Computer Organization and Design*", Morgan Kaufmann, 2007
[4] Ramesh S. Gaonkar, "*Microprocessor, Architecture, Programming, and Applications with the 8085"*, Penram International Publication, 5/e

<table>
<tr><th colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</th><th colspan="4">II Year B.E. (Electronics and Telecommunication Engg.)</th></tr>
<tr><th>Subject Code & Name</th><th colspan="3">Instructions Hours per Week</th><th colspan="4">Credits</th></tr>
<tr><td rowspan="2">ETR4C2 ELECTRICAL AND ELECTRONIC MEASUREMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce students to monitor, analyze and control any physical system.
- To understand students how different types of meters work and their construction.
- To provide a student a knowledge to design and create novel products and solutions for real life problems.
- To introduce students a knowledge to use modern tools necessary for electrical projects.

Prerequisites(s): Basic Electrical Egg and Basic Electronics

COURSE CONTENTS

UNIT-I

Basic concept of Measurements and Instruments, Measurement Methods, Generalized measurement System, Classification of Instruments, Static & Dynamic Characteristics, Errors & Uncertainty measurement of system, Linear & Non-linear Systems.

UNIT-II

Operation principles of Analog Instruments - Moving coil, Moving iron, PMMC, Dynamometer and
Induction type instruments, Measurement of Voltage, Current, Power, Power Factor, Energy, Instrument Transformer - current and potential transformer, Measurement of Phase & Frequency.

UNIT-III

Measurement of Resistance- low, medium and high resistance measurement, A.C. Bridges- general equation, Potentiometer- DC potentiometer, Multi-range potentiometer, AC potentiometer and their applications, High Frequency Measurement , Twin T & Bridge Networks, Q-meter and its applications.

UNIT-IV

Display Devices I- Construction & working of Basic CRO, its Components (Deflection plates, Screen, Aquadag, Time Base Generator, Oscilloscope Amplifiers), Measurements of phase and frequency (Lissajous Patterns), Types of CRO, Special types of CRO, Types of CRO Probes.

UNIT-V

Display Devices II- Digital Voltmeter (ramp type DVM, Integrating and Potentiometric type DVMs, Signal Generator, Function Generator, Wave Analyzer, Distortion Analyzer, Spectrum Analyzer, Frequency Counter, Display Devices & Recorders.

Learning Outcomes:

Upon Completing the Course, Student will able to:

- To use the techniques and skills for electrical projects.
- Design a system, component or process to meet desired needs in electrical engineering.
- Measurement of R, L, C, Voltage, Current, Power factor, Power, Energy.
- Ability to balance Bridges to find unknown values.
- Ability to measure frequency, phase with Oscilloscope.
- Ability to use Digital voltmeters

BOOKS RECOMMENDED:

[1] A.K.Sawhney & Puneet Sawhney, "*A Course in Electrical and Electronic measurements and Instrumentation*", 7/e, Dhanpat Rai & Co.(P) Ltd.,2005

[2] Albert D.Helfrick & William D.Cooper, "*Modern Electronic Instrumentation and measurement Technique*",Low Price Edition, Pearson Education, 2005

[3] Ernest O.Doebelin, "*Measurement Systems Application and Design*", 5/e, Tata McGraw – Hill Publishing Company Ltd., 2004

[4] H.S.Kalsi, "*Electronic Instrumentaion*", Technical Education Series, Tata McGraw –Hill Publishing Company Ltd.,2001

[5] Alan S.Morris, "*The Essence of Measurement*", Eastern Economic Edition, Prentice Hall of India Private Limited.,1997

List of Practical Assignments:

1. To calibrate test Ammeter with reference Ammeter and hence detection of deviation of the test ammeter from reference ammeter using comparison method.
2. To calibrate test Voltmeter with reference Voltmeter and hence detection of deviation of the test Voltmeter from reference Voltmeter using comparison method.

3. To calibrate test Wattmeter with reference Wattmeter and hence detection of deviation of the test Wattmeter from reference Wattmeter using comparison method.
4. To calibrate test Energy meter with reference Energy meter and hence detection of deviation of the test Energy meter from reference Energy meter using comparison method.
5. To study Hay's Bridge and hence determination of unknown value of Self Inductance of given coil using Hay's Bridge.
6. To study Anderson Bridge and hence determination of unknown value of Self Inductance of given coil using Anderson Bridge.
7. To study Schering's Bridge and hence determination of unknown value of Capacitance of given coil using Schering's Bridge.
8. To study Maxwell's Bridge and hence determination of unknown value of Inductance of given coil using Maxwell's Bridge.
9. To study Wien's Bridge and hence determination of unknown value of Capacitance of given coil using Wien's Bridge.
10. To study De Sauty Bridge and hence determination of unknown value of Capacitance of given coil using De Sauty Bridge.
11. To study Kelvin's Bridge and hence determination of unknown value of very low resistance of given coil using Kelvin's Bridge.
12. To study the construction detail of CRO including measurement of voltage, Phase and frequency with the help of CRO.

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Institute of Engineering & Technology</td><td colspan="4">II Year B.E. (Electronics and Telecommunication)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR4C3
ANALOG ELECTRONICS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To recall various BJT parameters, connections and configurations.
- To Explain and Demonstrate BJT Amplifier, Hybrid Equivalent and Hybrid Models.
- To explain construction and characteristics of JFETs and MOSFETs.
- To explain various types of FET biasing, and demonstrate the use of FET amplifiers.
- To Demonstrate and Construct Frequency response of BJT and FET amplifiers at various frequencies.
- To Define, Demonstrate and Analyze Power amplifier circuits in different modes of operation.
- To Demonstrate and Apply Feedback and Oscillator circuits using FET.

Prerequisites: Basic knowledge and understanding of semiconductor devices and operation required.

COURSE CONTENTS

Unit I

BJT AC Analysis: BJT AC Analysis:

BJT Transistor Modeling, The re transistor model, Common emitter fixed bias, Voltage divider bias, Emitter follower configuration. Darlington connection-DC bias; The Hybrid equivalent model, Approximate Hybrid Equivalent Circuit Fixed bias, Voltage divider, Emitter follower configuration; Complete Hybrid equivalent model, Hybrid π Model.

Unit II

Field Effect Transistors:

Construction and Characteristics of JFETs, Transfer Characteristics, Depletion type MOSFET, Enhancement type MOSFET.

FET Amplifiers:

JFET small signal model, Fixed bias configuration, Self-bias configuration, Voltage divider configuration, Common Gate configuration. Source-Follower Configuration, Cascade configuration.

Unit III

BJT and JFET Frequency Response:

Logarithms, Decibels, Low frequency response – BJT Amplifier with RL, Low frequency response FET Amplifier, Miller effect capacitance, High frequency response – BJT Amplifier, High frequency response-FET Amplifier, Multistage Frequency Effects.

Unit IV

Feedback and Oscillator Circuits:

Feedback concept, Feedback connection types, Voltage Series, Voltage Shunt, Current Series, Current Shunt, practical feedback circuit Phase shift oscillator, wien bridge oscillator, colpitts Oscillator, hartely oscillator, Crystal Oscillator.

Unit V

Power Amplifiers:

Definition and amplifier types, Series fed class A amplifier, Transformer coupled class A amplifier, Class B amplifier operation and circuits, Amplifier distortion, Class C and Class D amplifiers. Voltage regulators: Discrete transistor voltage regulation - Series and Shunt Voltage regulators.

Learning Outcomes: After studying this course, students will be able to:

- Acquire knowledge of and Working principles, characteristics and basic applications of BJT and FET.
- Single stage, cascaded and feedback amplifier configurations and Frequency response characteristics of BJT and FET.
- Analyze the performance of FET amplifier in CS configuration and Power Amplifiers and Oscillator circuits.
- Interpretation of performance characteristics of transistors amplifiers, frequency Response and Oscillators.
- Apply the knowledge gained in the design of transistorized circuits, amplifiers and Oscillators.

BOOKS RECOMMEDED

[1]. Adel S. Sedra and Kenneth C. Smith, “*Micro Electronic Circuits Theory And Applicatication,*” 5th Edition ISBN:0198062257
[2]. Behzad Razavi, “*Fundamentals of Microelectronics*”, John Weily ISBN 2013 978-81-265-2307-8
[3]. J.Millman & C.C.Halkias,”*Integrated Electronics*”, 2nd edition, 2010, TMH. ISBN 0-07-462245-5
[4]. K. A. Navas, “*Electronics Lab Manual*”, Volume I, PHI, 5th Edition, 2015, ISBN: 9788120351424.

List of Practical Assignments:

1. Realize BJT Darlington Emitter follower with and without bootstrapping and determine the gain, input and output impedances.
2. Design and set up the BJT common emitter amplifier using voltage divider bias with and without feedback and determine the gain bandwidth product from its frequency response.
3. Plot the transfer and drain characteristics of a JFET and calculate its drain resistance, mutual conductance and amplification factor.
4. Design, setup and plot the frequency response of Common Source JFET/MOSFET amplifier and obtain the bandwidth.
5. Plot the transfer and drain characteristics of n-channel MOSFET and calculate its parameters, namely; drain resistance, mutual conductance and amplification factor.
6. Set-up and study the working of complementary symmetry class B push pull power amplifier and calculate the efficiency.
7. Design and set-up the RC-Phase Shift Oscillator using FET, and calculate the frequency of output waveform.
8. Design and set-up the following tuned oscillator circuits using BJT, and determine the frequency of oscillation. (a) Hartley Oscillator (b) Colpitts Oscillator
9. Design and set-up the crystal oscillator and determine the frequency of oscillation

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Electronics & Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR4C4	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
ANALOG COMMUNICATION	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- The fundamentals of signals & linear time invariant systems used in communication systems.
- Knowledge of probability, random variables & random processes
- In depth knowledge of different types of analog communication system and different modulation techniques used in these systems.
- Analysis of noise and its impact on different modulation techniques.

Prerequisite(s): Basic Electronics

COURSE CONTENTS

Unit-I

Signals and Systems: Types of signals, Classification of Systems, Fourier series, Fourier transform & Its Properties, Convolution, Signal transmission through LTI Systems, Auto correlation, Cross correlation, Energy and power spectral density.

Probability, Random Variables & their moments, their significance, Gaussian & Rayleigh Probability density functions, their means and variances, Q-Function, Central limit theorem.

Unit -II

Amplitude Modulation: Need of Modulation, Block schematic of a typical communication system. AM modulation system, Modulation index, Generation (Squire Law & Switching Modulator) & Detection (Envelope & Squire Law Detector) of AM wave , Side bands & Power contents in AM Wave, DSB-SC (Balanced, Ring Modulator & Synchronous Detector), SSB-SC, Methods of generation & detection, VSB modulation, Comparison of various AM systems, Frequency division multiplexing, Group delay & phase delay.

Unit -III

Frequency Modulation: Relationships between Phase & Frequency Modulation, Narrowband FM, Wideband FM & their Spectrum, Transmission bandwidth of FM And PM signals, Methods of generation (Direct & Indirect) & detection of FM (Discriminators : Balanced, Phase Shift And PLL Detector), Pre- Emphasis & De-Emphasis, Stereophonic FM Broadcasting.

Unit -IV

AM transmitter block diagram, TRF receiver & its limitations, Necessity of heterodyning, Super heterodyne radio receivers, IF amplifiers & selection of IF. FM transmitters, FM receivers, AGC, AVC, AFC, Dynamic Range of Receivers.

Unit -V

Random & Guassian processes and their frequency domain analysis, Sources of noise, Noise figure and Noise figure of amplifiers in cascade, Noise bandwidth, Effective noise temperature, and quadrature components of noise, Rician noise as narrow band Gaussion noise. Performance of AM, FM in presence of low noise case.

Introduction to Digital Communication: Nyquist Sampling Theorem, Time division Multiplexing, PAM, PWM, PPM.

Learning Outcomes:

On Completion of this course the students will be able to:

- Analyze analog communications in time domain and frequency domain.
- Distinguish between different analog modulation techniques.
- Understand the importance of noise considerations in communication systems.

BOOKS RECOMMENDED:

[1] Proakis and Salehi, "*Fundamentals of Communication Systems*", 1/E Pearson Education, 2005.

[2] Lathi B.P., "*Analog and Digital Communication systems*", 3/E Oxford Press, 2007.

[3] Haykin Simon, "*Communication Systems*", 4/E John Willey & Sons, 2006.

[4] Carlson, "*Communication Systems*", 5/E McGraw Hill, 2004.

[5] Taub & Schilling, "*Principles of communication systems*", 3/E McGraw Hill, 2000.

[6] Singh R.P. & Sapre, "*Communication systems Analog & Digital*", 2/E TMH, 2007.

List of Practical Assignments:

1. To Perform the fourier synthesis of the following signals
   a) Square wave
   b) Triangular wave
   c) AM wave SC
   d) AM wave FC
2. Generation of AM Waveforms.
   a) Waveforms generation of DSB-SC Amplitude modulation System
   b) Waveforms generation of SSB-SC Amplitude modulation System

c) Waveforms generation of AM-FC System for different modulation index

3. To study the working of AM receiver.
   a) (a)Detection of AM wave by envelope detector
   b) (b)Detection of AM wave by square law detector
4. Receiving of AM signal using superhetrodyne receiver and analyzes it.
5. To modulate a message signal using FM modulator.
6. To demodulate a received FM signal using FM demodulator circuit.
7. To study the working of pulse width modulator and demodulator.
8. To study the working of pulse amplitude modulator and demodulator.
9. To study the working of pulse position modulator and demodulator.
10. To study the working of spectrum analyzer. Analyzing the different AM and FM waveforms on spectrum analyzer.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Electronics & Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR4G2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
SIGNALS AND SYSTEMS	**3**	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

This course aims to provide detailed description Signals and System Analysis. Fourier series and Fourier transform, Laplace and Z Transform along with respect to SISO systems and State variable analysis for MIMO systems.

Prerequisite(s): Engineering Mathematics

COURSE CONTENTS

UNIT-I Fundamentals of Signals & Systems:

All basic Continuous time signals. Energy signal and Power signal. Continuous time systems, discrete time signals and discrete time systems. Linear Time invariant system theory and its significance to continuous time and discrete time system analysis. Linear convolution Integral and Linear convolution sum.

UNIT-2 Fourier series and Fourier Transform:

Fourier series, Different forms of Fourier series, Dirchlet conditions, Wave symmetry, Parseval theorem. Fourier Transform; its properties and applications. Symmetry properties of Fourier transform. System analysis with Fourier transform. Ideal Filters.

UNIT-3 Laplace Transform and its applications:

Laplace Transform and its properties. Region of convergence, Laplace Transform of some common functions, Initial value and Final value theorem. Inverse Laplace Transform, Transfer function, Characteristics of transfer function, Poles and Zeros, System analysis using Laplace Transform.

UNIT-4 State Variable Techniques:

Introduction, State Variable Concept, Form of state equations, State space representation of continuous time and discrete time LTI systems, solution of state equation, state transition matrix.

UNIT -5 Discrete Time Signal/Systems and Z-Transform:

Introduction, Z-Transform definition, Region of Convergence, Z-Transform of some common sequences, properties of Z-Transform, Inverse Z-Transform, System function of discrete time, LTI Systems, Convolution Theorem, Complex Convolution Theorem.

Learning Outcomes:

On Completion of this course the students will be able to:

- The focus of this course is to familiarize the students with the concept of Fourier transform & Fourier series.
- Analyze the spectral characteristics of signals using Fourier analysis.
- Classify systems based on their properties and determine the response of LTI
- Identify system properties based on impulse response and Fourier analysis.
- Apply transform techniques to analyze continuous-time and discrete-time

BOOKS RECOMMENDED:

[1] Rodger E. Ziemer, William H.Tranter, D. Ronald Fannin, "*Signals and Systems*", Pearson 4th Edition

[2] Hwei P. Hsu (Schaum's Outline Series), "*Signals and Systems*", TMH Edition

[3] A. Anand Kumar, "*Signals and Systems*", PHI 3rd Edition

[4] A.V.Oppenheim et al, "*Signals and Systems*", 2nd Edition, Pearson 2003

[5] Smarajit Ghosh, "*Signals and Systems*", Pearson

[6] Simon Haykin , "*Signals and Systems*" 2nd edition, Wiley, 2008.

[7] B P Lathi, "*Digital and Analog Communication Systems*" 4th edition, Oxford University Press, 2000

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR4L2
ELECTRONIC WORKSHOP-II</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

1. To familiarize students with various Electronic devices and their specifications.
2. Develop skill for Design and Testing of different types of Electronic subsystems using Analog and Digital IC's
3. Familiarize students with PCB layout tool to prepare PCB print for assigned project.
4. Develop skills of writing a structured technical document for project and its presentation.
5. Develop ability to diagnose faults and their rectification.

COURSE CONTENTS

List of Exercises / Experiments

1. Familiarization /Identification of electronic components with specification and Functionality, type, size, colour coding, package, symbol, cost etc. Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.
2. Drawing of electronic circuit diagrams using EDA tools, Interpret data sheets of discrete components and IC's, Estimation and costing.
3. Familiarization/Application of testing instruments and commonly used tools like Multimeter, Function generator, Power supply, CRO etc. Soldering iron, De-soldering pump, Cutters, Wire strippers, Screw drivers, Hot air soldering and desoldering station etc.
4. Testing of electronic components Resistor, Capacitor, Diode, Transistor, UJT and JFET using multimeter and different IC's using IC tester.
5. Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.]
6. Assembling electronic circuit/system on general purpose PCB, testing and show the functioning (Total two projects. **Any one from 1-13 and one from 14-18 project list)**

List of Projects

1. Fastest Finger First Indicator Project
2. Fire Alarm Circuit

3. Plant Watering Watching Indicator
4. Clap switch for operating electric equipment like fan, bulb
5. Mobile Battery Charger
6. 7 Segment Counter
7. Metal Detector
8. Electronic letter box
9. Traffic Light circuit
10. Light-Sensitive Fire Alarm
11. Infrared Motion-Sensing Relay Switch
12. LPG Leakage Detector

14. Design and implement a single stage voltage amplifier using BJT in common emitter configuration for a gain of 10 to amplify input voltage 10 mVp-p, 10-100 KHz. Also tabulate the results for different input range.
15. Design and implement a two stage R-C coupled amplifier using BJT in common emitter configuration for a gain of 100 to amplify input voltage 1mVp-p, 10-100 KHz. Also tabulate the results for different input range.
16. Design and implement LOW PASS, HIGH PASS filter using OP-AMP with cut off frequency 10 KHz and a bandpass filter with passband of 100 KHz.
17. Design and implement variable frequency and variable amplitude triangular waveform generator using OP-AMP. Tabulate the frequency range and amplitude range for the implemented circuit.
18. Design and implement variable frequency and variable amplitude square waveform generator using OP-AMP. Tabulate the frequency range and amplitude range for the implemented circuit.

Learning Outcomes:

Upon completing the course, students will be able to design, test and implement any Analog or Digital circuit by making use of the various tools and instruments available in the Electronics Workshop.

BOOKS RECOMMENDED:

[1] K. A. Navas, “*Electronics Lab Manual*”, Volume I, PHI, 5th Edition, 2015, ISBN: 9788120351424
[2] R.A Penfold, “*Electronic Projects in Workshop*”, Newnes Technical Books
[3] T.K Hamingway, “*Electronic Designer’s Handbook*”, Business Books Limited.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">STR4S4
ENGINEERING ECONOMICS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
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Learning Objectives:

- To make fundamentally strong base for decision making skills by applying the concepts of economics.
- Educate the students on how to systematically evaluate the various cost elements of a typical manufactured product, an engineering project or service, with a view to determining the price offer.
- Prepare engineering students to analyze profit/revenue data and carry out make economic analysis in the decision making process to justify or reject alternatives/projects.

COURSE CONTENTS

Unit-I

Introduction to Engineering Economics: Definitions, Nature and Scope of Economics; Difference between Microeconomics and Macroeconomics; Concepts of Engineering Economics- Engineering Efficiency and Economic Efficiency.

Consumer Demand Analysis: Meaning, Features and Determinants of demand; Law of Demand and its Exceptions; Reasons for Law of Demand; Importance of Law of Demand; Elasticity of Demand.

Unit-II

Supply Analysis: Meaning, Supply Function, Law of Supply, Determinants of Supply, Fluctuation of supply; Elasticity of supply and its measurement.

Unit-III

Theory of Production: Production Function, Factors of Production; Law of Variable Proportions; Law of returns to scale

Cost, Revenue and Profit Analysis: Cost Classifications for Predicting Cost Behavior; Concept of Profit, Gross Profit and Net Profit; Break Even Point (BEP).

Unit-IV

National Income: Circular Flow of Income, Meaning and Concept of National Income: GNP/GNI, NNP/NNI, Personal Income and Disposable Income; Methods of Computing National Income -Production Method, Income Method, Expenditure Method.

Unit-V

Economic Stabilization: Monetary Policy- Meaning, Objectives, Tools; Fiscal Policy-Meaning, Objectives, Tools.

Learning Outcomes:

Upon completing the course, students will be able to:

- Understand major principles of economic analysis for decision making among alternative courses of action in engineering.
- Apply economic principles to prices and quantities in competitive supply and demand for goods and for money.
- Solve economic problems involving comparison and selection of alternatives by using analytical techniques including benefit-cost ratio and breakeven analysis.

BOOKS RECOMMENDED:

[1] C S Park, "*Contemporary Engineering Economics*", Pearson Education, 2002.
[2] J S Chandan, "*Statistics for Business and Economics*", Vikas Publishing.
[3] H. L. Ahuja, "*Principles of Microeconomics*", S. Chand (G/L) & Company Ltd, 2002.
[4] D. N. Dwivedi, "*Macroeconomics Theory and Policy*", Tata McGraw-Hill Publishing Company, 2010.
[5] S Damodaran, "*Managerial Economics*", Oxford University Press, 2010.

List of Assignments (Theory):

During the learning of course students are required to research and submit an outline of the past, present and future position of a company of their choice. The outline must include at least one properly labelled table and figure and at least two references.

DEVI AHILYA VISHWAVIDYALAYA, INDORE

FACULTY OF ENGINEERING

SCHEME OF EXAMINATION
&
COURSE OF CONTENTS

B.E III Year Programme (CBCS)
(ELECTRONICS & TELECOMMUNICATION ENGINEERING)

INSTITUTE OF ENGINEERING & TECHNOLOGY
(www.iet.dauniv.ac.in)

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

SCHEMES OF EXAMINATION FOR B.E PROGRAMME

B. E. III YEAR ELECTRONICS & TELECOMMUNICATION ENGINEERING (CBCS) L - Lecture, T – Tutorial, P – Practical, PC-Programme core, PE-Programme Elective, GE-Generic Elective, CBCS-Choice based credit system

Semester-V

S.No	Subject code	Subject Name	Type	L-T-P	Credits
1	ETR5C1	OBJECT ORIENTED PROGRAMMING	PC	3-1-0	4
2	ETR5C2	DIGITAL COMMUNICATION	PC	3-1-1	4+1(P)
3	ETR5C3	EMF AND TRANSMISSION LINE	PC	3-1-1	4+1(P)
PROGRAMME ELECTIVE (ANY ONE FROM LIST GIVEN BELOW)					
4	ETR5E1	MICROCONTROLLERS	PE	3-1-1	4+1(P)
	ETR5E2	PROBABILITY AND RANDOM PROCESSES			
	ETR5E3	SMART SENSORS AND MEMS			
	ETR5E4	ARTIFICIAL INTELLIGENCE			
	ETR5E5	POWER ELECTRONICS			
5	ETR5G3	DIGITAL SIGNAL PROCESSING	GE	3-1-0	4
6	ETR5L3	SOFTWARE WORKSHOP	PC	0-0-1	1(P)
7	STR5S5	PRINCIPLES OF MANAGEMENT	SS	2-0-0	2
8	ETR5V5	COMREHENSIVE VIVA -V	VIRTUAL	0-0-4	4
TOTAL **CREDITS**					**30**

Semester-VI

S.No	Subject code	Subject Name	Type	L-T-P	Credits
1	ETR6C1	VLSI DESIGN	PC	3-1-0	4
2	ETR6C2	MOBILE AND WIRELESS COMMUNICATION	PC	3-1-1	4+1(P)
3	ETR6C3	CONTROL SYSTEM	PC	3-1-1	4+1(P)
PROGRAMME ELECTIVE (ANY ONE FROM LIST GIVEN BELOW)					
4	ETR6E1	LINEAR INTEGRATED CIRCUITS	PE	3-1-1	4+1(P)
	ETR6E2	MULTIMEDIA COMMUNICATION			
	ETR6E3	SOFT COMPUTING TECHNIQUES			
	ETR6E4	INDUSTRIAL AND MEDICAL ELECTRONICS			
	ETR6E5	MODELING AND SIMULATION			
5	ETR6G4	COMPUTER NETWORKS	GE	3-1-0	4
6	ETR6L4	DESIGN WORKSHOP	PC	0-0-1	1(P)
7	STR6S6	ENTERPRENEURSHIP AND IPR DEVELOPMENT	SS	2-0-0	2
8	ETR6V6	COMPREHENSIVE VIVA	VIRTUAL	0-0-4	4
TOTAL **CREDITS**					**30**

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Electronics & Telecommunication Engg.)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR5C1
OBJECT ORIENTED PROGRAMMING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective: To learn about object oriented concepts through Java programming.

Prerequisites: basics of computer programming

COURSE CONTENTS

UNIT-I

Introduction to Object Oriented Programming:

Object oriented concepts, Need for object oriented programming, Principles of object oriented programming- Abstraction, Encapsulation, Polymorphism, Inheritance; Procedural language vs OOPs, Salient features of Java, Development of Java programming, Access modifiers, Introduction to object model, concept of object initialization, simple Java program structure,

UNIT-II

Introduction to Java classes and objects

Java data types, data type conversions and type casting, operators and their precedence, Types of operators, conditional statements- if—else, switch case, ternary operator, Iteration statements-for loop, while expression, do-while, branching mechanism, introduction to classes-class members and member functions, constructors, constructor overloading, String handling, wrapper classes, Arrays and vectors.

UNIT-III

Inheritance and Polymorphism

Inheritance basics, Types of inheritance, merits and demerits, application of keyword Super, method overriding and overloading, Inhibiting inheritance of class using Final, Dynamic method dispatch, runtime polymorphism, abstract classes, Interfaces, implementing interfaces, Packages in Java, importing packages and classes into programs, user defined packages

UNIT-IV

Exception handling and Multi-threading

Introduction to exceptions, need for exceptions, exception handling techniques, exception types, Using try-catch, finally, throw and throws keywords, user defined exceptions,, Multi-threading in Java, Thread class, the Main Thread, creation of new Threads, Thread states, Thread priority, Thread synchronization.

UNIT-V

Java I/O, Applets and Event Handling

Basic I/O classes, byte streams and character streams, class File, reading and writing Bytes, Applet basics, Applet architecture, Applet class and methods, Applet life cycle, event handling in Java, Delegation event model, types and sources of events, event listeners.

Learning Outcomes:

Upon completing the course, Student would be able to:

- Understand the basic concepts of Java programming
- Familiarize with the declaration of classes, arrays, operations with arrays, process of inheritance.
- Learn the implementation of interfaces, importing packages, handling exceptions and creating applets.
- learn how to write, compile and get results of simple application programs in Java

BOOKS RECOMMENDED:

[1] Herbert Schildt, Java The complete reference, McGraw Hill Education private limited, 2013.

[2] Anita Seth, B.L.Juneja, Java One Step Ahead, Oxford University press, 2017.

[3] Timothy, Budd, Object Oriented Programming, 3/E Pearson Education, 2002.

[4] Cay S.Horstmann, Core Java, vol-1, 8/E, Pearson Education, 2008.

Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**III Year B.E. (Electronics and Telecommunication)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR5C2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
DIGITAL COMMUNICATION	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

The course contents are aimed to provide:

(1) Knowledge of various digital encoding techniques.
(2) Understanding of various baseband and bandpass transmission and reception techniques.
(3) Acquaintance with source encoding and channel encoding techniques.
(4) To know why digital communication systems are better than analog communication systems.

Prerequisites:

Knowledge of Fourier analysis and random variables.

COURSE CONTENTS

UNIT-I

Review of Fourier transforms, Energy Spectral Density, Power Spectral Density and their properties, sampling & its types, TDM**.** Digital encoding techniques**:** PCM, quantization (uniform and non-uniform), quantization noise, DPCM, ADPCM, DM, ADM and their comparison.

UNIT-II

Line coding techniques: Desirable characteristics of Line codes, NRZ and RZ forms of unipolar, polar & bipolar and bi-phase line codes and their waveforms, PSDs and comparison. Inter Symbol Interference, pulse shaping (Raised cosine spectrum, duo-binary signalling), Eye patterns. Baseband reception and probability of error, optimum filter, matched filter, correlation receivers.

UNIT-III

Band-pass modulation and demodulation techniques: BPSK, DPSK, QPSK, BFSK, M-ary PSK & FSK, MSK (their generation, detection, waveforms, PSDs, signal constellation diagrams, performance of these systems in the presence of noise). Introduction to Spread Spectrum techniques.

UNIT-IV

Information theory: Concept of amount of information, entropy & its types, source encoding such as Shannon-Fano, Huffman Codes. Information rate, channel capacity (its calculation for Binary Symmetric channel;, Binary Erasure Channel, noiseless channels and Gaussian channel), Shannon's theorem, bandwidth and S/N trade off .

UNIT-V

Channel encoding techniques: Linear Block codes (Systematic Linear Block codes, Parity check matrix, Syndrome testing), cyclic codes, Hamming codes, BCH codes, convolution codes, their encoding and decoding operation.

Learning Outcomes:

Upon Completing the Course, Student will able to learn:

(1) Various processes and their types involved in digital communication system.
(2) Application and selection of these processes with their types, according to requirement.

BOOKS RECOMMENDED:

[1]. Lathi B. P., Modern Analog and Digital Communication Systems, 4^{th} ed., Oxford Univ. Press, 2011.
[2]. Haykin Simon Communication System, 4th ed., Wiley Publication, 2001.
[3]. Schaum's Outline Series, Analog and Digital Communication, 2nd ed., TMH, 2006.
[4]. Taub & Schilling, Principles of Communication System, 4^{th} ed., TMH, 2013.
[5]. Dr. Bernard Sklar, Digital Communication, 4th ed.,Pearson education, 2001.
[6]. Proakis & Salehi, Digital Communication, 2nd ed., McGraw Hill, 2004.

List of Practical Assignments:

Assignment I

Fourier synthesis of various waveforms.

(a) To perform Fourier synthesis of square wave.
(b) To perform Fourier synthesis of triangular wave.
(c) To perform Fourier synthesis of AM with suppressed carrier wave.
(d) To perform Fourier synthesis of AM with carrier wave.
(e) To perform Fourier synthesis of DTMF signals.

Assignment II

Performance evaluation of digital communication system in presence of various line encoding techniques .

(a) To generate various line encoding techniques like unipolar, polar, bipolar with RZ and NRZ format.
(b) To draw the PSD of these line encoding techniques.

(c) To compare the performance of these line enconing techniques.

Assignment III

Performance evaluation of digital communication system in presence of various digital modulation techniques .

(a) To evaluate the performance of MPSK for M=2,4,8,16 and their comparison study.
(b) To evaluate the performance of ASK.
(c) To evaluate the performance of MFSK for M=2,4,8,16 and comparison study.
(d) How will select a particular modulation technique for a particular application

Assignment IV

Performance evaluation of digital communication system in presence of various error correcting codes .

(a) To evaluate the performance of Hamming code.
(b) To evaluate the performance of Convolution code.
(c) Performance comparison of these two codes.
(d) How will select a particular channel code for a particular application.

Assignment V

Performance evaluation of digital communication system in presence of various communication channels .

(a) To evaluate the performance of AWGN channel.
(b) To evaluate the performance of fading channel.
(c) Performance comparison of different communication channels.
(d) What will be the impact of a communication channel on the performance of digital communication system.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR5C3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
EMF AND TRANSMISSION LINE	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

1) To analyze field potentials due to static changes
2) To evaluate static magnetic fields
3) To understand how materials affect electric and magnetic fields
4) To understand the relation between the fields under time varying situations
5) To understand principles of propagation of uniform plane waves.
6) To understand principles of Transmission Lines

Prerequisites: Matrix and Vector Algebra

COURSE CONTENTS

Unit I

Vector Analysis: General Treatment on Cartesian, cylindrical, spherical and general curvilinear co-ordinate systems with reference to vectors, operation of Gradient, Divergence, Curl, Laplacian, Gauss's Divergence theorem, Stoke's theorem.

Unit II

Electrostatics: Review of electric field quantities and their definitions. Gauss's flux theorem, Poisson's equation and Laplace equation, Uniqueness theorem, Green's theorem, Coulomb's law, dipole moment. Electrostatic field in dielectric: polarization, electric flux density, boundary conditions, capacitor and capacitance, electrostatic shielding, energy stored in electric fields.

Unit III

Magnetic Fields and Electromagnetic Induction: Magnetic flux and flux density, static currents in conducting media, Ampere's circuital law, Biot-Savart law, boundary conditions between magnetic media, magnetic force, magnetic potential, magnetic force and torque, Lorentz force on straight and long current carrying conductors in magnetic field, magnetic force between two long and parallel current carrying conductors, Magnetic dipole and dipole moment, energy stored in magnetic field. Faraday's law for induction (transformer and motion), inductor and inductance (self and mutual).

Unit IV

Maxwell's Equations & Electromagnetic Waves: Maxwell's equations, equation of continuity displacement current, Maxwell's equation in point and integral forms, time-varying potentials, wave equations, uniform plane waves in dielectrics and conductors, power loss in a plane conductor, energy storage, Sinusoidally time varying uniform plane wave in free space & conductors, Poynting's vector theorem.

Unit V

Transmission Lines : Introduction of transmission line**, l**ine equations, equivalent circuit , line impedance, input impedance, measurement of secondary constants, line sections, reflection coefficient , SWR and power, Smith chart and its applications, some applications of transmission lines.

Learning Outcomes:

Upon completing the Course Student will able:
To familiarize the student to the concepts, calculations and pertaining to electric, magnetic and electromagnetic fields &Transmission Line so that an in depth understanding of antennas, electronic devices, Waveguides is possible.

BOOKS RECOMMENDED:

[1]. Engineering Electromagnetics, William H. Hayt; Mc-Graw Hill.
[2]. Theory and Problems of Electromagnetics, Josep h A. Edminister; McGraw Hill.
[3]. Element of electromagnetics Electromagnetic, Mathew N.O Sadiku, Oxford University Press.
[4]. Elements of Engineering Electromagnetics, N. Rao, Prentice Hall.
[5]. Electromagnetics for Engineers, Fawwaz T.Ulaby, Pearson Education.

List of Practical Assignments:

[1]. To Study Vector Analysis with Matlab.
[2]. To Study the Surface and Volume Integrals with Matlab.
[3]. To study E Field of Linear Charge with Matlab.
[4]. To Study E Field of Surface Charge with Matlab.
[5]. To Study Electric Flux Density with Matlab.
[6]. To Study Electric Flux through a Surface with Matlab.
[7]. To Study Magnetic Field of a Current Sheet with Matlab.
[8]. Measuring the Characteristics of a line.
[9]. Measuring the Attenuation of a line.
[10]. Measuring the input Impedance of the line.
[11]. Measuring Phase Displacement between the Current & Voltage at input of line.
[12]. To Study Stationary Waves.

<table>
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<tr><th>Subject Code & Name</th><th colspan="3">Instructions Hours per Week</th><th colspan="4">Credits</th></tr>
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MICROCONTROLLERS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective: In this student would learn the architecture of AVR, interfacing and controlling of peripheral devices through programming in assembly as well as in embedded C of AVR microcontroller. The course will cover AVR, 8-bit Microcontroller in detail with sufficient exposure to design an automated system.

Prerequisite: knowledge of Digital Logic Design, Microprocessor architecture, logical ability and programming skills.

COURSE CONTENTS

Unit 1: Introduction to Microcontroller

Microcontrollers and Embedded processors, Microcontroller survey, Overview of AVR family, AVR Microcontroller architecture, Register, status register, ROM space and other hardware modules, ATmega32 pin configuration &function of each pin.

Unit 2: AVR Assembly Language Programming

Addressing modes of AVR, Different instructions, assembly language programs, I/O Port Programming, Time delay loop, BCD, ASCII conversion Program, Look-up table, Bit addressability, Accessing EEPROM, MACROs.

Unit 3: AVR Programming in C and Timers

Data types, I/O programming, logic operations, Intel HEX file, Timer programming in assembly and C, Input capture and Wave Generator, PWM programming.

Unit 4: Interrupt & Serial Port Programming

Interrupt environment, Interrupt programming and applications, Serial Port programming and applications.

Unit 5: Peripheral Interfacing

LCD and Keyboard Interfacing, ADC, DAC and sensor interfacing, Relay, Opto-isolator and Stepper Motor Interfacing, DC motor control, SPI protocol and Display interfacing, I2C Protocol and RTC interfacing.

Learning Outcome:

After learning the course the students should be able to:
1. Understand the architecture of AVR 8-bit Microcontroller.
2. Describe the importance and function of each pin of AVR ATmega32 Microcontroller.
3. Write, debug and simulate assembly as well as embedded C language programs.
4. Understand Timer operation, Interrupt environment and Serial Communication.
5. Interface I/O peripheral devices with microcontroller.
6. Summarize the functionality of I2C and SPI protocol.

BOOKS RECOMMENDED:

[1] The AVR Microcontroller and Embedded Systems Using Assembly and C, By Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, Pearson Education.
[2] Programming and Customizing the AVR Microcontroller, By Dhananjay Gadre, McGraw Hill Education
[3] AVR ATmega32 data sheet

List of Practical Assignments:

1. **<u>BASIC PROGRAMS IN ASSEMBLY LANGUAGE</u> :-**
   I. Write a program to Toggle all bits of PORTB by sending value $55 and $AA continuously. Put delay between each issuing of data to PORTB.
   II. Write a program when an LED is connected to each pin of PORTD. Turn on each LED from pin D0 to D7.
   III. Write a program to create a square wave of 50% duty cycle on bit 0 to PORTC.
   IV. Write a program when a Switch is connected to pin PB2.
      a) IF SW=0, send the letter ‘N’ to PORTD.
      b) IF SW=1, send the letter ‘Y’ to PORTD.
   V. Write a program when a Switch is connected to pin PB0 and an LED to pin PB7. To get status of SW and send it to the LED.
2. **<u>AVR PROGRAMMING in C</u>:-**
   I. Write a program to toggle all bits of PORTB 200 times.
   II. Write a program to toggle all bit PORTB continuously with 100ms delay XTAL=8MHz.
   III. WAP to read pins 1 and 0 of PORTB, send ASCII code to PORTD as per following status of Pin1 Pin0.

Pin1	Pin0	
0	0	send '0' to port D
0	1	send '1' to port D
1	0	send '2' to Port D
1	1	send '3' to Port D

IV. Write a program to send value 44H serially one bit at a time via PORTC pin3 (LSB FIRST).

V. Write a program to store ‘G’ into location 0x005F of EEPROM.

3. <u>CODE CONVERSION (IN ASSEMBLY AND C)</u>:-

I. Write a program to perform checksum byte calculation for data.

II. Write a program to calculate the checksum byte for given data.

III. Write a program to convert hexadecimal number FDH to decimal and display digit on PORTB, PORTC, PORTD.

IV. Write a program to convert Packed BCD to ASCII.

V. Write a program to convert ASCII to packed BCD.

4. <u>TIMER PROGRAMMING (IN ASSEMBLY AND C)</u>:-

I. Write a program to toggle all bits of PORTB using some delay. Use CTC mode. Assume XTAL=8MHz.

II. Write a program using of prescaler 64 to generate delay of 1920 µs. Assume XTAL=8MHz.

III. Toggle only the PORTB.4, Use Timer1, normal mode, no prescaler to create the delay of 2ms.

IV. Use TOV0 flag to extend Timer0 to a 16-bit counter and display on PORTC and PORTD.

5. <u>INTERRUPT AND SERIAL PORT PROGRAMMING (IN ASSEMBLY AND C)</u>:-

I. Using Timer1, toggle pin PORTB.5 every second, while at the same time transfer data from PORTC to PORTD.

II. Write a program to receive bytes of data serially and put on PORTB. Set baud rate =9600 & use 1 stop bit.

III. Write a program to toggle PORTC.3, whenever INT0 goes low.

IV. Write a program to transmit the letter ‘G’ serially at 9600baud, continuously. Do this task with interrupt and without Interrupt.

6. <u>LCD, KEYBOARD AND OTHER PERIPHERAL INTERCACING AND PROGRAMMING (IN ASSEMBLY AND C)</u>

I. Write “HELLO” on the LCD using port A of Atmega 32.

II. Interface Keyboard with Atmega 32 and write a program to send ASCII code to Port D for any key pressed.

III. Interface DAC 0808 with Atmega 32 and generate a triangular wave.

IV. Interface LM 34 with Atmega 32 and write a program to read the sensor continuously and display the reading on Port D.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR5E2 RANDOM PROCESS	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objective: The course aims at providing the necessary basic concepts in random processes. Knowledge of fundamentals and applications of random phenomena will greatly help in the understanding of topics such as signals & systems, pattern recognition, voice and image processing and filtering theory.

Prerequisite: Basic Mathematics

COURSE CONTENTS

UNIT I RANDOM VARIABLES

Discrete and continuous random variables – Moments - Moment generating functions and their properties. Binomial, Poisson,Geometric, Uniform, Exponential, Gamma and normal distributions – Function of Random Variable.

UNIT II TWO DIMENSIONAL RANDOM VARIBLES

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem (for iid random variables)

UNIT III CLASSIFICATION OF RANDOM PROCESSES

Definition and examples - first order, second order, strictly stationary, wide-sense stationary and ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process – Random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS

Linear time invariant system - System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output – white noise.

Learning Outcomes:

At the end of the course, the students would

- Have a fundamental knowledge of the basic probability concepts.
- Have a well-founded knowledge of standard distributions which can describe real life phenomena.
- Acquire skills in handling situations involving more than one random variable and functions of random variables.
- Understand and characterize phenomena which evolve with respect to time in probabilistic manner.
- Be able to analyze the response of random inputs to linear time invariant systems.

BOOKS RECOMMENDED:

[1]. Oliver C. Ibe, "Fundamentals of Applied probability and Random processes", Elsevier, First Indian Reprint (2007) (For units 1 and 2) [2]. Peebles Jr. P.Z., "Probability Random Variables and Random Signal Principles", Tata McGraw-Hill Publishers, Fourth Edition, New Delhi, 2002.(For units 3, 4 and 5). REFERENCES

[3]. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw-Hill edition, New Delhi, 2004.
[4]. Leon-Garcia,A, "Probability and Random Processes for Electrical Engineering", Pearson Education Asia, Second Edition, 2007
[5]. Yates and D.J. Goodman, "Probability and Stochastic Processes", John Wiley and Sons, Second edition, 2005.

List of Practical Assignments:

- Based on Matlab and Simulink toolboxes

<table>
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SMART SENSORS AND MEMS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

The student will gain a basic understanding of current MicroElectroMechanical Systems (MEMS) technology and industrial instrumentation systems, with particular emphasis on smart sensors and actuators. The course introduces the fundamental of measurement systems and focuses in particular on MEMS fabrication, MEMS transducer types and applications.

Prerequisite: Basic Electronics

COURSE CONTENTS

Unit 1: Principles of Sensing, Classification and Terminology of Sensors, Measurands. Some basic discussion about electric field, potential, capacitance, resistance etc.

Unit 2: Acoustic and Magnetic Sensors, Mechanical Sensors, Radiation and Thermal Sensors Chemical and Biosensors, Electronic Interface and Integrated Sensors/Design Projects/ Wireless integration.

Unit 3: Introduction to Microsystems, MEMS microsystem components, Microfluitics microsystem components, Microfluidics Continued microsystem components, Electronic/wireless integration, putting it all together- system design.

Unit 4: Introduction to Bulk Micromachining, Isotropic and Orientation Dependent Wet Etching, Dry Etching, Buried Oxide Process, Silicon Fusion Bonding, Sacrificial Layer Technology,

Unit 5: Surface Micromachining using Plasma Etching, ,Combined 1C Technology and Anisotropic Wet Etching, Processes Using Both Bulk and Surface Micromachining, Adhesion Problems in Surface Micromachining, Surface Versus Bulk Micromachining

Learning Outcomes:

At the end of this course, students will be able to:

1. Select the right sensor for a given application.
2. Design basic circuit building blocks.
3. Simulate, synthesize, and layout a complete sensor or sensor system
4. Design MEMS device or microsystem ready for fabrication tools.

BOOKS RECOMMENDED:

[1]. Brignell JE and White NM (1996). Intelligent sensor systems revised edition.
[2]. Beeby SP, Ensell GJ, Kraft M and White NM (2004). MEMS Mechanical Sensors.
[3]. Bentley JP (2005). Principles of measurement systems.

List of Practical Assignments:

- Based on Matlab toolboxes

<table>
<tr><th colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR5E4
ARTIFICIAL INTELLIGENCE</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective: To search and discover intelligent characteristics of existing AI projects, map a new problem – as search and create an animation – showing different search strategies for a problem, program a new game/ problem in Prolog, evaluate different Knowledge Representation schemes for typical AI problems, design and implement a typical AI problem to be solved Using Machine Learning Techniques, design and implement a futuristic AI application

Prerequisite: Basic Mathematics and Programming

COURSE CONTENTS

UNIT I INTRODUCTION

Introduction, Definition, Future of Artificial Intelligence, Characteristics of Intelligent Agents , Typical Intelligent Agents, Problem Solving Approach to Typical AI problems

UNIT II PROBLEM SOLVING METHODS

Problem solving Methods, Search Strategies, Uninformed, Informed, Heuristics, Local Search Algorithms and Optimization Problems, Searching with Partial Observations, Constraint satisfaction Problems, Constraint Propagation, Backtracking Search, Game Playing , Optimal Decisions in Games ,Alpha, Beta Pruning, Stochastic Games

UNIT III KNOWLEDGE REPRESENTATION

First Order Predicate Logic, Prolog Programming, Unification, Forward Chaining, Backward Chaining, Resolution, Knowledge Representation, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information

UNIT IV MACHINE LEARNING

Probability basics, Bayes Rule and its Applications, Bayesian Networks, Exact and Approximate Inference in Bayesian Networks, Hidden Markov Models, Forms of Learning , Supervised Learning, Learning Decision Trees, Regression and Classification with Linear Models, Artificial

Neural Networks, Nonparametric Models, Support Vector Machines, Statistical Learning, Learning with Complete Data, Learning with Hidden Variables, the EM Algorithm, Reinforcement Learning

UNIT IV INTRODUCTION TO PROLOG
Introduction To Prolog: Syntax and Numeric Function, Basic List Manipulation Functions In Prolog,Functions, Predicates and Conditional, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays, Miscellaneous Topics, LISP and Other AI Programming Languages.

Learning Outcome:

After learning the course the students should be able to
- Understand various search methods
- Use various knowledge representation methods
- Understand various Game Playing techniques
- Use Prolog Programming language using predicate logic

BOOKS RECOMMENDED:

[1].S. Russell and P. Norvig,Artificial Intelligence: A Modern Approach , Prentice Hall, 3 rd Edition, 2009
[2]. Bratko, I., Prolog Programming for Artificial Intelligence (International Computer Science Series), Addison-Wesley Educational Publishers Inc; 4th edition, 2011.
[3].David L. Poole, Alan K. Mackworth , Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
[4].Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning series), The MIT Press; second edition, 2009
[5]. William F. Clocksin, and Christopher S. Mellish, ”Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003

List of Practical Assignments:

1.Write a program to implement Tic-Tac-Toe game problem.
2.Write a program to implement BFS (for 8 puzzle problem or Water Jug problem or any AI search problem) .
3.Write a program to implement DFS (for 8 puzzle problem or Water Jug problem or any AI search problem)
4.Write a program to implement Single Player Game (Using Heuristic Function)
5.Write a program to Implement A* Algorithm.
6.Write a program to solve N-Queens problem using Prolog.
7.Write a program to solve 8 puzzle problem using Prolog.
8.Write a program to solve travelling salesman problem using Prolog.
9.Write the Conceptual Dependency for following statements.
(a)John gives Mary a book
(b)John gave Mary the book yesterday

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR5E5	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
POWER ELECTRONICS	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To prepare the students to analyze & design different power converter circuits.
- To acquire knowledge about various application of power electronics.

Prerequisites: Basic Electronics

COURSE CONTENTS

UNIT-I

Static Power Devices

Power semiconductor diodes & transistors, Thyristors, Construction, Characteristics, Ratings, Protection, Heating, Cooling, Mounting, Turn on methods, Gate characteristics, Firing circuits of thyristor, Introduction to other members of thyristor family like PUT, SUS, SCS, DIAC, TRIAC.

UNIT-II

Converters

Thyristor commutation techniques, Phase controlled rectifiers, Principal of phase control, Full wave controlled converters, Single-phase full wave converters, Three-phase thyristor converter circuits, Basic principle & power circuit of Dual converter & AC voltage controller.

UNIT-III

DC to DC Converter

Choppers: Basic principal of chopper operation, Control strategies, Step-up chopper, Different types of chopper circuits, Thyristor chopper circuits, Performance analysis.

UNIT-IV

Inverter

Single-Phase voltage source inverters, Principal of operation, Fourier analysis of single-phase inverters, Force-commutated thyristor inverters, Current source inverters, Pulse-width Modulated Inverters.

UNIT-V:
Industrial application of Power Electronics, SMPS, UPS, static switches, circuit breakers, solid state relays, concept of Electric drive.

Learning Outcomes:

Upon Completing the Course, Student will able to:
- Design the Inverter, chopper, rectifiers for high voltage.
- Apply design concepts for industrial applications.

BOOKS RECOMMENDED:

[1] Muhammad H. Rashid, *Power Electronics Circuits, Devices & Applications,* 3/e. 2004, PHI
[2] Cyril W. Lander, *Power Electronics*, 3/e.1993, The McGraw-Hill
[3] Dr. P.S. Bimbhra, *Power Electronics,* 4/e. 2006, Khanna Publishers
[4] P.C. Sen, *Power Electronics,*
[5] Ned Mohan, *Power Electronics, Converters, Application & Design,* 2/e. 1995, John Wiley
[6] Joseph Vithayathil, *Power Electronics, Principles & Applications,* 6/e. 2010, McGraw Hill

List of Practical Assignments:

1. Study of SCR Characteristics
2. Study of DIAC Characteristics
3. Study of TRIAC Characteristics
4. Study of UJT Characteristics
5. Study of MOSFET Characteristics
6. Study of PUT Characteristics
7. Study of SCR Triggering Circuits
8. Study of Single Phase PWM Inverter
9. Study of Single Phase Controlled Rectifier
10. Study of Single Phase Cycloconverter
11. Study of Step-up Chopper
12. Study of Step-down Chopper
13. Study of SCR commutation Circuits
14. Study of Speed control of universal motor using SCR

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
STR5S5	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
PRINCIPLES OF MANAGEMENT	**2**	**0**	**0**	**2**	**0**	**0**	**2**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

1. To provide engineering students with an accelerated introduction to the basics of management and the language of business.
2. To provide a basis of understanding to the students with reference to working of Business Organizations through the process of Management.
3. To inculcate the managerial skills and to teach how it can be executed in a variety of circumstances.

COURSE CONTENTS

UNIT I – INTRODUCTION TO MANAGEMENT AND ORGANISATION

Basic concepts of management- definition, principles , levels and functions of management; Managerial roles and skills; Organization- meaning, types, business environment, efficiency and effectiveness.

UNIT II – PLANNING

Nature and purpose of planning - types of planning, planning process, forecasting; Objectives-setting objectives, types of objectives; Decision making.

UNIT III – ORGANISING AND STAFFING

Organization chart, Organization structures, departmentalization, span of control, delegation of authority- centralization and decentralization; Informal organization; process of Staffing.

UNIT IV – DIRECTING

Direction- meaning, process and components; motivation- theories of motivation; leadership-types and theories of leadership; communication- process, barriers and types.

UNIT V – CONTROLLING

Meaning and process of managerial control, techniques of control evaluation- budgetary and non-budgetary control techniques; Use of computers and IT in management control.

Learning Outcome:

At the end of the course, students should be able to do the following:

1. Identify the key management processes and the relevance of management in organizations.
2. Understand the key management skills required in organizations and how these might be applied.
3. Evaluate their own managerial skills and the ways in which these might be developed.

BOOKS RECOMMENDED:

[1]. R.D Agrawal, Organization & Management.1/E PHI 1997.

[2]. Tripathy PC And Reddy PN, Principles of Management, Tata McGraw-Hill, 5th Edition, 2012.

[3]. Dinkar Pagare, Principles of Management, Sultan Chand & Sons, 2000.

[4]. G.K.Vijayaraghavan and M.Sivakumar, Principles of Management, Lakshmi Publications, 5th Edition, 2009.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR5G3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
DIGITAL SIGNAL PROCESSING	**3**	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

To provide the analysis techniques like for discrete time systems analyze the discrete time systems in time and frequency domain using Z- Transform and Fourier transforms to learn the signal processing tool box of MATLAB for implementing the basic problems of DSP designing of digital filters.

Prerequisite(s): Awareness about the analysis of analog signals and systems and analog filter design.

COURSE OF CONTENTS

Unit-I

Introduction to signal processing , Discrete time signals and sequence operations , Discrete time systems properties ,Linear time invariant systems ,convolution ,properties of LTIV systems ,Inverse system .Frequency domain representation of discrete time signals and systems(DTFT), properties,Representation of sequences by Fourier transforms.

Unit-II

Introduction to Z- transforms , properties , Inverse Z – transform, ,block diagram representation of linear constant coefficient difference equation,Signal flow graph representation of LCCDE, Basic structures for IIR systems ,Basic structures for FIR systems. Representation of periodic sequences , the discrete Fourier series ,properties of DFS, Fourier transform of periodic signals, properties,circular convolution ,linear convolution using DFT, Implementing LTIV systems using DFT.

Unit-III

Efficient computation of DFT , Goertzel algorithm , decimation in time FFT algorithm, In place computation, alternative forms , decimation in frequency FFT algorithm , In place computation, alternative forms.

Unit IV

Filter design techniques ,Design of discrete time IIR filters from continuous time filters, filter design by impulse invariance , bilinear transformation ,design of FIR filters by windowing properties of commonly used windows.

Unit V

Introduction of DSP Processor.Types of Digital signal processors , Applications.

Learning Outcome:

At the end of the course, students should be able to do the following:

- Analyze discrete-time systems in both time & transform domain and also through pole-zero placement.
- Analyze discrete-time signals and systems using DFT and FFT.
- Design and implement digital finite impulse response (FIR) filters.
- Design and implement digital infinite impulse response (IIR) filters.
- Understand and develop multirate digital signal processing systems.

BOOKS RECOMMEDED

[1] Oppenheim and Schafer, Discrete time signal processin, 2/E PHI, 2005.
[2] Proakis and Manolakis, Discrete time signal processing, PHI, 2005.
[3] S. Mitra, Discrete time signal processing, Pearson Education.

Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**III Year B.E. (Electronics & Telecommunication Engg.)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR5L3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
SOFTWARE WORKSHOP	**-**	**-**	**2**	**-**	**-**	**2**	**2**
Only Practical examination will be held							

Learning Objective: To familiarize students about Java based application programs

Prerequisites: Basics of Java programming

COURSE CONTENTS

UNIT-I

Introduction to Object Oriented Programming, Java based application programs related to topics such as conditional statements, iteration statements with a focus on problems related to electronics and telecommunication.

UNIT-II

Introduction to string handling, Arrays, Java based application programs related to these topics with a focus on problems related to electronics and telecommunication.

UNIT-III

Introduction to Inheritance and Polymorphism, Java based application programs related to these topics with a focus on problems related to electronics and telecommunication.

UNIT-IV

Exception handling and Multi-threading, Java based application programs related to these topics with a focus on problems related to electronics and telecommunication.

UNIT-V

Java I/O, Applets and Event Handling, creating GUIs in AWT windows, Java based application programs related to these topics with a focus on problems related to electronics and telecommunication.

List of Practical Assignments:

1. Write a program that converts inches to centimeters.
2. Write a program in which the program gives output numbers 1 to 10 along with their square roots.
3. Write a program to find the average of five double numbers.
4. Write a program to determine the area of a sector of circle of radius r and angle subtended by the sector at the centre, a. The values of these variables are entered by the user.
5. Write a program that finds the greatest of 4 integer numbers using ternary operator. The number values are entered by the user of the program.
6. Write a program in which a sample of 8 random numbers is generated and an average value is determined by the user.
7. *Make a program which uses a for loop to calculate and display squares and cubes of numbers from1 to 8.*
8. Write a program that finds the greatest of 4 integer numbers using ternary operator. The number values are entered by the user of the program.
9. *Write a program in which a sample of 8 random numbers is generated and an average value is determined.*
10. Write a program in which a class is declared to deal with the chracteristics of regular polygons and declare methods for determining area and perimeter. The lenght of the side and number of sides are declared public.
11. Write a program in which a method is declared to determine volume of a box with lenght, width and height as variables. The arguments should be passed on by refernce.
12. Create a class Circle. Wrte a program to calculate:

    (i) circumCircle() - to compute the circumference of a circle.

    (ii) arcLenght – to compute the lenght of the arc for a given angle.
13. Within the main method of the class Circle, create an object of the class Circle. Compute Circle's circumference when the radius is 10 and arc lenght when the angle is 45.

14. Write a proMake an applet program to display strings in different colors.gram that declares an array of type double and finds out the square roots of the array elements.

15. *Write a program to demonstrate the multiplication of two matrices.*

16. *Write a program in which method overriding is implemented. The super class declares two instance variables i.e. radius and height, and define a method to determine the volume. The sub class determines the volume of cone and cylinder.*
17. *Make program to determine the trigonometric functions sin(), cos() and tan() by using methods of Math class for angles 30, 60, and 90 degrees.*

18. *Declare an interface with a method to calculate volume with one double parameter. Implement the same for finding volume of sphere and volume of a cube.*

19. *Make an applet program to display strings in different colors.*

Learning Outcomes:

Upon completing the course, Student would be able to:

- Write Java based application programs
- Learn to apply the concepts relating to various topics

BOOKS RECOMMENDED:

[1] Herbert Schildt, Java The complete reference, McGraw Hill Education private limited, 2013.

[2] Anita Seth, B.L.Juneja, Java One Step Ahead, Oxford University press, 2017.

[3] Timothy, Budd, Object Oriented Programming, 3/E Pearson Education, 2002.

[4] Cay S.Horstmann, Core Java, vol-1,8/E, Pearson Education, 2008.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Electronics & Telecommunication Engg.)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR6C1
VLSI DESIGN</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective: This course presents the fundamental of Digital CMOS VLSI design with different VLSI design methodologies and combinational, sequential and semiconductor memory circuit design. It also covers the limitations of CMOS in NANO technology with introduction to the NANO Technology

Prerequisites: Knowledge of Digital Circuit and Basics of Semiconductors is required.

COURSE CONTENTS

Unit I

VLSI design flow, VLSI design style, introduction to the basic fabrication processes (wafer preparation, oxidation, diffusion, etching, metallization and lithography, etc.), Fabrication process Flow: basic Steps, the CMOS n-well Process. Metal oxide semiconductor (MOS) structure, Types of MOSFET: Enhancement and Depletion. Structure and operation of MOS transistor.

Unit II

Threshold voltage equation and energy band diagram of MOSFET, controlling of threshold voltage, MOSFET current – Voltage Characteristics. Transconductance, Drain conduction. Aspect ratio, process parameters, second order effects, MOS small signal and Large signal model, MOS capacitances. Stick diagram rules for nMOS and CMOS technology, lambda based and micron based design rules. Layout design for CMOS inverter

Unit III

Analysis of different types of inverter circuit, CMOS inverter, transfer characteristic, calculation of propagation delay, rise time, fall time, noise margin and power dissipation for CMOS Inverter. Effect of threshold voltage and supply voltage on Delay and power dissipation. Limitations of CMOS in NANO scale circuit design.

Unit IV

CMOS logic**,** Complex Logic Circuits, pseudo NMOS logic, pass transistor logic, Transmission Gate logic and Dynamic logic circuit design. Designing of Combinational logic circuit using CMOS and analysis of various design parameters.

Unit V

Sequential MOS Logic circuits , SR Latched circuits, clocked latch and Flip Flop Circuits, CMOS D latch and Edge Triggered Flip Flop, Design of the Schmitt trigger circuit, Dynamic random access and Static random access memory cell design and analysis, Sense amplifier and row and column decoder circuit.

Learning Outcomes:

Upon completing the course, Student would be able to:

1.Understand the static and dynamic behavior of MOSFETs (Metal Oxide Semiconductor Field Effect Transistors) and the secondary effects of the MOS transistor model.
2.To be aware about the trends in semiconductor technology, and how it impacts scaling and its effect on device density, speed and power consumption.
3.To understand MOS transistor as a switch and its capacitance.
4.Student will be able to design digital systems using MOS circuits (Static and Switching characteristics of inverters)
5.Able to learn Layout, Stick diagrams, Fabrication steps.
6.Understand the concept behind ASIC (Application Specific Integrated Circuits) design and the different implementation approaches used in industry.

BOOKS RECOMMENDED:

[1]. Sung-mo Kang and Yusuf Leblebici, CMOS Digital Integrated Circuit analysis and Design, Tata McGraw-Hill, 3/e.
[2]. R. Jacob Baker, Harry W. Li and David E. Boyce, CMOS Circuit design, layout and Simulation, PHI,IEEE press, Series Edition,
[3]. Yuan Taur and Tak H. Ning, Fundamentals of Modern VLSI Devices, Cambridge university Press, Special Edition, 1998
[4]. Neil H.E. Weste and Kamran Esharhian, Principal of CMOS VLSI design, PHI, 2/e
[5]. Jan M. Rabaey, Digital Integrated Circuit, PHI, 2/e

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR6C2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
MOBILE AND WIRELESS COMMUNICATION	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives: The course contents are aimed to provide:

Evolution of mobile communication system from 1G to 5G.

Understanding of various transmission and reception techniques used in different mobile communication systems.

To know the importance of communication channel in performance of mobile communi-cation system.

Prerequisites: Knowledge of analog and digital communication systems.

COURSE CONTENTS

Unit – I

Introduction to Wireless Communication: Classification of different wireless communication networks, Transceiver techniques for Mobile wireless communication - Modulation, Channel Coding, Speech Coding, Spread spectrum Modulation, Multiple Access Techniques, Duplexing.

Unit – II

Channel Characterization: Characterizing Mobile-Radio Propagation, Large-Scale Fading, Path loss models, Small-Scale Fading, Types of small scale fading, fading parameters – Coherence time, coherence BW, Delay spread, Doppler spread. Models for Fading channel-Rayleigh Fading and Rician distribution for fading channel, Fading mitigation techniques - Equalization Techniques, Diversity Techniques, RAKE Receiver, OFDM.

Unit – III

Introduction to Cellular Mobile System: A basic cellular system, Performance criteria, Concept of frequency reuse channels, C/I ratio, cell splitting, sectoring, types of non co-channel interference, co-channel interference: measurement & reduction factor, Frequency management, Channel Assignment, Handoffs, Dropped call rate.

Unit – IV

GSM: System architecture, Air interfaces, Multiple access, Channel organization and framing structure, Call set-up procedure, Protocols and signaling, Authentication and security.

CDMA: CDMA Evolution, CDMA IS-95 systems - its forward and reverse links, PN sequence related to IS-95, Power control, Trans receiver techniques used in CDMA, call processing steps, Hand-off process.

Unit – V

Advanced Mobile Networks: Wireless Networks GPRS, EDGE, 3G-UMTS, Wi-max, WLAN, their architecture and working. Overview of IP and Mobile IP, Introduction to 4G & 5G systems.

Learning Outcomes:

Upon Completing the Course, Student will able to learn
(1) Various processes and their types involved in mobile communication system.
(2) Current and future Mobile communication standards and techniques used in standards.

BOOKS RECOMMENDED:

[1].S Misra, "Wireless Communications and Networks" 3G and Beyond, Second Edition, Mc Graw Hill, 2013.
[2].A F Molisch, Wireless communication, Second Edition, Wiley Publication, 2014.
[3].A Biswas, M Chaudhary, Wireless Communication, Theory and Applications, Cambridge University Press, First Edition, 2017.
[4].T.S.Rappaport, "Wireless Communications: Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint 2003.
[5].W.C.Y.Lee, "Mobile Communications Engineering: Theory and applications, Second Edition, McGraw-Hill International, 1998.

List of Practical Assignments:

Note: Assignments has to be performed using MATLAB.

Assignment I : Performance evaluation of Mobile communication system in presence of various digital modulation techniques.

(a) To evaluate the performance of MPSK for M=2,4,8,16 and their comparison study.
(b) To evaluate the performance of MFSK for M=2,4,8,16 and comparison study.
(c) Compare the performance of MSK & QPSK techniques.
(d) How will select a particular modulation technique for a particular application.

Assignment II : Performance evaluation of mobile communication system in presence of various error correcting codes .

(a) To evaluate the performance of Hamming code.
(b) To evaluate the performance of Convolution code.
(c) Performance comparison of these two codes.
(d) How will select a particular channel code for a particular application.

Assignment III : Performance evaluation of mobile communication system in presence of various communication channels.

(a) To evaluate the performance of AWGN channel.
(b) To evaluate the performance of Rayleigh channel.
(c) To evaluate the performance of Recian channel
(d) Performance comparison of different communication channels.
(e) What will be the impact of a communication channel on the performance of digital com-munication system.

Assignment IV : Performance evaluation of digital communication system in presence of various equalizers using.

(a) To evaluate the performance of linear equalizers.
(b) To evaluate the performance of adaptive equalizers.
(c) Performance comparison of different equalizers.
(d) What will be the impact of an equalizer on the performance of digital communication system.

Assignment V : Simulate a mobile communication system and evaluate its various performance measures.

Institute of Engineering & Technology				Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR6C3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
CONTROL SYSTEM	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives: To provide the fundamental knowledge of control system engineering and the concept of mathematical modeling of the physical system. The subject gives various classical analysis tools for design and stability of system in time and frequency domain.

Prerequisites: Knowledge of Laplace transforms, Z-transform, Basics of MATLAB & Simulink.

COURSE CONTENTS

UNIT-I: Introduction to the control system & Physical modeling

Basic component of control system (CS), open-loop CS (non-feedback system), close-loop CS (feedback CS), Types of feedback CS- linear and non-linear CS, time-invariant and time variant CS, single variable and multivariable control system.
Effect of feedback on-overall gain, stability, sensitivity, external disturbance or noise, Block diagram representation of CS, Block diagram reduction rules, Transfer function (TF), Poles-zero concept, Signal flow graph (SFG), Mason's gain formula.
Modeling of CS - electrical networks, mechanical systems-translational and rotational mechanical system, analogy concept- force to voltage (F-V) and force to current (F-I) analogy.

UNIT-II: Time domain analysis & Stability

Time response of continuous-data system, Standard test signals, Time response of prototype first and second order CS, Performance specifications of prototype I & II order systems, Steady-state errors and error constants (positional, velocity, acceleration), Effect of adding Poles and Zeroes to open-loop and close-loop transfer function (TF), Concept of Dominant poles of TF.
Types of controllers and their control action-proportional (P), integral (I), derivative (D), PID control, and derivative feedback control, MATLAB based problems.
Stability-Concept of stability, Necessary conditions for stability, Absolute and relative stability, Algebraic Criterion of stability- Routh Hurwitze Criterion. The Root locus concept, Guidelines for sketching Root-locus, Root contour.

UNIT-III: Stability and Frequency domain analysis of CS

Frequency domain analysis- Concept of complex frequency, performance specification of frequency domain, Co-relation between time & frequency domain, Polar plot, Bode plot, Stability analysis in frequency domain- Nyquist Criterion, Stability margins-Gain and Phase margin, MATLAB Based Problems.

UNIT-IV: Design of Feedback CS & State Space Analysis of CS

Approach to system design, Preliminary considerations classical design, Realization of basic Compensators-Lead, Lag, and Lag-lead compensator, Design of compensators in Time and Frequency domain.
Concept of State, State Variable, and State Model, State model representation of an LTI system, co-relation between State Model and TF, Solution of State Equations, Transfer Matrix, Concept of Controllability & Observability, MATLAB based problems.

UNIT-V Digital Control Systems

Block diagram representation of Digital Control System, Sampling process, Mathematical analysis of sampling process, Reconstruction of sampled signal, Pulse Transfer Function, Zero-order and first order hold circuit, Mapping of s-plane to z-plane.

Learning Outcomes:

Upon Completing the Course, Student will able to:

- Understand the concept of LTI control systems, Importance of feedback in CS and stabil-ity concept.
- Able to Design a Stable Control System
- Understand the difference between Linear and Digital Control Systems.

BOOKS RECOMMENDED:

[1] B.C. Kuo, Automatic Control System, 7/E, PHI, 2006.
[2] I. J. Nagrath and M. Gopal, Control Systems Engineering, 5/E, New Age International Publishers, 2007.
[3] M. Gopal, Control Systems (Principles & Design), 5/E, Tata McGraw Hill, 2007.
[4] Bishop & Dorf, *Modern Control System,* Addision Welseley.
[5] Ogata, Discrete-Time Control System, 2/e, PHI, 1995.

List of Practical Assignments:

1. Find the transfer function of various LTI control systems (open loop and close loop) us-ing MATLAB command.
2. Write a program to plot the poles and zeroes for the different sets of transfer function us-ing MATLAB.
3. Write a program to plot the time response of first and second order control system on im-pulse, unit-step, ramp and parabolic input signals using MATLAB. Also find the value of various transient response parameters.
4. To determine the position, velocity and acceleration error coefficient of given transfer functions using MATLAB.
5. Plot the root locus for various transfer functions using MATLAB command.
6. Plot the Nyquist plot for the given transfer function using MATLAB. Also comment on the systems stability.
7. Plot the Bode plot for the transfer function given below by using MATLAB.

$$G(s)H(s) = \frac{2(s+0.25)}{s^2 (s+1) (s+0.5)}$$

Also find (a) Phase cross over frequency (b) Gain cross over frequency (c) Gain margin (d) Phase margin.

Subject Code & Name	Instructions Hours per Week			Credits			
ETR6E1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
LINEAR INTEGRATED CIRCUITS	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objective: In-depth knowledge of Operational Amplifier including its circuit analysis, design and application.

Prerequisite: Analysis using R-parameter and feedback concept.

COURSE CONTENTS

UNIT I

Operational Amplifier Fundamentals: Amplifier Fundamentals, The Operational Amplifier ,Basic Op Amp Configurations, Ideal and practical Op Amp Circuit Analysis and characteristics ,Positive and Negative Feedback , Feedback in Op Amp Circuits , The Return Ratio and Blackman's Formula , Op Amp Powering. Circuits with Resistive Feedback: Current-to-Voltage Converters, Voltage-to-Current Converters, Current Amplifiers, Difference Amplifiers, Instrumentation Amplifiers, Instrumentation Applications, Transducer Bridge Amplifiers. CMRR, offset error voltage and current.

UNIT II

Active filters I: The Transfer Function, First-Order Active Filters, Standard Second-Order Responses, *KRC* Filters, Multiple-Feedback Filters, State-Variable and Biquad Filters, Sensitivity.Active filters II: Filter Approximations, Cascade Design, Generalized Impedance Converters,Direct Design, The Switched Capacitor, Switched-Capacitor Filters, and Universal SC Filters

UNIT III

Static Op Amp Limitation: Simplified Op Amp Circuit Diagrams, Input Bias and Offset Currents, Low-Input-Bias-Current Op Amps, Input Offset Voltage, Low-Input-Offset-Voltage Op Amps, Input Offset Error and Compensation Techniques, Input Voltage Range/Output Voltage Swing, Maximum Ratings. Dynamic Op Amp limitation: Open-Loop Frequency Response, Closed-Loop Frequency Response, Input and Output Impedances, Transient Response,Effect of Finite GBP on Integrator Circuits, Effect of Finite GBP on Filters, Current-Feedback Amplifiers.

UNIT IV

Stability: The Stability Problem, Phase and Gain Margin Measurements, Frequency Compensation of Op Amps, Op Amps Circuits with a Feedback Pole, Input-Lag and Feedback-Lead Compensation, Stability in CFA Circuits.

UNIT V

Designing- Adder, Subtractor, Integrator, Differentiator, Voltage follower, Comparator, Zero Crossing detector, Schmitt trigger, Peak Detector. Signal Generator: Sin wave generator, multivibrators, triangular and saw tooth wave generator, Log/Antilog amplifiers.

Learning Outcome:

After learning the course the students should be able to:

Understand op-amp’s basic construction, characteristics, parameter limitations, various configurations and other applications of op-amp.
Analyze and deign basic op-amp circuits, particularly various linear and non-linear circuits, active filters, signal generators, and data converters

BOOKS RECOMMENDED:

[1] Millman & Halkias - Integrated Electronics, Tata McGraw Hill.
[2] Franco-Design with Operational Amplifiers & Analog Integrated Circuits, TMH
[3] Schilling & Belove-Electronic Circuit, Discrete & Integrated , TMH
[4] Gayakwad R.A- Op-Amps and Linear IC’s, Pearson .
[5] Coughlin and Driscoll – Operational Amplifier and Linear Integrated Circuits – Pearson Education Asia.

List of Practical Assignments:

1) To measure the gain of inverting & non-inverting amplifier.
2) To analyze the voltage transfer characteristics of op-amp.
3) To study the inverting adder & subtractor configuration of op-amp.
4) To study the non- inverting adder & subtractor configuration of op-amp.
5) To study the differentiator configuration of op-amp.
6) To study the integrator configuration of op-amp.
7) To study the low pass & high pass filter.
8) To study the band pass & band reject filter.
9) To study the zero crossing detector.
10) To analyze the performance of comparator.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Electronics and Telecommunication)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>ETR6E2</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>MULTIMEDIA COMMUNICATION</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective: This course introduces fundamental technologies for video communications and networking. It will address 1) how to efficiently represent and process video signals, and 2) how to deliver video signals over networks.

Prerequisite: Computer Networks and D.S.P

COURSE CONTENTS

UNIT-I

Introduction to Multimedia What is multimedia, multimedia and hypermedia, Graphics and Image representation, Graphics/Image data types, popular file formats Fundamental concepts in Video. Types of video signals, Analog Video, Digital Video, Basics of Digital Audio, Digitization of Sound, MIDI, Quantization and transmission of audio.

UNIT-II

Lossless compression Algorithms : Run length coding, variable length coding, Dictionary based coding, Arithmetic coding, lossless image compression

UNIT-III

Lossy compression algorithm: Introduction, distortion measures, rate distortion theory, quantization, transform coding, Wavelet based coding, embedded zero tree wavelet coefficients, SPIHT

UNIT-IV

Image compression standards: The JPEG standard, JPEG 2000standard, JPEG LS standard, JBIG **UNIT-V**

MPEG Video Coding : Basic video compression techniques---H.261,MPEG-1, MPEG-2,MPEG-4, Video transport over the Internet and wireless networks

Learning Outcomes:

At the end of the course, the students would

understand the basics of analog and digital video: video representation and transmission analyze analog and digital video signals and systems
know the fundamental video processing techniques
acquire the basic skill of designing video compression
familiarize himself/herself with video compression standards
know the basic techniques in designing video transmission systems: error control and rate control

BOOKS RECOMMENDED:

[1]. D. Taubman and M. Marcellin, "JPEG2000: Image Compression Fundamentals, Standards, and Practice," Kluwer, 2001.
[2]. Iain E G Richardson, "H.264 and MPEG-4 Video Compression," John Wiley & Sons, September 2003
[3]. M. E. Al-Mualla, C. N. Canagarajah and D. R. Bull, "Video Coding for Mobile Communications: Efficiency, Complexity and Resilience", Elsevier Science, Academic Press, 2002.
[4]. A. Murat Tekalp, "Digital Video Processing," Prentice Hall, Englewood Cliffs, NJ, 1995.
[5]. Khalid Sayood, "Introduction to Data Compression," 2nd ed., Morgan Kaufmann, 2000.
[6]. Jerry Gibson, Toby Berger, Tom Lookabaugh, Rich Baker and David Lindbergh, "Digital Compression for Multimedia: Principles & Standards," Morgan Kaufmann, 1998.
[7]. A. N. Netravali and B. G. Haskell, "Digital Pictures – Representation, Compression and Standards," 2nd ed. Plenum Press, 1995.

List of Practical Assignments:

Practical based on Audio and Vision System Toolbox of MATLAB:

Computer Vision System Toolbox™ provides algorithms and tools for video processing workflows. Read and write from common video formats, perform common video processing algorithms such as deinterlacing and chroma-resampling, and display results with text and graphics burnt in to the video. Video processing in MATLAB® uses System objects, which avoids excessive memory use by streaming data to and from video files.

Audio System Toolbox™ provides algorithms and tools for the design, simulation, and desktop prototyping of audio processing systems. It enables low-latency signal streaming from and to audio interfaces, interactive parameter tuning, and automatic generation of audio plugins for digital audio workstations.Audio System Toolbox includes libraries of audio processing algorithms (such as filtering, equalization, dynamic range control, and reverberation), sources (such as audio oscillators and wavetable synthesizers), and measurements (such as A- and C-weighting). Interfaces to external MIDI controls and low-latency audio drivers such as ASIO, ALSA, and CoreAudio enable to validate multichannel audio designs in MATLAB® or Simulink®.

Institute of Engineering & Technology				Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR6E3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
SOFT COMPUTING TECHNIQUES	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives: To provides an understandable approach to Soft Computing based methods for problem solving by combining different methods of AI, fuzzy systems, and neural networks

Prerequisite: Overview of Artificial Intelligence and Digital systems

COURSE CONTENTS

Unit -I

Fuzzy Set Theory and Fuzzy Relations:

Classical Sets and Fuzzy Sets, Classical Set. Operations on Classical Sets, Properties of Classical Sets, Mapping of Classical Sets to a Function, Fuzzy Sets , Fuzzy Set Operations, Properties of Fuzzy Sets, Classical and Fuzzy Relations**,** Cartesian Product of Classical Relations , Fuzzy Relations, Tolerance and Equivalence Relations, Fuzzy Numbers, Fuzzy Arithmetic, Alpha cut, MATLAB based Exercises.

Unit – II

Introduction to Fuzzy Inference System:

Membership Functions**,**Introduction, Features of Membership Function, Classification of Fuzzy Sets ,Fuzzification, Membership Value Assignments, Defuzzification**,** Lambda Cuts for Fuzzy Sets, Lambda Cuts for Fuzzy Relations, Defuzzification Methods , Fuzzy Rule-Based System**,** Formation of Rules ,Decomposition of Rules, Aggregation of Fuzzy Rules, Properties of Set of Rules,Fuzzy Inference System, Fuzzy Inference Methods, Mamdani's Fuzzy Inference Method,Takagi–Sugeno Fuzzy Method (TS Method) , MATLAB based problems.

Unit-III

Neural Networks and Perceptron model

Introduction to Neural Network. Models of a Neuron. Network Architectures. Learning Processes. Supervised and Unsupervised Learning, Perceptron. Back-Propagation Algorithm. XOR Problem. Generalization. Approximations of Functions. Self-Organizing Map algorithm. Learning Vector Quantization, MATLAB based problems.

Unit-IV

Fuzzy Neural Networks

Integration of fuzzy logic and neural networks ,Fuzzy Hybrid neural, Computation of fuzzy logic inferences by hybrid neural net, Tuning fuzzy control parameters by neural nets, Fuzzy rule extraction from numerical data, Neuro-fuzzy classifiers, ANFIS, Applications of fuzzy neural systems, MATLAB based problems

Unit V
Genetic Algorithms
Introduction, Structure of Evolutionary Algorithms, Components of Evolutionary Algorithms, Representation, Evaluation/Fitness Function, Population Initialization, Selection, Recombination, Mutation, Reinsertion, Multi-objective Evolutionary Algorithms, and MATLAB based problems

Learning Outcomes:

At the end of this course, students will be able to:

- Identify and describe soft computing techniques and their roles in building intelligent machines
- Recognize the feasibility of applying a soft computing methodology for a particular problem
- Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems Apply genetic algorithms to combinatorial optimization problems
- Apply neural networks to pattern classification and regression problems
- Effectively use existing software tools to solve real problems using a soft computing approach
- Evaluate and compare solutions by various soft computing approaches for a given problem.

BOOKS RECOMMENDED:

[1] S. Haykin, “Neural Networks: A Comprehensive Foundation”, Prentice Hall, 1999.
[2] G J Klir and T A Folger, "Fuzzy sets, uncertainty, and information", Prentice-Hall, 1992.
[3] D. Driankov, H. Hellendoorn and M Reinfrank, "An introduction to fuzzy control", Springer-Verlag, 1993.
[4] G J Klir and B Yuan, "Fuzzy Sets and Fuzzy Logic - Theory and Applications", Prentice-Hall, 1995.
[5] C. Bishop, “Neural Networks for Pattern Recognition”, Oxford University Press, 1995.

List of Practical Assignments:

1. Write A Program For Implementing Linear Saturating Function.
2. Study And Analysis Of Art Model.
3. Write A Program For Error Back Propagation Algorithm (Ebpa) Learning.
4. Study And Analysis Of CPN
5. Study And Analysis Of Genetic Algorithm Life Cycle.
6. Study And Analysis Of Fuzzy Vs Crisp Logic.
7. Write A Program Of Perceptron Training Algorithm.
8. Write A Program To Implement Hebb’s Rule
9. Write A Program To Implement Of Delta Rule
10. Write A Program For Back Propagation Algorithm
11. Write A Program To Implement Logic Gates

Subject Code & Name	Instructions Hours per Week			Credits			
ETR6E4	L	T	P	L	T	P	Total
INDUSTRIAL AND MEDICAL ELECTRONICS	3	1	2	3	1	1	5
Duration of Theory Paper: 3 Hours							

Learning Objective: To understand the application of Electronics in Medical Science & Industrial applications.

Prerequisite: Electrical Engg, Basic Electronics, Applied Chemistry and Physics

COURSE CONTENTS

Unit-I

Basic concept of Sensors and transducer, Transducers used for measurement of Displacement-resistive, inductive and capacitive method, Linear and Angular Velocity, Acceleration- seismic and peizoelectric accelerometer, Capacitive Transducer, Piezo-Electric Transducer, and LVDT, strain measurement technique, resistance strain gauge and its types, Signal conditioning of strain gauges.

Unit-II

Transducers for Temperature Measurement- Resistance Thermometer like RTD, Thermistor and Thermocouple, Radiation and Optical Pyrometer.

Transducers for Measurement of Pressure: **-** Manometers types, Elastic Types transducers, Low Pressure measurement gauges.

Unit-III

Transducers for Measurement of Flow: - Types of flow meters, variable head constant area meter and its types, constant head variable area meter and its types, variable head variable area meter and its types,

Transducer for Level Measurement: - Resistive method, Ultrasonic, Capacitive and Gamma Ray level Gauges.

UNIT-IV

Sources of biomedical signals, Medical instrumentation system, General constraints in design of medical instrumentation system, Origin & types of bioelectric signals, Electrodes used for ECG, EEG, EMG, Biomedical recorders: ECG, EEG, EMG, PCG, VCG, Lasers used in medical field, Bedside patient monitoring system, Biomedical telemetry & Telemedicine.

UNIT-V

X-ray machine & Digital radiography, Principles & system components of Computed-Tomography, Magnetic Resonance Imaging: Principles of NMR, Ultrasonic & Thermal imaging systems, Cardiac pacemaker, Artificial kidney, Dialyzers, Haemodialysis machine, Lithotriptor system, Introduction to Defibrillators, Mechanics of Respiration, Artificial ventilation, Types of ventilators.

Learning Outcome:

Upon Completing the Course, Student will able to:

Understand the various sources of bioelectric signals & their processing.
Describe the fundamentals of various recording & diagnostic instruments.
Study & understand the fundamentals of medical & laboratory instrumentation. Understanding of various Industrial transducers.

BOOKS RECOMMENDED:

[1] A.K.Sawhney & Puneet Sawhney, A Course in Mechanical Measurements and Instrumentation, 12/e, Dhanpat Rai & Co. (P) Ltd., 2004
[2] B.C.Nakra & K.K.Chaudhary, Instrumentation Measurement and Analysis, 2/e, TATA McGraw-Hill Publishing Company Ltd, New Delhi., 2003
[3] D.Patranabis, Principles of Industrial Instrumentation, 2/e, Tata McGraw-Hill Publishing Company Ltd, New Delhi., 1998
[4] R.S.Khandpur, Handbook of Biomedical Instrumentation, 2/e, Tata McGraw-Hill, 2007
[5] John G. Webster, Medical Instrumentation, 4/e, Wiley, 2015

List of Practical Assignments:

1. Study of ECG Simulator for understanding the ECG signal & its generation process.
2. Using ECG Amplifier & CRO measure the amplitude, frequency & nature of ECG signal.
3. Study of EEG Simulator for understanding the EEG signal & its generation process.
4. Using EEG Amplifier & CRO measure the amplitude, frequency & nature of EEG signal.
5. Study of EMG Simulator for understanding the EMG signal & its generation process.
6. Using EMG Amplifier & CRO measure the amplitude, frequency & nature of EMG sig-nal.
7. Study of Heart & Pacemaker.
8. Study of Defibrillator system.
9. Study of Respiratory system.
10. Experimental study of ph meter & UV-Spectrophotometer.
11. Study of various Temperature sensors.
12. Study of various Pressure sensors

13. Study of various Flow sensors
14. Study of various level sensors
15. Study of various displacement sensors

Institute of Engineering & Technology				Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR6E5	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
MODELING AND SIMULATION	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

To give exposure of stochastic processes and to show their importance in engineering education and research

To develop skills to identify a process, its inputs and outputs. Then to develop a model and quantify the results.

To give an hands on experience in MATLAB to be used as a simulation tool for the stochastic processes

To develop an orientation towards research in electronics and computer engineering.

Prerequisites: Fundamental knowledge of Probability Theory

COURSE CONTENTS

UNIT –I

Introduction to Probability Theory -Relative Frequency and Classical Definitions, Sample Space and Events, Conditional Probabilities, Independent Events, Bayes Formula, Bernoulli Trials.

UNIT –II

Random Variables- Definition, Discrete Random Variables, Probability mass Function , Distrribution Functions: Bernoulipmf, Bionomialpmf, Geometric pmf, Poisson pmf, ContinuousRandom Variables, Cumulative Distribution Function(CDF), Probability Density Function (PDF), Exponential Distribution, Reliability and failure rate, Normal Distribution, Uniform Distribution. Mean, Variance and Moments of Random Variables, Function of a Random Variable and it's Expectation, Jointly Distributed Random Variable.

UNIT –III

Markov Chains - Classification of stochastic process, Introductionto Markov chains, Classification of States, Transition Probabilities, Limiting State Probabilities, HigherTransition Probabilities, Concept of Transient States and Absorption Probabilities, Solution of Problems Based on Markov Chains.

UNIT –IV

Markov Processes -Introduction to Continues Time Markov Chains, Birthand Death Processes, The Transition Probability Function, Limiting Probabilities, Exponential Distribution & Poison Process. Solution of Problems Based on Continuous Time Markov Chains, Introduction to Queuing Theory and M/M/1 Queuing Systems.

UNIT –V

Simulation- Simulation of Queues, Statistical Inference and FewExamples on Simulation Estimation of Mean and Variance, Confidence Interval, Regression and Correlation analysis

Learning Outcomes:

Upon Completing the Course, Student will able to:

Describe basic characteristics of systems, and illustrate these descriptions using simple examples.

Distinguish between modelling methods that are suitable for continuous-time, discrete-time, discrete-event, and hybrid systems, and apply these methods to simple systems.

Build performance metrics into a system model and interrogate these metrics to appraise the performance of different system configurations or designs.

Use industry-relevant simulation tools to model the performance of semi-realistic case study systems.

Organise a modelling and simulation workflow, and apply a workflow to address performance questions related to a system.

BOOKS RECOMMENDED:

[1]. S.M. Ross, “Introduction to Probability Models, 9th Edition, Elsevier Publication”, 2007.

[2]. K.S.Trivedi, “Probability and Statistics with Reliability, Queuing and Computer Sci-ence Applications”, 2nd Edition , A Wiley-Interscience Publication.

[3]. Averill M. Law,W. David Kelton, “Simulation Modeling and Analysis”, 3rd Edition, Tata McGraw-Hill Publication.

[4]. A Papoulis, S.VPillai, “Probability Random Variables and Stochastic Processes”, 4th Edition, TMH Publication, 2002.

List of Practical Assignments:

To become familiar with the MATLAB and Simulink environments.

To learn to construct state space, transfer function and block diagram models of dynamical systems and to simulate these models in MATLAB and Simulink.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
STR6S6	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
ENTERPRENEURSHIP AND IPR DEVELOPMENT	**2**	**0**	**0**	**2**	**0**	**0**	**2**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

1. To provide awareness about entrepreneurship.
2. To develop the skills of entrepreneurship & to encourage the students to become an entre-preneur.
3. To self motivate the students by making aware of different opportunities and successful growth stories
4. To impart the basics of Intellectual property Rights.

COURSE CONTENTS

UNIT I

Introduction to Entrepreneurship: Entrepreneurship- Concept, Nature, Functions and Importance; Entrepreneurs- Characteristics, Types and Motivation; Entrepreneurial process; Enterprise- Definition and Classification (MSME- Micro, Small & Medium Enterprises).

Case Study: Success and Failure stories of entrepreneurs and discussing their characteristics and reasons for success/failure.

UNIT II

Entrepreneurial Journey: Creativity and Innovation, Recognizing opportunities and Generating ideas, Feasibility analysis, Industry and Competitor analysis, developing effective business model.

Class Activity: Idea generation by students.

UNIT III

Business Plan for New Ventures in Respective Industry: Project Identification, Market Survey, Production plan, Operational plan, Marketing plan, Organizational plan and financial plan; writing a business plan.

Class Activity: Students asked to finalize on their ideas and start writing business plans

UNIT IV

Institutional Support to Entrepreneurs: Need for Institutional support different Government & Non Government institutions to support Entrepreneurs like, NSIC, SIDO, SSIB, SSIDC, SISIs , DTICs, industrial Estates, Specialized Institutions.

UNIT V

Intellectual Property Rights: Introduction of IPR, General Provisions & Basic principles of IPR, various perspective of IPR like Innovation & Creation, Innovators & Creators; Patents, Copyrights and Trademarks.

Learning Outcomes:

At the end of the course, students should be able to do the following:

1. Learn how to start an enterprise and design business plans those are suitable for funding by considering all dimensions of business.
2. Understand entrepreneurial process by way of studying different cases and performing class activities.

BOOKS RECOMMENDED:

[1]. Robert D. Hisrich, Mathew J. Manimala, Michael P Peters and Dean A. Shepherd, “En-trepreneurship”, 9th Edition, Tata Mc-graw Hill Publishing Co.ltd.-new Delhi, 2014.

[2]. Bruce R. Barringer and R. Duane Ireland, “Entrepreneurship”, 4th Edition, Pearson Pub-lications, New Delhi, 2011.

[3]. N.K. Acharya, *Text book on intellectual Property Rights*, Asha Law House New Delhi, New Edition, 2001.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR6G4	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
COMPUTER NETWORKS	**3**	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives: The content covers the different types of computer networks, the layered approach of protocol stack, its advantage, and protocols of each layer.

Prerequisite(s): Fundamental knowledge of data transmission

COURSE OF CONTENTS

Unit I
Computer network – Hardware, Software, Reference model, physical layer
Network and application, categories of network-LAN, MAN, WAN, Wireless Network, Internetwork, Reference models.– OSI,TCP/IP model and their comparison, Line configuration-point to point, multicast ,broadcast ,Network Topology – Mesh , Star ,Tree , Bus , Ring , Hybrid Physical Layer – Shannon's maximum data rate of a channel, Transmission media – Guided as Magnetic, Twisted Pair, coaxial cable, fiber optics etc., wireless as radio wave, microwave, infrared

Unit II
Data Link Layer
Framing techniques , Error detection-correction , Multiplexing-TDM ,FDM,WDM ; switching – circuit , message , packet switching , Repeaters, Hubs , Bridges ,switches ,routers and gateways ;Data link protocols -- unrestricted simplex protocol, stop & wait , sliding window ,Go-back- n ,selective repeat, data link layer in internet

Unit III
Medium Access control sublayer
Channel allocation, Multiple access protocols – ALOHA, CSMA, CSMA /CD, collision-free protocol
Ethernet- frame format, cabling, encoding, performance, fast Ethernet, gigabit Ethernet, Broadband and wireless LAN, Bluetooth

Unit IV

Network layer

Connectionless – connection oriented service, comparison of virtual circuit and datagram subnet, Routing algorithms- shortest path , flooding ,distance vector , hierarchical routing , congestion control and prevention ,Quality of service , network layer in internet- IP protocol and IP address, IPv6, OSPF, BGP routing protocol

Unit V

Transport layer and Application layer

Elements of transport protocol, internet transport protocol-UDP / TCP protocol, performance issues-Network performance measurement, system design for better performance Domain name system, email, world wide web- architecture, HTTP

Learning Outcome:

After completing this course the student must demonstrate the knowledge and ability to:

1. Independently understand basic computer network technology.
2. Understand and explain Data Communications System and its components.
3. Identify the different types of network topologies and protocols.
4. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
5. Identify the different types of network devices and their functions within a network
6. Understand and building the skills of subnetting and routing mechanisms.
7. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

BOOKS RECOMMEDED

[1] Andrew S. Tannenbaum, Computer Networks, 4/E Pearson Education, 2003 ,
[2] William Stallings ,Data and Computer Communications , 8/E Prentice Hall India, 2007
[3] Behrouz A.Forouzan , Data Communications and Networking ,4/E Tata McGraw-Hill, 2000

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics & Telecommunication Engg.)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR6L4	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
DESIGN WORKSHOP	-	-	2	-	-	2	2
Only Practical examination will be held							

Learning Objective: To enable student to design and Simulate circuit on Circuit simulation software and generate PCB layout. Fabrication of PCB for the generated circuit.

Prerequisites: Basic and Digital Electronics

COURSE CONTENTS

Perform any three Problems for Module 1 and 2 each. Design and Simulate on Circuit simulation software and generate PCB layout. Fabricate PCB for the generated circuit by obtaining bill of material.

MODULE 1 - DIGITAL ELECTRONICS

Q.1 Design a 3 bit counter which counts in the sequence
: 001, 011, 010, 110, 111, 101, 001, ...
(a) Use clocked D flip-flops
(b) Use J-K flip-flop

Q.2 Design and Implement a 8-bit barrel shifter using 4 X 1 Multiplexers.

Q.3 Design a one-input, one-output serial 2's complementer. The circuit accepts a string of bits from the input and generates the 2's complement at the output. The circuit can be reset asynchronously to start and end the operation.

Q.4 Design a four-bit shift register with parallel load using D flip-flops. There are two control inputs: shift and load. When shift = 1, the content of the register is shifted by one position. New data are transferred into the register when load = 1 and shift= 0. If both control inputs are equal to 0, the content of the register does not change.

Q.5 Design a 16-bit Magnitude comparator using IC 7485 (4-bit Magnitude comparator).

Q.6 Design a hardware stack to hold a maximum of four values, each consisting of one bit. The stack has the following input lines:

Clock

POP

PUSH
input data
and a single output line. The output line always reports the current top of the stack. (Recall that a stack pushes data onto the top of the stack, and pops data from the top of the stack. In other words, last in, first out. If more than four values are pushed on, older values are discarded.)
You may use AND, OR, XOR, and NOT gates, etc; flip-flops of any kind; and/or decoders, multiplexers, etc.

MODULE 2 - ANALOG ELECTRONICS

Q.1 Design a common- emitter amplifier with output impedance 10KΩ and a gain of 100 using a transistor of β=200 and a 24V power supply.

Q.2 Design a two stage RC coupled BJT amplifier to meet the following specifications.
Av ≥ 5000, Sico ≤ 10,Fl = 20Hz, *Vo*=2*Vo*, Vcc = 15V.
Calaulate Av, Ri and Ro of designed circuit.

Q.3 Design a cascode amplifier stage using bipolar transistors to drive a load resistor of 100 Ω. The amplifier output is to be time varying signal of ±600mV. The overall performance of the amplifier is specified as:
- Operating current for cascade stage collectors = 1,2mA
- Overall gain = -30
- DC power supply +15V

Q. 4 Design the basic BJT differential amplifier to provide a differential input resistance of at and a differential voltage gain of 100 V/V. The transistor β is specified to be at least 100. The available positive power supply is 5V.

Q.5 Design a CMOS cascode amplifier with the following specifications:
DC gain = 2500
Gain-Bandwidth product = 100MHz.
Load capacitance = 1 pF

Q.6 Design a saw tooth generator using a 555 timer having a pulse duration of 10 sec and peak voltage of 5V.

Learning Outcomes:

Upon completing the course, Student would be able to:
Design basic Analog and Digital circuit, PCB layput and use of EDA tool.

BOOKS RECOMMENDED:

[1].Bob Dobkin ,"Analog Circuit Design: A Tutorial Guide to Applications and Solutions", Newnes Publications,2011.
[2]. Nihal Kulratna,"Electronic Circuit Design: From Concept to Implementation",CRC Press,2008.

DEVI AHILYA VISHWAVIDYALAYA, INDORE

FACULTY OF ENGINEERING

SCHEME OF EXAMINATION
&
COURSE OF CONTENTS

B.E IV Year Programme (CBCS)
(ELECTRONICS & TELECOMMUNICATION ENGINEERING)

INSTITUTE OF ENGINEERING & TECHNOLOGY
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DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

SCHEMES OF EXAMINATION FOR B.E PROGRAMME

B. E. IV YEAR ELECTRONICS & TELECOMMUNICATION ENGINEERING (CBCS) L -Lecture, T – Tutorial, P – Practical, PC-Programme core, PE-Programme Elective, CBCS-Choice based credit system

Semester-VII

S.No	Subject code	Subject Name	Type	L-T-P	Credits
1	ETR7C1	PROJECT PHASE-I	PC	0-0-7	7
2	ETR7C2	OPERATING SYSTEM	PC	3-1-0	4
3	ETR7C3	ANTENNA AND WAVE PROPOGATION	PC	3-1-1	4+1(P)
4	ETR7C4	RF AND MICROWAVE ENGG.	PC	3-1-1	4+1(P)
PROGRAMME ELECTIVE (ANY ONE FROM LIST GIVEN BELOW)					
5	ETR7E1	CIRCUIT DESIGN USING HDL	PE	3-1-1	4+1(P)
	ETR7E2	WIRELESS ADHOC AND SENSOR NETWORKS			
	ETR7E3	EMBEDDED SYSTEM			
	ETR7E4	INDUSTRIAL COMMUNICATION			
	ETR7E5	SPEECH AND IMAGE PROCESSING			
8	ETR7V7	COMREHENSIVE VIVA -VII	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

Semester-VIII (For Students not opting for Internship)

S.No	Subject code	Subject Name	Type	L-T-P	Credits
1	ETR8P2	PROJECT PHASE-II	PC	0-0-7	7
2	ETR8C1	TELECOM NETWORKS	PC	3-1-0	4
3	ETR8C2	OPTICAL COMMUNICATION	PC	3-1-1	4+1(P)
4	ETR8C3	SATELLITE AND NAVIGATION SYSTEM	PC	3-1-1	4+1(P)
PROGRAMME ELECTIVE (ANY ONE FROM LIST GIVEN BELOW)					
4	ETR8E1	INTERNET OF THINGS	PE	3-1-1	4+1(P)
	ETR8E2	NETWORK SECURITY			
	ETR8E3	ELECTROMAGNETIC INTERFERENCE AND ELECTROMAGNETIC COMPATIBILITY			
	ETR8E4	DBMS AND DATA ANALYTICS			
	ETR8E5	MACHINE LEARNING			
8	ETR8V8	COMPREHENSIVE VIVA	VIRTUAL	0-0-4	4
TOTAL **CREDITS**					**30**

Semester-VIII (For Students opting for Internship)

S.No	Subject code	Subject Name	Type	L-T-P	Credits
1	ETR8CI1	INTERNSHIP	PC	0-0-20	20
Two Elective courses to be chosen from SVAYAM-NPTEL (Shortlisted by Departmental Committee)					
3	ETR8G1		PE	3-0-0	3
4	ETR8G2		PE	3-0-0	3
5	ETR8VI	COMPREHENSIVE VIVA	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**IV Year B.E. (Electronics & Telecommunication Engg.)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR7C1 **PROJECT PHASE-I**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	0	**0**	**14**	**0**	**0**	**7**	**7**

Learning Objective: To provide a comprehensive hands on experience to the students about the development of a complete project starting from analysis to testing. The students can also take a research project for innovating a new idea and its implementation.

Prerequisites: Electronics and Computer related subjects till III year.

COURSE CONTENTS

The major emphasis (but not limited to) shall be given on Microcontroller, Microprocessors, Analog and Digital Electronics/Communication ,VLSI and VHDL etc these are practice oriented areas of interest. The students shall be making the system, application or simulation packages depending upon the idea, technology chosen and expertise available. The architectural issues shall be important while the exposure to the technology needs to be gained by the students through thorough practice.

The students (in a batch) shall be required to be continuous interaction with the guide for the advice, guidance and facilities periodically and show the progress. They shall also be taking a certificate in the diary for satisfactory remarks or comments. Batch size shall be decided as per need and the quantum of the project.

The students shall make presentation and submit an originally drafted project reports periodically and at the end of the semester.

Learning Outcomes:

Upon completing the course, Student would be able to:

- Work in a team
- Develop small working projects through designing, analysis and testing of model
- Able to give presentation on the project developed

BOOKS RECOMMENDED:

[1] Reference books and web links of the relevant material the must be consulted as advised by the guide.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR7C2 **OPERATING SYSTEM**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**0**	**3**	**1**	**0**	**4**

Learning Objectives:

The course contents are aimed to provide:

Students will learn how Operating System is Important for Computer System.

To make aware of different types of Operating System and their services.

To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.

To know virtual memory concepts.

To learn secondary memory management

Prerequisites: Basic knowledge of Data Structures and Computer Organization.

COURSE CONTENTS

UNIT-I

Introduction: Role of OS: Types of OS, Batch Systems; Multiprogramming; Time Sharing; Distributed & Real time OS. Computer structure and OS: System Architecture – I/O, Storage, Processors; System components- OS Services, System Calls , System Programs; System Design, Implementation and Generation.

UNIT-II

Process Management: Concepts of process: Process status, Process description, Process model. Process Scheduling: Concepts, Scheduler organization, preemptive and non- preemptive scheduler strategies, scheduling algorithms: FCFS, SJN, Priority Scheduling, Round Robin Scheduling, Multiple Processor scheduling, Thread Concepts and Multiple threaded OS.

UNIT-III

Process Synchronization and Deadlock: Process Co-operation, Concepts of Inter-process communication, Process Synchronization, Synchronization Issues, Critical Section problem, Mutual exclusion Primitives and Algorithms, Process Synchronization with semaphores. Concepts of Deadlock, Conditions for Deadlocks, Resource Concepts & Abstractions, Deadlock Prevention, Avoidance and Recovery, Banker Algorithms for Deadlock Avoidance.

UNIT-IV

Memory Management and File system: Paging, Segmentation and Contiguous memory allocation. Virtual Memory: Demand Paging, Page replacement and Frame Allocation policies, Thrashing. File System: Concepts, Access Method, Directory Structure, and File System Management.

UNIT-V

Disk management and other issues: Disk management: Disk Structure and Scheduling. File systems, and operating system support for distributed systems. Protection and Security related issues. Case studies of contemporary operating systems.

Learning Outcomes:

Upon Completing the Course, Student will able to learn:

Understands the different services provided by Operating System at different

level. They learn real life applications of Operating System in every field.

Understands the use of different process scheduling algorithm and synchronization techniques to avoid deadlock.

They will learn different memory management techniques like paging, segmentation and demand paging etc.

BOOKS RECOMMENDED:

[1]. Silberschatz, Galvin and Gagne, Operating System Principles, 7th Ed. Addison Wesley.
[2]. Gary Nutt, Operating Systems, 3rd Ed. Pearson Education, India
[3]. Tanenbaum, Modern Operating Systems, PHI.
[4]. W. Stalling, Operating Systems, Macmillan.
[5]. H. M. Dietel, Operating Systems, Addison Wesley Longman.
[6]. Maurice J. Bach, The design of Unix Operating system, Pearson Education, India.
[7]. Sumitabha Das, Unix Concepts & Applications: includes SCO UNIX & Linux, Tata McGraw Hill.

<table>
<tr><th colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</th><th colspan="4">IV Year B.E. (Electronics and Telecommunication)</th></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR7C3
ANTENNA AND WAVE PROPOGATION</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives: This course presents the fundamental concepts of antenna and radio wave propagation. It gives emphasis to the antenna theories, modeling, analysis and design and also the physical behaviors along with the radio wave propagation problems in telecommunication field.

Prerequisites: Knowledge of Electromagnetic field and theory, Fundamentals of Physics

COURSE CONTENTS

UNIT-I

Introduction to types of antennas, radiation mechanism, current distribution on thin wire antenna, radiation pattern like isotropic, directional and omnidirectional, Radiation intensity, gain ,directive gain, directivity, antenna efficiency, effective area, effective length, reciprocity theorem, radar equation, beam efficiency, bandwidth, polarization Antenna temperatures ,FBR ,radiation resistance, Equivalent noise temperature of antenna.

UNIT-II

Poynting theorem, wave equation in terms of electromagnetic potentials and their solution, short electric dipole, retarded vector potential, small current element, small dipole, Finite length dipole, Half wavelength dipole, Infinite perfect conductors, ground effects.

UNIT-III

Introduction to various form of array, array of n isotropic sources of equal and unequal amplitude and uniform spacing, design consideration of Broadside, End fire, Dolphy Tchebyscheff arrays, continuous arrays, rectangular arrays, planar array , binomial array circular array, and super directivity.

UNIT-IV

Huygens' Principle, Hertz and Marconi antenna, ground and antenna losses, High frequency antenna, Dipole antenna, Harmonic antenna and inverted V antenna, Rhombhic Antenna, RDF, Loop antenna, Adcock Antennas & direction finder, Folded Antenna, Yagi Uda Antenna, Corner Reflected Antenna, Helical Antenna, Horn Antenna, Slot Antenna, Microstrip Antenna, LPDA, Microwave Antenna, Antenna with parabolic reflector, Lens Antenna, Babinet's Principle, Antenna Measurements.

UNIT-V

Modes of propagation, Sky wave propagation, Effect of earth's magnetic field on Ionospheric radio wave propagation, Virtual heights, MUF, LUF, Skip distance, OWF, Ionospheric abnormalities, Multihop propagation, Duct propagation, VLF and ELF propagations.

Learning Outcomes:

Upon completing the course, student will able to grasp the fundamental concept of antenna and its radiation mechanism.

BOOKS RECOMMENDED:

[1]. K.D.Prasad, Antenna and Wave Propagation, 3/e, Satya Prakashan, New Delhi; reprint-2007.
[2]. Constantine A.Balanis, Antenna Theory: Analysis and Design, 2/e, John Wiley & Sons Inc, Noida India.
[3]. John Daniel Kraus, Ronald J. Marhefka, Antennas, 3/e, McGraw-Hill Higher Education
[4]. C.G.Christodoulou, P.F.Wahid, Fundamentals of Antennas: Concepts and Applications, SPIE
[5]. S.R.Saunders, Antennas and Propagation for Wireless Communication Systems, 1/e, Wiley, John & Sons, Inc.
[6]. Richard C. Johnson, Henry Jasik, Antenna Engineering Handbook, McGraw-Hill Companies.

List of Practical Assignments:

1) ARRANGING THE TRAINER AND PERFORMING FUNCTIONAL CHECKS
2) STUDY OF SIMPLE DIPOLE λ/2 ANTENN.
3) TO PERFORM POLARISATION TEST.
4) TO PERFORM MODULATION TEST.
5) STUDY OF THE VARIATION IN THE RADIATION STRENTH AT A GIVEN DISTANCE FROM THE ANTENNA.
6) STUDY OF RECIPROCITY THEOREM.
7) TO PRACTICE HOW TO USE THE MATCHING STUB PROVIDED WITH THIS TRAINER.
8) SWR MEASUREMENT.
9) STUDY OF SIMPLE DIPOLE λ/4 ANTENNA.
10) TO STUDY FOLDED DIPOLE λ/2ANTENNA.
11) STUDY OF YAGI UDA 3 ELEMENT FOLDED DIPOLE.
12) STUDY OF YAGI UDA 5 ELEMENT FOLDED DIPOLE.

13) STUDY OF YAGI UDA 5 ELEMENTS SIMPLE DIPOLE.
14) STUDY OF YAGI UDA 7 ELEMENTS SIMPLE DIPOLE.
15) STUDY OF HERTZ ANTENNA.
16) STUDY OF ZEPPELIN ANTENNA.
17) STUDY OF λ/2 PHESE ARRAY END FIRE ANTENNA.
18) STUDY OF λ/4 PHESE ARRAY ANTENNA.
19) STUDY OF COMBINED CO-LINER ARRAY.
20) STUDY OF BROAD SIDE ARRAY.
21) STUDY OF LOG PERIODIC ANTENNA.
22) STUDY OF LOOP ANTENNA.
23) STUDY OF RHOMUBUS ANTENNA.
24) STUDY OF GROUND PLANE ANTENNA.
25) STUDY OF SLOT ANTENNA.
26) ANTENNA CURRENT SENSOR.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR7C4	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
RF AND MICROWAVE ENGINEERING	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objective:

To give students the knowledge and understanding of the basic concepts of microwave and its components.

To make students aware about the working and behavior of microwave vacuum tube devices and microwave solid state devices.

To provide knowledge about the microwave strip lines, microwave integrated circuits fabrication process and microwave measurements.

To make students aware about applications and hazards of microwave radiations

Prerequisite: Basic knowledge of EM field, transmission lines and Analog electronics

COURSE CONTENTS

UNIT-I

Microwave fundamentals – microwave frequencies, microwave devices, microwave systems, microwave units of measure, Scattering or S – matrix representation of multiport network, microwave waveguides, microwave cavities. Microwave hybrid circuit, waveguide tees, directional couplers, circulators and isolators.

UNIT-II

Microwave Vacuum Tube Devices – Limitations of conventional vacuum tubes in the microwave frequency range, Klystron amplifier, reflex klystron oscillator, travelling wave tube, Magnetron oscillator.

UNIT-III

Microwave semiconductor devices – microwave tunnel diode with its principles of operation and characteristics, Gunn-effect diodes, LSA diodes, Read diode, IMPATT, TRAPATT, BARITT diodes, parametric devices, parametric amplifiers.

UNIT-IV

Strip lines, monolithic microwave integrated circuits (MMIC) and microwave measurements- microstrip lines, parallel strip lines, coplanar strip lines, shielded strip lines, MMIC materials, MMIC growth, MOSFET fabrication, microwave test bench, power measurement, insertion loss and attenuation measurements, VSWR measurements, return loss measurement by reflectometer, impedance measurement, frequency measurement.

UNIT-V

Application, hazards and some advance topics - Applications of microwave, microwave radiation hazards, introduction to millimeter waves and its applications, design and implementation of microwave and millimeter wave circuits and systems

Learning Outcome:

After learning the course the students should be able to:

- Understand the basic concepts of microwave and its devices and components.
- Apply the knowledge of microwave to solve the microwave communication and microwave application based problems.
- Apply this knowledge for research in the field of microwave engineering.

BOOKS RECOMMENDED:

[1] Samuel Y. Liao, *Microwave devices and circuits*, Third Edition, Pearson, 2003
[2] Annapurna Das and S K Das, *Microwave Engineering*, Third Edition, McGraw Hill, 2015
[3] R.E.Collin, *Foundations for Microwave Engineering*.,2/e, IEEE Press 2002
[4] David M.Pozar, *Microwave Engineering*. 2/e,John Wiley & Sons 2003
[5] P.A.Rizzi, *Microwave Engineering- Passive circuits* - PHI

List of Practical Assignments:

1. Learn how to operate microwave test bench.
2. To study the characteristics of the Reflex Klystron Tube and to determine its electronic tuning range.
3. To plot different Modes of the Reflex Klystron Tube.
4. To study V-I characteristics of Gunn diode.
5. To determine the different parameters of Isolators and Circulators.
6. To measure attenuation.
7. Measurement of scattering parameters of Magic Tee.
8. To Measure main-line and auxiliary-line VSWR, coupling factor and directivity of a multi-hole directional coupler.
9. Measurement of guide wavelength.
10. To plot directional pattern of horn antenna.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR7E1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
CIRCUIT DESIGN USING HDL	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objective: To enable the students to translate a functional system description into appropriate digital blocks coded in VHDL.Perform synthesis, place, and route of a digital design into a target FPGA.

Prerequisite: Digital Design, C language.

COURSE CONTENTS

Unit I Introduction to VLSI and HDL

History of IC Design, IC Technology, Moore's Law, IC Design Constraints, Feature Size, VLSI Family, Programmable Logic Devices, Designing with Programmable Logic- Design Entry, Simulation, Synthesis, Implementation, Device Programming, EDA Tools, IP Cores, Gjeski's Y Chart.
Digital system design process, Hardware simulation, Levels of abstraction, VHDL requirements, Elements of VHDL Top down design, VHDL basic language Elements, VHDL operators, Timing, Concurrency, Objects and classes.

Unit II Behavioural Modeling

Signal assignments ,Concurrent and sequential assignments., Entity Declaration, Architecture Body, Behavioral Modeling, Process statement, Loop control statements, Multiple Processes, Delay Models, Signal Drivers.

Unit III Dataflow and Structural Modeling Techniques

Data flow Modeling, Concurrent Assignment statements, Block statements, Structural Modeling, Component declaration and Instantiation, Generate statements.

Unit IV Advance Topics in VHDL

Generics and Configuration, Subprogram, Overloading, Packages and Libraries, Design Libraries, Attributes.

Unit V Design for Synthesis

Language directed view of synthesis, Inference from CSA statements, Inference from within Process, Inference using Signals v/s variables, Latch v/s Flip Flop Inference, Wait statements, Synthesis Hints, Synthesis for dataflow and structural models.

Learning Outcomes:

At the end of the course, the students would be:

- Able to design digital systems through HDL language
- Simulation, synthesis and implementation of HDL code
- Implementation of code on FPGA/CPLD

BOOKS RECOMMENDED:

[1]. J. Bhasker, *VHDL* Primer, 3/e, Addison Wesley, 1999.
[2]. Sudhakar Yalamanchili, *Introductory VHDL-From Simulation to Synthesis*, Pearson
[3]. Douglas Perry, *VHDL*, 3/e Edition, McGraw Hill 2001.
[4]. Peter.J.Ashenden, The Designer's Guide to *VHDL-AMS*,
[5]. Charles.H.Roth, *Digital system Design using VHDL*, Thompson Publishers, 2/e Edition, 2007.
[6]. Ben Cohen, *VHDL*-Coding style and Methodologies, Kluwer academic Publishers, 1995.
[7]. Volnei. A.Pedroni, *Circuit Design with VHDL*, *MIT* Press Cambridge, 2004.

List of Practical Assignments:

<u>VHDL Programming using Xilinx ISE</u>

Note: For Q1 to Q5 use behavioral modeling. For Q6 to Q7 use data flow modeling and for Q8 to Q10 use structural modeling.

Q.1 Write a VHDL code for a Full Adder.

Q.2 Write a VHDL code for 8X1 Multiplexer using if-elseif statement, case statement and nested if statement and compare their delay and area.

Q.3 Write a VHDL code for a 3X8 decoder using case statement.

Q.4 Write a VHDL code for a J-K flip-flop triggered at falling edge of clock pulse. Also include clear and reset pins synchronized with clock pulse.

Q.5 Write VHDL code for a synchronous 3-bit binary up-down counter. Include a selection line for selecting the mode of counting upwards or downwards.

Q.6 Design a combinational circuit with three inputs x, y, and z and three outputs A,B and C. when the binary input is 0,1,2, or 3 the binary output is one greater than the input otherwise the binary output is one less than the input.

Q.7 Write a VHDL code for a 3-bit binary code to 3-bit grey code conversion.

Q.8 Design a 4-bit ripple counter using T-Flip flop as basic component.

Q.9 Design a 4-bit Magnitude comparator using 1-bit Magnitude comparator as basic entity.

Q.10 Design a circuit of a 3-bit parity generator and the circuit of a 4-bit parity checker using an odd parity bit.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR7E2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
WIRELESS ADHOC AND SENSOR NETWORKS	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

1. To understand the basics of Ad-hoc & Sensor Networks.
2. To learn various fundamental and emerging protocols of all layers.
3. To study about the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks.
4. To understand the nature and applications of Ad-hoc and sensor networks.
5. To understand various security practices and protocols of Ad-hoc and Sensor Networks.

Prerequisite: Computer networking concepts

COURSE CONTENTS

UNIT I -MAC & TCP IN AD HOC NETWORKS

Fundamentals of WLANs, IEEE 802.11 Architecture, Self-configuration and Auto configuration, Issues in Ad-Hoc Wireless Networks, MAC Protocols for Ad-Hoc Wireless Networks, Contention Based Protocols -TCP over Ad-Hoc networks, TCP protocol overview-TCP and MANETs, solutions for TCP over Ad-Hoc Networks.

UNIT II-ROUTING IN AD HOC NETWORKS

Routing in Ad-Hoc Networks, Introduction, Topology based versus Position based Approaches, Proactive, Reactive, Hybrid Routing Approach, Principles and issues ,Location services ,DREAM ,Quorums based location service, Grid–Forwarding strategies, Greedy packet forwarding ,Restricted directional flooding, Hierarchical Routing, Issues and Challenges in providing QoS.

UNIT III-MAC, ROUTING & QOS IN WIRELESS SENSOR NETWORKS

Introduction, Architecture, Single node architecture, Sensor network design considerations ,Energy Efficient Design principles for WSNs, Protocols for WSN, Physical Layer : Transceiver Design considerations, MAC Layer Protocols ,IEEE802.15.4 Zigbee, Link Layer and Error Control issues-Routing Protocols, Mobile Nodes and Mobile Robots, Data Centric & Contention

Based Networking ,Transport Protocols & QOS, Congestion Control issues ,Application Layer support.

UNIT IV -SENSOR MANAGEMENT

Sensor Management, Topology Control Protocols and Sensing Mode Selection Protocols, Time synchronization, Localization and positioning, Operating systems and Sensor Network programming, Sensor Network Simulators.

UNIT V -SECURITY IN AD HOC AND SENSOR NETWORKS

Security in Ad-Hoc and Sensor networks, Key Distribution and Management, Software based Anti-tamper techniques, water marking techniques, Defence against routing attacks, Secure Ad-hoc routing protocols, Broadcast authentication WSN protocols, TESLA, Biba, Sensor Network Security Protocols, SPINS.

Learning Outcomes:

At the end of this course, students will be able to:

1. Identify different issues in wireless ad hoc and sensor networks.
2. To analyze protocols developed for ad hoc and sensor networks.
3. To identify and address the security threats in ad hoc and sensor networks.
4. Establish a Sensor network environment for different type of applications.

BOOKS RECOMMENDED:

[1].Adrian Perrig, J. D. Tygar, "Secure Broadcast Communication: In Wired and Wireless Networks", Springer, 2006.
[2].Carlos De Morais Cordeiro, Dharma Prakash Agrawal “Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition), World Scientific Publishing, 2011.
[3].C.Siva Ram,Murthy and B.S.Manoj, “Ad Hoc Wireless Networks–Architectures and Protocols”, Pearson Education, 2004.
[4].C.K.Toh, “Ad Hoc Mobile Wireless Networks”, Pearson Education, 2002.
[5].Erdal Çayırcı , Chunming Rong, “Security in Wireless Ad Hoc and Sensor Networks”, John Wiley and Sons, 2009.

List of Practical Assignments:

Practical based on open source Sensor network Simulator.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR7E3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
EMBEDDED SYSTEM	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objective:

The goal of the course is to teach the concepts C Language and object oriented programming, PIC architecture and peripheral interfacing.
To read and understand the C and C++ programming, PIC microcontroller architecture and programming and RTOS.
The course focuses on how to write program and peripheral interfacing of PIC microcontroller and develop the applications.

Prerequisite: Knowledge of C language, Computer architecture and Microcontroller.

COURSE CONTENTS

UNIT I -Introduction to Embedded systems: Embedded systems, processor embedded into a system, embedded hardware units and devices in a system, embedded software in a system, examples of embedded systems, embedded SOC and use of VLSI circuit design technology, Complex systems design and processors, Design process in embedded system, formalization of system design, design process and design examples, classification of embedded systems, skills required for an embedded system designer.

UNIT II-PIC Microcontrollers: PIC 16 Series family overview, an architecture overview of the 16F84A, Status register, 16F84A memory, Some issues of timing, Power-up and Reset, PIC 16F84A parallel ports, 16F84A clock oscillator, 16F84A operating conditions, 16F84A interrupt structure.

UNIT III-Larger systems and the PIC 16F873A:The main idea –the PIC 16F87XA, The 16F873A block diagram and CPU, 16F873A memory and memory maps, 16F873A interrupts, 16F873A oscillator, reset and power supply, 16F873A parallel ports.

UNIT IV-RTOS: Basic design using RTOS, Micro/OS-II and Vxworks, windows CE, OSEK, real-time Linux functions,

UNIT V- Case study: Digital camera hardware and software architecture, embedded systems in automobile, embedded system for a smart card, mobile phone software for key inputs.

Learning Outcome:

After learning the course the students should be able to

Understand the fundamentals of embedded systems

Understanding of C and basics of C Understand the OOP concepts of classes, objects, methods,

constructors, destructors in C++

Understand the microcontroller architecture (PIC)

Understand and able to write the assemble language program.

Understand and able to write the I/O and timers/counter programming

BOOKS RECOMMENDED:

[1]. Embedded Systems Architecture Programming and Design by Raj Kamal, II edition, Tata MCGraw-Hill.

[2]. Designing Embedded Systems with PIC Microcontroller s: principles and applications by Tim Wilmshurst, Elsevier.

[3]. Embedded Systems Design by Steve Heath, II edition, Newnes publications

[4]. Embedded Systems Architecture: A Comprehensive Guide for Engineers and

[5]. Programmers by Tammy Noergaard, Elsevier

List of Practical Assignments:

Practical based on PIC Microcontroller programming, it’s interfacing with different peripherals and communication to other systems.

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<tr><th colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</th><th colspan="4">IV Year B.E. (Electronics and Telecommunication)</th></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR7E4
INDUSTRIAL COMMUNICATION</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

1.To introduce the basic principles of networking

2. To learn industrial protocols and the way of data processed and transferred in industrial network

3. To equip the students with the relevant knowledge to understand and solve technical problems in Industrial Automation systems.

Prerequisites: Digital Communications

COURSE CONTENTS

UNIT I-Fundamental of Industrial Data Communication Systems:

Review of Data Acquisition, Automation System Architecture - Hierarchical Levels, Functional Layered Models **-** OSI reference model, System engineering approach, Input / Output Structures, Control Unit Structure, Protocols, Communication principles and modes: network topology, transmission media, noise, cable characteristic and selection; bridges, routers and gateways, Instrumentation and control devices.

UNIT II-Industrial Communication Standards and Protocols:

Serial communication standards: Standards organizations, Serial data communication interface standards, Balanced and unbalanced transmission lines, Synchronous and asynchronous communication, RS 232,422,485 standards.
Industrial protocols: XON/OFF Signaling, Binary Synchronous Protocol (BSC), HDLC/SDLC protocol, CSMA/CD, CA protocol, OSI implementation for Industrial communications, Industrial control applications: ASCCII-based protocol – ANSI –X 3.28 -2.5.

UNIT III-HART Communication Protocol Architecture:

Physical, data link, application layer, communication technique, normal and burst mode of communication, benefits of HART.

UNIT IV- Open industrial Fieldbus and DeviceNet systems:

Industrial Ethernet: 10Mbps, 100Mbps Ethernet, Gigabit Ethernet, Industrial Ethernet.

Foundation fieldbus: Fieldbus requirement, features, advantages, fieldbus components, types, architecture–physical, data link, application layer, system and network management, wiring, segment functionality checking, function block application process.
PROFIBUS: Architecture, OSI-model, PROFIBUS types – PA, DP & FMS and their comparison, Designing PROFIBUS, Network design, Advantages and Applications of PROFIBUS in industries.

UNIT V-Programmable Logic Controller:
PLC Controller operation, Architecture,topology, SCADA integration PLC as RTU,Batch and sequential processing, Ladder diagram

Learning Outcomes:

Upon Completing the Course, Student will able to:

1.Identify the need for network protocols during data exchange
2. Demonstrate the use of serial standards as required in an industrial plant environment.
3. Analyze and identify the methods of communications
4. Compare the different protocols used as industrial standards
5. Demonstrate a working programmable logic controller network in a simulated industrial automated application.

BOOKS RECOMMENDED:

[1]. John Park, Steve Mackay, Edwin Wright, *Practical Data Communications for Instrumentations and Control*, 1st Edition ELSEVIER, 2003.
[2]. Deon Reynders, Steve Mackay, Edwin Wright, *Practical Industrial Data Communications*, 1st Edition ELSEVIER, 2005.
[3]. William C. Dunn, *Fundamental of industrial instrumentation and process control*, Mc Graw-Hill, 2005.
[4]. Behrouz A. Forouzan, *Data Communications and Networking*, 2nd Edition, Mc Grow – Hill, 2001.

List of Practical Assignments:

1. To study Amplitude Modulation and Frequency Modulation.
2. To study and simulate Pulse Width Modulation.
3. To study digital communication using ASK, FSK and PSK.
4. To study RS-232, RS-485 and RJ-45 communication standards.
5. To study types of Cables and Interference.
6. To study Modbus Protocol.
7. To study HART Protocol.
8. To study CANBUS, Device Net and SDS system.
9. To study network topologies and Ethernet.
10. To study mobile communication and satellite communication

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR7E5	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
SPEECH AND IMAGE PROCESSING	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives: Student will learn the basic principles and tools used to process speech, images and videos, and how to apply them in solving practical problems of commercial and scientific interests.

Prerequisites: Signals and systems, Digital signal processing

COURSE CONTENTS

UNIT I- Digital Speech Processing

The Fundamentals of Digital Speech Processing. A Review of Discrete -Time Signal & Systems , the Z-transform, the DFT, Fundamental of Digital Filters, FIR system, IIR Systems. Time–Domain Methods for Speech Processing. Time-Dependent Processing of speech, short -time energy and Average Magnitude, Short time Average Zero-Crossing Rate. Digital Representation of speech Waveform Sampling speech signals, statistical model, Instantaneous quantization, Instantaneous companding, quantization for optimum SNR, Adaptive quantization, Feed-forward Feedback adaptions.

UNIT II- Linear Predictive Coding of Speech

Block diagram of Simplified Model for Speech Production. Basic Principles of Linear Predictive Analysis-The Auto Correlation Method. The Prediction Error Signal. Digital Speech Processing for Man-Machine Communication by voice. Speaker Recognition Systems-Speaker verification and Speaker Identification Systems

UNIT III-Digital Image

Different stages of Image processing & Analysis Scheme. Components of Image Processing system, Multiprocessor Interconnections. A review of various Mathematical Transforms. Image Formation: Geometric Model, Photometric Model. Image Digitization: A review of Sampling and quantization processes. A digital image.

UNIT IV- Image Processing

Image Enhancement: Contrast Intensification, Smoothing, Image sharpening. Restoration: Minimum Mean –Square Error Restoration by Homomorphic Filtering. Image Compression: Schematic diagram of Data Compression Procedure, Lossless compression–coding. Multivalued Image Processing, Multispectral Image Processing, Processing of colour images

UNIT V- Case study on Speech and Image Processing

Learning Outcomes:

Upon Completing the Course, Student will able to:

- learn the theory behind fundamental processing tasks including image/video enhancement, recovery, and compression.
- learn how to perform these key processing tasks in practice using state-of-the-art techniques and tools like optimization toolboxes to statistical techniques.

BOOKS RECOMMENDED:

[1].Milan Sonya, Vaclav Hlavac & Roger Boyle, “Image Processing Analysis and Machine Vision”, Vikas Publishing House
[2].A.K. Jain, “Digital Image Processing”, Pearson Education
[3].Chanda, B. & Majumder, D. D, “Digital Image Processing & Analysis” , Prentice Hall (India)

List of Practical Assignments:

Practical based on Texas Instruments DSP Processor kit, it’s interfacing with different peripherals and communication to other systems.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Electronics & Telecommunication Engg.)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR8P2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
PROJECT PHASE-II	**0**	**0**	**14**	**0**	**0**	**7**	**7**

Learning Objective: To provide a comprehensive hands on experience to the students about the development of a complete project starting from analysis to testing. The students can also take a research project for innovating a new idea and its implementation.

Prerequisites: Electronics and Computer related subjects till III year.

COURSE CONTENTS

The major emphasis (but not limited to) shall be given on Microcontroller, Microprocessors, Analog and Digital Electronics/Communication ,VLSI and VHDL etc these are practice oriented areas of interest. The students shall be making the system, application or simulation packages depending upon the idea, technology chosen and expertise available. The architectural issues shall be important while the exposure to the technology needs to be gained by the students through thorough practice.

The students (in a batch) shall be required to be continuous interaction with the guide for the advice, guidance and facilities periodically and show the progress. They shall also be taking a certificate in the diary for satisfactory remarks or comments. Batch size shall be decided as per need and the quantum of the project.

The students shall make presentation and submit an originally drafted project reports periodically and at the end of the semester.

Learning Outcomes:

Upon completing the course, Student would be able to:

- Work in a team
  - Develop small working projects through designing, analysis and testing of model
  - Able to give presentation on the project developed

BOOKS RECOMMENDED:

[1] Reference books and web links of the relevant material the must be consulted as advised by the guide.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR8C1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
TELECOM NETWORKS	**3**	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

The course contents are aimed to provide:
A detailed working of different telecommunication networks used for accessing broadband.

Prerequisites:

Knowledge of analog communication, digital communication and basics of computer networks.

COURSE CONTENTS

UNIT-I

Introduction : Classification of different wireless and wired telecommunication networks, their comparison, Broadband access, Classification of Legacy broadband technologies, Fixed wired broadband technologies, Fixed wireless broadband technologies, Mobile wireless broadband technologies, Overview of 2G, 3G, 4G & 5G networks, Telecommunication Traffic- unit of traffic, network traffic load and parameters, grade of service and blocking probability.

UNIT-II

Public switched telephone networks (PSTN): Various subsystems of PSTN - subscriber end instruments, subscriber loop systems, transmission system, signalling system, trunk networks. speech digitization, line coding, frame formats used in PSTN, switching.

UNIT-III

Integrated Services Digital Networks (ISDN): Evolution from PSTN, basic principles, architecture and reference points, various frame formats, protocol stack, ISDN services. Broadband ISDN architecture, protocol stack, cell format, BISDN services.

UNIT-IV

Digital subscriber line (DSL): Dial up internet connection, its shortcomings, wired broadband technologies : (DSL), its types ADSL, SDSL, VSDL etc. working principle of DSL, Discrete multi tone modulation, Cable modem & its working principle.

UNIT-V

Optical Access Network: comparison of optical access networks, DSL and cable modem, PON, EPON, GPON and WDMEPON: overview, principal of operation, architecture, standards; Hybrid Wireless-Optical Broadband Access Network

Learning Outcomes:

Upon completing the course, student will able to learn about various wired and wireless telecommunication networks used for broadband access, their comparison, technologies used in these networks.

BOOKS RECOMMENDED:

[1]. I S Misra, Wireless Communications and Networks:3G and Beyond, Second Edition, Mc Graw Hill, 2013.

[2] Thiagrajan Viswanathan, Telecommunications Switching Systems and Networks, PHI, 1998.

[3] W. Stallings, ISDN and Broad band ISDN with Frame Relay and ATM, Pearson Education, 2005.

[4]. Shami, Abdallah, Maier, Martin, Assi, Chadi (Eds.), "Broadband Access Networks - Technologies and Deployments", Springer, 2009.

<table>
<tr><th colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</th><th colspan="4">IV Year B.E. (Electronics and Telecommunication)</th></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR8C2
OPTICAL COMMUNICATION</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives: To understand fundamentals of optical communication system, its various elements, and optical networking

Prerequisites: Basic knowledge of electromagnetic theory

COURSE CONTENTS

UNIT-I

Introduction to optical fiber communication system, Advantages of optical fiber communication over conventional electrical communication, review of optical fiber fundamentals, ray theory transmission, electromagnetic mode theory for optical propagation in optical waveguides, Types of optical fibers: step index fibers, graded index fibers, single mode fibers etc., cut off wavelength

UNIT-II

Transmission characteristics: fiber attenuation, absorption and scattering losses, fiber bend loss, fiber dispersion, intermodal and intra-modal dispersion, overall fiber dispersion, dispersion shifted fibers, dispersion flattened fibers, non-zero-dispersion shifted fibers, polarization maintaining fibers.

UNIT-III

Optical sources: Lasers and LEDs: basic concepts, injection laser, characteristics, temperature dependence, dynamic response, noise, reliability, Optical detection principle, absorption, quantum efficiency, responsivity, large wavelength cut off, pin photodiode, avalanche photodiode, receiver: basic concepts and types of noise.

UNIT-IV

Optical networks: Basic principles and components, couplers, isolators, circulators, multiplexers: gratings, Fabry perot filters, multilayer dielectrics, Mach-Zehnder interferometer, Acousto-optic tunable filters, Optical amplifiers-Semiconductor optical amplifiers, Erbium doped fiber amplifiers, wavelength converters, optical switches, optical add-drop multiplexers

UNIT-V

Optical networks: architecture, Synchronous optical network/ synchronous digital hierarchy- elements, multiplexing, layers, frame structure, WDM network architectures, broadcast and select networks, wavelength routed networks, routing and wavelength assignment (RWA), access networks, Optical OFDM, Flexible optical networks

Learning Outcomes:

Upon completing the course, students will be well versed with the fundamental concepts of optical communication, and will be able to contribute to the current and upcoming advances in the technology.

BOOKS RECOMMENDED:

[1] John M Senior, Optical fiber Communication: Principles and Practice, Pearson Education - 2006
[2] Gerd Keiser, Optical fiber communication, Fifth Edition McGraw Hill Education (India), 2013
[3] Rajiv Ramaswami and Kumar N. Sivarajan, "Optical Networks : A Practical Perspective", Harcourt Asia Pte Ltd., Second Edition 2004.
[4] C. Siva Ram Moorthy and Mohan Gurusamy, "WDM Optical Networks : Concept, Design and Algorithms", Prentice Hall of India, Ist Edition, 2002

List of Practical Assignments:

1) To set-up a fiber optic analog link
2) To set up a fiber optical digital link
3) To obtain intensity modulation of an analog signal, transmit it over a fiber cable and demodulate it at the receiver and to get back original signal
4) To obtain intensity modulation of a digital signal, transmit it over a fiber cable and demodulate it at the receiver and to get back original signal
5) To study the frequency modulation in case of fiber optic communication system.
6) To undertake the pulse width modulation in case of fiber optic communication system.
7) To determine the propagation losses in case of optical fiber communication system.
8) To evaluate bending losses in case of optical fiber communication system.
9) To determine the numerical aperture of an optical fiber
10) To study the characteristics of frequency modulation in case of fiber optic communication system.
11) To plot the electrical to optical conversion characteristics

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**IV Year B.E. (Electronics and Telecommunication)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR8C3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
SATELLITE AND NAVIGATION SYSTEM	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objective:

The curriculum focuses on following learning objectives:

- To get acquainted with satellite communication system and its importance.
- To understand the concepts of satellite orbit, launching mechanisms, launch vehicles, types of satellites and various access techniques

Prerequisite: Knowledge of Digital Communication and Wireless Communication

COURSE CONTENTS

UNIT-I

Introduction to Satellite Communication: Evolution of satellites and launch vehicles, basic concept and overview of satellite communication system, comparison with other communication system, various types of satellites and their applications, recent trends in satellite communication system.

Orbital Mechanics: Orbit and trajectories, Orbiting satellites: basic principles and equation o the orbit, Orbital parameters: definition and calculation, injection velocity and resulting satellite trajectories, types of satellite orbits.

UNIT-II

Satellite Launch and In-orbit Operations: Launch sequence and its types, launch vehicles, orbital perturbations: longitudinal and inclination changes, satellite stabilization, orbital effects on communication system performance, look angles: definition and determination, sub satellite point, calculation of elevation and azimuth angle, specialization to geostationary satellite, visibility test.

The Space Segment: Satellite sub systems, Altitude and orbit control system, telemetry, tracking, command and monitoring, power system, communication subsystems-transponders, satellite antennas, space qualification and equipment reliability.

UNIT-III

Satellite Link Design: Basic transmission theory, Link parameters, frequency considerations, propagation considerations- Introduction, atmospheric losses, ionospheric effects, rain attenuation, other propagation impairments, noise considerations, interference related problems, G/T ratio, C/N ratio, Link Design: design procedure and link budget, design of uplink and downlink, combined uplink and downlink C/N ratio, link budget examples for C band, Ku band and Ka band.

The Earth Segment: Earth station, types of earth station, architecture of Earth station, Earth station Design considerations and optimization.

UNIT-IV

Modulation and Multiplexing Techniques for Satellite Links: Amplitude modulation, frequency modulation, Carson's rule, analog FM transmission by satellite, digital modulation and demodulation, Digital transmission of analog signal, multiplexing techniques: Frequency division multiplexing and time division multiplexing.

Satellite Access: Introduction to multiple access techniques, Frequency division multiple access: Preassigned and demand assigned, calculation of C/N ratio FDMA, Demand Assigned FDMA, Time Division Multiple access: Introduction, TDMA Frame structure, TDMA Burst structure Computing unique word detection probability, TDMA frame efficiency, Code Division Multiple Access: Frequency hoping, Time hoping.

UNIT-V

Satellite Applications: VSAT Systems-overview, network architecture, access control protocols, modulation and multiple access selection, VSAT earth station and calculation of link margin.

Low earth orbit and Non Geo –stationary satellite systems: Orbit consideration, coverage and frequency consideration, delay and throughput considerations, system considerations.

Direct Broadcast Satellite Television and Radio: Digital DBS TV system design and link budget

Satellite navigation and the Global Positioning System: Introduction, radio and satellite navigation, GPS position location principles, GPS receivers and codes-C/A code.

Learning Outcome:

After learning the course the students should be able to:

- To analyze satellite sub systems, space segment and Earth segment.
- To design communication link for various types of satellite systems.
- After learning this course student will get the knowledge of satellite link design and fundamentals, power and bandwidth requirement, effect of the transmission medium etc.
- Student will be familiar with regulatory aspects and standards, various applications of satellite and navigation system, and some value added examples.

(iii) To understand and design various satellite applications.

BOOKS RECOMMENDED:

[1]. A. Maini, V. Agrawal, "Satellite Communications", Wiley India Pvt. Ltd., 2013.
[2]. T. Pratt, C. Bostain, J. Allnutt, 'Satellite Communications', Second Edition, John Wiley & Sons, 2003.
[3]. M.Richharia, 'Satellite Communication Systems-Design Principles", Macmillan 2003.

List of Practical Assignments:

1. Determination of orbit for a given eccentricity using Kepler's equation.
2. Computing the orbit of satellite by providing the satellite orbital parameters.
3. Calculation of look angle (Azimuth angle and elevation angle) with the help of given latitude and longitude of earth station as well as sub-satellite point.
4. Calculation of EIRP for earth station and satellite transponder and C/N ratio at the satellite and earth station receiver.
5. Obtain the autocorrelation of an input sequence applied at the Earth Station.
6. Obtain the waveforms for input signal, sampled signal, time division multiplexed signal and recovered signal for satellite communication.
7. Obtain the waveforms for BPSK modulation and demodulation in satellite communication.
8. Obtain the waveforms for QPSK modulation and demodulation in satellite communication.
9. Simulate Code Division Multiple Access for satellite communication of N transmitter/receiver pair.
10. Link budget analysis of transponder by obtaining the graph of C/N ratio v/s Pt and Pr.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR8E1
INTERNET OF THINGS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective:

Assess the genesis and impact of IoT applications, architectures in real world.
Illustrate diverse methods of deploying smart objects and connect them to network.
Compare different Application protocols for IoT.
Infer the role of Data Analytics and Security in IoT.
Identify sensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry.

Prerequisite: Computer Network, C Language

COURSE CONTENTS

Unit I

IoT Introduction, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.

Unit II

Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.

Unit III

IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.

Unit IV

Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of IoT Security, Common Challenges in IoT Security, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment

Unit V

IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.

Learning Outcomes:

At the end of the course, the students would be:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

BOOKS RECOMMENDED:

[1]. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1 st Edition, Pearson Education

[2]. Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017.

[3]. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1 st Edition, VPT, 2014.

[4]. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017.

List of Practical Assignments:

1. To study the architecture of application board of Raspberry Pi.
2. To demonstration the OS (Debian) for RPi in a SD card preparation, configuration of Raspberry Pi during first booting and use of remote SSH like putty
3. To demonstrate the basic linux commands on Raspberry pi.
4. To create a database & Store the value in Raspberry Pi.
5. To install Android on Raspberry Pi.
6. To Setup R Pi first time without using screen, mouse, keyboard.
7. To interface ADC at GPIOs of Raspberry Pi for measuring analog voltage.

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR8E2
NETWORK SECURITY</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To understand the fundamentals of Cryptography.
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To design security applications in the field of Information technology

Prerequisite: Computer Network

COURSE CONTENTS

UNIT I -

An Overview of Computer Security-Security Services-Security Mechanisms-Security Attacks-Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies.

UNIT II-

Classical Cryptography- Substitution Ciphers-permutation Ciphers-Block Ciphers-DESModes of Operation- AES-Linear Cryptanalysis, Differential Cryptanalysis- Hash Function - SHA 512-Message Authentication Codes-HMAC - Authentication Protocols.

UNIT III-

Introduction to Public key Cryptography- Number theory- The RSA Cryptosystem and Factoring Integer- Attacks on RSA-The ELGamal Cryptosystem- Digital Signature Algorithm-Finite Fields-Elliptic Curves Cryptography- Key management – Session and Interchange keys, Key exchange and generation-PKI.

UNIT IV -

Design Principles, Representing Identity, Access Control Mechanisms, Information Flow and Confinement Problem Secure Software Development: Secured Coding - OWASP/SANS Top

Vulnerabilities -
Buffer Overflows - Incomplete mediation - XSS - Anti Cross Site Scripting Libraries - Canonical Data Format - Command Injection - Redirection - Inference – Application Controls.

UNIT V -
Secret Sharing Schemes-Kerberos- Pretty Good Privacy (PGP)-Secure Socket Layer (SSL)- Intruders – HIDS- NIDS - Firewalls - Viruses

Learning Outcomes:

- At the end of this course, students will be able to:
- Implement basic security algorithms required by any computing system.
- Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- Analyze the possible security attacks in complex real time systems and their effective countermeasures.
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical derivation, modeling, and simulations.
- Formulate research problems in the computer security field.

BOOKS RECOMMENDED:

[1]. William Stallings, “Cryptography and Network Security: Principles and Practices”, Third Edition, Pearson Education, 2006.
[2]. Matt Bishop ,“Computer Security art and science ”, Second Edition, Pearson Education, 2002.
[3]. Wade Trappe and Lawrence C. Washington, “Introduction to Cryptography with Coding Theory” Second Edition, Pearson Education, 2007.
[4]. Jonathan Katz, and Yehuda Lindell, Introduction to Modern Cryptography, CRC Press, 2007.
[5]. Douglas R. Stinson, “Cryptography Theory and Practice”, Third Edition, Chapman & Hall/CRC, 2006.

List of Practical Assignments:

1) Design and implementation of a simple client/server model and running application using sockets and TCP/IP.
2) To make students aware of the insecurity of default passwords, printed passwords and password transmitted in plain text.
3) To teach student how to use SSH for secure file transfer or for accessing local computer using port forwarding technique.
4) Comparison between Telnet and SSH for Secure Connection

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR8E3 ELECTROMAGNETIC INTERFERENCE AND ELECTROMAGNETIC COMPATIBILITY	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objective: The purpose of this course is to expose the students to the basics and fundamentals of Electromagnetic Interference and Compatibility in System Design.

Prerequisite: EMF and Transmission line

COURSE CONTENTS

UNIT 1 EMI environment

Concepts of EMI and EMC and Definitions, Sources of EMI , Celestial Electromagnetic noise-Lightning Discharge, Electrostatic Discharge, Electromagnetic Pulse, Electromagnetic emissions-Noise from relays and Switches, Nonlinearities in Circuits

UNIT 2 EMI COUPLING PRINCIPLES

Capacitive coupling , Inductive coupling, Common Impedance Ground Coupling, Ground Loop coupling, Transients in power supply lines, Radiation coupling, Conduction coupling, Common – mode and Differential-mode interferences, Conducted EM noise on power supply lines

UNIT 3 EMI MEASUREMENTS

Open Area test site measurements-Measurement precautions , Open -Area test site, Anechoic Chamber, TEM-Reverberating TEM-GTEM cell , Comparisons

UNIT 4 EMI CONTROL TECHNIQUES

EMC Technology, Grounding, Shielding, Electrical Bonding, Power line filter, CM filter, DM filter, EMI suppression Cables, EMC Connectors ,Isolation transformer

UNIT 5 EMI / EMC STANDARDS

Introduction- Standards for EMI/EMC, MIL-STD-461/462-IEEE/ANSI standard-CISPR/IEC standard, FCC regulations, British standards, VDE standards-Euro norms, Performance standards-some comparisons.

Learning Outcome:

After learning the course the students should be able to know about:

- EMI Environment
- EMI Coupling and Measurements
- EMI control techniques and standards

BOOKS RECOMMENDED:

[1]. Prasad Kodali ,"Engineering Electromagnetic Compatibility –Principles, Measurements, and Technologies", IEEE press.
[2]. Henry W. Ott , "Noise Reduction Techniques in Electronic Systems"- 2nd Edition-John Wiley & Sons.
[3]. Bernharo Q'Keiser, 'Principles of Electromagnetic Compatibility', Artech house, 3rd edition, 1986

List of Practical Assignments:

The practical will be based on various EMI reduction techniques like Grounding, Shielding, Electrical Bonding, Power line filter, CM filter, DM filter, EMI suppression Cables etc.

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR8E4
DBMS AND DATA ANALYTICS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To understand the need of databases, its architecture and schemas.
- To familiarize students with representing domains using entity-relationship modelling. How to design a normalized schema in the relational data model.
- Develop skills in students to implement schema and query using SQL.
- Develop ability to develop database applications based on the requirements.

Prerequisites: Knowledge of Data Structures and Computer Programming and some topics of operating systems

COURSE CONTENTS

Unit-I Introduction: Database Environment:

Basic Concepts, Advantages of Database approach, Comparison with Traditional file systems, DBMS Architecture, Database Users, Data Models and Schemas, Database languages and Interfaces; Database development process: Development Lifecycle, Types of Application.

Unit-II Database Analysis & Modeling:

Introduction to Data Analysis and Modeling, Modeling the rules, Entity Relationship Model, ER Model Constructs- Attributes, Relationship etc., Enhanced ER Model and Business Rules, Modeling Enhanced relationships – Specialization and Generalization, Union Types. Binary and Ternary relationship Issues.

Unit-III Database Design:

Introduction to Logical Database Design, Relational Data Model – Codd's Rules, Relational Algebra etc.; Integrity Constraints, Transforming ER diagrams into relations, Functional Dependencies, Normalization – 1NF, 2NF, 3NF, BCNF and 4NF etc.

Unit-IV System Implementation & Transaction Processing:

Introduction to SQL – Inserting , Updating, and Deleting data, Processing Single Tables, Processing Multiple Tables, PL/SQL Constructs - Views, Triggers, Cursors etc; Transaction

Processing – Properties, Schedules and Serializability Issues. Concurrency Control – Introduction, Locking etc.

UNIT V- Introduction to Big Data Platform:

Challenges Of Conventional Systems – Web Data – Evolution Of Analytic Scalability, Analytic Processes And Tools, Regression Modeling, Multivariate Analysis, Bayesian Modeling, Inference And Bayesian Networks, Support Vector And Kernel Methods, Analysis Of Time Series: Linear Systems Analysis, Nonlinear Dynamics – Rule, Introduction To Streams Concepts – Stream Data Model And Architecture – Stream Computing, Sampling Data In A Stream – Filtering Streams – Counting Distinct Elements In A Stream – Estimating Moments – Counting Oneness In A Window – Decaying Window – Realtime Analytics Platform(RTAP) Applications

Learning Outcomes:

Upon Completing the Course, Student will able to:

- Understand the fundamentals of relational database system including: data models, database architectures and database manipulations.
- Understand the theories and techniques in developing database applications and be able to demonstrate the ability to build databases using DBMS such as MySQL.
- Be familiar with managing database systems.
- Understand new developments and trends in databases.

BOOKS RECOMMENDED:

[1]. Fundamentals of Database Systems, By R. Elmasri and S. Navathe, 6th Ed. Pearson Education, 2010.
[2]. Database System Concepts, By A. Silberschatz, H. Korth and S. Sudarshan, 6th Ed. McGraw Hill Education, 2013.
[3]. A First Course in Database Systems, By J. Ullman, J. Widom, 3rd Edition, Pearson Education, 2014.
[4]. Database Systems, By T. Connolly and C. Begg, 4th Edition, Pearson Education, 2008.
[5]. Database Management Systems, R. Ramkrishnan and J. Gehrke, 3rd Edition, McGraw Hill Education, 2014.
[6]. MySQL : The Complete Reference, 1st Edition, McGraw Hill Education, 2004.

List of Practical Assignments:

During the learning of course, students need to do assignments:

1. Designing an E-R model.
2. Solving basic SQL assignments.
3. Solving intermediate SQL assignments involving Nested and Join queries.
4. Using PL/SQL constructs involving procedures, triggers, views etc.
5. Exploring how transaction processing is handled by MySQL.

<table>
<tr><th colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</th><th colspan="4">IV Year B.E. (Electronics and Telecommunication)</th></tr>
<tr><th>Subject Code & Name</th><th colspan="3">Instructions Hours per Week</th><th colspan="4">Credits</th></tr>
<tr><td rowspan="2">ETR8E5
MACHINE LEARNING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives: The field of machine learning is concerned with the question of how to build computer programs able to construct new knowledge or to improve already possessed knowledge by using input information. The goal of this course is to introduce the theoretical foundations of machine learning, to provide practical experience of applying machine learning techniques and to investigate new problems where machine learning techniques can do better

Prerequisites: Basic knowledge of a programming language and Basic knowledge of probabilities and statistics is required.

COURSE CONTENTS

Unit-I Introduction:

Definition, Applications of machine learning, Importance of machine learning, Aspects of developing a learning system: training data and test data, Issues in machine learning, Types of learning: supervised, unsupervised and Reinforcement learning, Concept learning, General-to-specific ordering of hypotheses. Version spaces and the candidate elimination algorithm.

Unit-II Supervised Learning:

Classification and Regression learning methods, Decision Tree Learning: Representing concepts as decision trees, ID3 algorithm. Picking the best splitting attribute, searching for simple trees and computational complexity. Regression and function approximation, linear regression and best fit, Order of polynomial, Polynomial regression, Cross validation.

Unit-III Unsupervised Learning:

Introduction to unsupervised learning -Clustering - Classification of clustering algorithms, Computational Learning theory, PAC Learning, VC dimension. Artificial Neural Networks Learning: Neural Network Representation, Perceptron, Backpropagation algorithm.

Unit-IV Language Learning:

Classification problems in language: word-sense disambiguation, Formal Language learning, introduction to Hidden Markov models (HMM's).
Support Vector Machines: Maximum margin linear separators. Quadratic programming solution to finding maximum margin separators..

Unit-V Genetic Algorithms (GAs):

Motivation, Representing Hypotheses, Genetic operators, fitness Function and Selection, Working of Genetic Algorithm, Evolutionary Programming and Genetic Programming, Case studies of Machine Learning data sets .

Learning Outcomes:

Upon Completing the Course, students will have knowledge of various machine learning techniques useful for solving the real world problems.

BOOKS RECOMMENDED:

[1].Tom Mitchell, Machine Learning, McGraw-Hill, 1997.
[2] Richard O. Duda, Peter E. Hart & David G. Stork, Pattern Classification, Wiley & Sons, 2001.
[3] Ethem Alpaydin, Introduction to Machine Learning, MIT Press, 2004.
[4] David E. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Kluwer Academic Publishers, Boston, MA, 1989.
[5] Zbigniew Michalewicz, Genetic Algorithms + Data Structures = Evolution Programs, Springer, 1999.

List of Practical Assignments:

List of Assignment in Machine Learning Lab:

1) Problem based on different machine Learning algorithm
2) Works on different machine learning Tools
3) Case Study on different data sets

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Electronics and Telecommunication)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ETR8G1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Introduction to photonics	**3**	**0**	**0**	**3**	**0**	**0**	**3**
Duration of Theory Paper: 3 Hours							

The Above Course ETR8G1 Introduction to photonics is as per the course available at

MOOC/SWAYAM Course - I
Applications

They will be offered in self study/ MOOCS mode for students who have opted for internship and went at other institutions/organization.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>ETR8G2
Cryptography & Network Security</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td><td>3</td><td>0</td><td>0</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
</table>

The Above Course ETR8G1 Introduction to photonics is as per the course available at

MOOC/SWAYAM Course - I
Applications

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DEVI AHILYA VISHWAVIDYALAYA, INDORE

FACULTY OF ENGINEERING

SCHEME OF EXAMINATION (CBCS)
&
COURSE OF CONTENTS

BE I Year Programme
(Common to All Branches)
Effective from July 2015

INSTITUTE OF ENGINEERING & TECHNOLOGY
(www.iet.dauniv.ac.in)

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

CBCS SCHEMES OF EXAMINATION FOR BE I PROGRAMME
(Subject to Revision)

B. E. I YEAR (Common to all branches)

(Computer Engineering, Information Technology and Civil Engineering*)

SEM - 1				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR1C1	Applied Mathematics-I	3-1-0	PC1
2.	ACR1C2	Chemistry & Environment Science	3-1-1	PC2
3.	MER1C3	Elements of Mechanical Engineering	3-1-1	PC3
4.	ETR1C4	Basic Electronics	3-1-1	PC4
5.	MER1C5	Workshop Practice	0-1-2	PC5
6.	SSR1S1	Technical English	3-1-0	SS1
7.	BER1V1	Comprehensive Viva I	0-0-4	Viva1
Total Credit for SEM I			**26 actual + 4 Virtual credits**	

SEM – 2				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR2C1	Applied Mathematics-II	3-1-0	PC1
2.	APR2C2	Applied Physics	3-1-1	PC2
3.	MER2C3	Engineering Drawing	2-1-2	PC3
4.	EIR2C4	Electrical Engineering	3-1-1	PC4
5.	COR2C5	Computer Programming in C++	3-1-1	PC5
6.	SSR2S2	Humanities	2-0-0	SS2
7.	BER2V2	Comprehensive Viva II	0-0-4	Viva2
Total Credit for SEM II			**26 actual + 4 Virtual credits**	

* Semester 1 for three branches and Semester 2 for other three branches for the teaching load balancing.

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

CBCS SCHEMES OF EXAMINATION FOR BE I PROGRAMME
(Subject to Revision)

B. E. I YEAR (Common to all branches)

(Mechanical Engineering, Electronics & Telecommunication Engineering and Electronics & Instrumentation Engineering*)

SEM - 2				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR2C1	Applied Mathematics-II	3-1-0	PC1
2.	APR2C2	Applied Physics	3-1-1	PC2
3.	MER2C3	Engineering Drawing	2-1-2	PC3
4.	EIR2C4	Electrical Engineering	3-1-1	PC4
5.	COR2C5	Computer Programming in C++	3-1-1	PC5
6.	SSR2S2	Humanities	2-0-0	SS2
7.	BER2V2	Comprehensive Viva II	0-0-4	Viva2
Total Credit for SEM II			**26 actual + 4 Virtual credits**	

SEM – 1				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR1C1	Applied Mathematics-I	3-1-0	PC1
2.	ACR1C2	Chemistry & Environment Science	3-1-1	PC2
3.	MER1C3	Elements of Mechanical Engineering	3-1-1	PC3
4.	ETR1C4	Basic Electronics	3-1-1	PC4
5.	MER1C5	Workshop Practice	0-1-2	PC5
6.	SSR1S1	Technical English	3-1-0	SS1
7.	BER1V1	Comprehensive Viva I	0-0-4	Viva1
Total Credit for SEM I			**26 actual + 4 Virtual credits**	

* Semester 1 for three branches and Semester 2 for other three branches for the teaching load balancing.

Semester 1

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE-I Year (Common to all branches)
Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AMR1C1:
Applied Mathematics-I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To develop the concepts of calculus, useful to create mathematical models in order to arrive into an optimal solution in various disciplines like physics, engineering, economics, and statistics.
- Provide the fundamentals of formal techniques like differentiation to find the slope of a curve, find approximation to the original function by Taylor's series, determine the stationary points of functions in order to sketch their graphs, optimization of functions and so on; Integration to find areas, volumes, central points and many useful things; Vector fields to represent many physical quantities like velocities, forces (useful in fluid mechanics), particle displacements (useful in solid mechanics), and electric and magnetic fields (electromagnetism).

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT-I

Differential Calculus: Review of Successive differentiation, Leibnitz theorem and problems; Expansion of functions by Taylor's and Maclaurin's Theorem; Asymptotes; Curvature in Cartesian and Polar Coordinates; Envelopes; Evolutes and Involutes.

UNIT-II

Advanced Differential Calculus: Function of Several Variables; Partial Differentiation; Approximations and errors; Jacobians; Taylor's Series of Two Variables; Maxima and Minima of Function of Two and More Variables; Lagrange's Method of Undetermined Multipliers.

UNIT-III

Integral Calculus: Beta and Gamma functions; detailed study of tracing of curves-Cartesian, polar and parametric curves; Area; Length of Curve; Volume; Surface of Revolution; Theorems of Pappus and Guldin and problems.

UNIT-IV

Advanced Integral Calculus: Multiple integrals: Double and Triple Integration; Change of Order of Integration; Area; Volume; Centre of Gravity; Moment of Inertia.

UNIT-V

Vector Calculus: Differentiation of a Vector; Gradient; Divergence; Curl; Integration of a Vector Function; Gauss's, Green's and Stoke's Theorems.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply the concept of function derivatives to study the behaviour and rate of how different quantities change, how the graph of a function can actually be computed, analysed, and predicted and use integrals to find the summation of infinitely many small factors to determine whole.
- Learn the applicability of calculus in various fields like, in physics, it is used in the study of motion, electricity, heat, light, harmonics, acoustics, astronomy, dynamics and advanced physics concepts including electromagnetism and Einstein's theory of relativity use calculus. In the field of chemistry, calculus can be used to predict functions such as reaction rates and radioactive decay. In addition, it is used to check answers for different mathematical disciplines such as statistics, analytical geometry, and algebra.
- Find a way to construct relatively simple quantitative models of change, and deduce their consequences.

BOOKS RECOMMENDED

[1] B.S.Grewal, Engineering Mathematics, 39/e, Khanna Publishers, 2006.

[2] Erwin. Kreyszig, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.

[3] Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.

[4] C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co. Ltd., 6/e, 2003.

[5] H.K.Das, Higher Engineering Mathematics, S.Chand New Delhi.

[6] E Mendelson, G J Hademenos, F Ayres, Schaum's Easy Outline: Calculus, McGraw-Hill, 2000.

[7] R C Wrede, M Spiegel, Schaum's Outline of Advanced Calculus, 2/e, McGraw-Hill, 2002.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE -I Year (Common to all branches) Semester- 1			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ACR1C2: Applied Chemistry & Environmental Science	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To learn chemistry of various engineering materials and processes, their importance, properties, testing, structure-property relationship, tailoring and their applications in various technologies.
- To understand and aware with various environmental issues and pollution and control studies in modern society for sustainable development.

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Prerequisite: Nil

COURSE OF CONTENTS

UNIT-I WATER AND ITS APPLICATIONS

Sources, impurities, applications, Hardness- its expression and determination; Boiler troubles and their causes; Industrial water requirement, Treatment of water for industrial purpose; De-ionization of water; Analysis of water; Water quality parameters, Numerical problems on water analysis and water treatment processes.

UNIT-II ENGINEERING MATERIALS AND TESTING

Introduction, classification and requirement of engineering materials. Material testings.

Polymers: Chemistry of polymer materials and their diversification; Types of polymerization and their brief account; Examples of polymers.

Cement, Glass and Refractories: Different types, composition, properties and uses.

UNIT-III LUBRICANTS

Introduction, Principle and functions of lubrication, Types of lubricants, Properties, tests and applications of solid, semi-solid and liquid lubricants; Synthetic lubricants and lubricating emulsions.

UNIT-IV INSTRUMENTAL TECHNIQUES IN MATERIAL CHARACTERIZATION

Classification, Lamberts and Beers Law; Introduction, Principle and applications of Colorimetry, IR, UV-Vis, NMR and Mass spectroscopy; Chromatographic Techniques and applications, Numerical Problems on spectroscopic techniques.

UNIT-V ENVIRONMENTAL SCIENCE

Components of Environment and their interactions, Natural resources, Ecosystem, Impacts of development of environment, Environment protection act, EIA, Sustainable development.

Pollution and its types, Description, effects and control measures of Air, Water, Land and Noise pollution, Chemical toxicology, Global warming, Depletion of ozone layer, Acid rains, Eutrophication, Rain water harvesting, Pollution case studies.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply applications of various engineering materials in different technologies.
- Relate structure-property-uses relationship of engineering materials and tailoring of materials for technology development.
- Use of material testing and material characterization required in different engineering applications.
- Understand the components of Environment and their interactions with modern world. Also to analyse factors affecting, causes of Environmental Pollution and to apply possible control measures for Sustainable development.

BOOKS RECOMMENDED:

[1] Jain & Jain, Engineering Chemistry, Dhanpat Rai Publications, 2007.
[2] S. S. Dara, A Text Book of Engineering Chemistry, S. Chand & Company, 2007.
[3] B.Joseph, Environmental Studies, Tata McGraw Hill.
[4] A.K. De, Environmental Chemistry, New Age International, 1996.
[5] Shashi Chawala, A Text Book of Engineering Chemistry, Dhanpat Rai Publications, 2006.

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Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER1C3:
Elements of Mechanical Engineering</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To understand the basic fundamentals of Mechanical Engineering in light of thermal engineering and production engineering.
- To provide an insight about the basic thermal and production processes, materials, components and applications.

Prerequisites: Nil.

COURSE OF CONTENTS

UNIT I

Thermodynamics and energy, Temperature and Zeroth law of thermodynamics, Systems and control volume, Properties of a system, Energy transfer by heat and work, First law of thermodynamics, Energy analysis of closed systems, Internal energy and enthalpy of ideal gases, Energy analysis of steady flow systems, Analysis of some steady flow engineering devices, Relevant review problems.

UNIT II

Properties of pure substance, p-v and T-s diagram for a pure substance, Mollier diagram for a pure substance, Quality or dryness fraction, Steam tables, Methods for measurement of steam quality, Relevant review problems.

UNIT III

Basic considerations in the analysis of power cycles, Air standard assumptions, Overview of reciprocating engines, Thermodynamic analysis of Otto cycle: Ideal cycle for spark ignition engines, Thermodynamic analysis of Diesel cycle: Ideal cycle for compression ignition engines, Comparison of Otto and Diesel cycles, Effect of Specific Heat and Dissociation on the performance of the cycles, Relevant review problems.

UNIT IV

Metal Casting: Classification and overview of metal casting processes: sand casting, expandable mould casting and permanent mould casting; Patterns, cores and moulding; Elements of gating systems; Heating, pouring and solidification; Casting quality: cleaning, finishing and defects.

UNIT V

Welding and Machining: Fundamentals of welding and overview of welding processes: Oxy-Acetylene gas welding, Arc welding: TIG, MIG, SAW etc., Resistance welding; Soldering & Brazing; weld quality and defects; Fundamentals of metal machining and introduction to turning and related operations; Constructional features of lathe, Geometry of single point cutting tool and cutting tool materials.

Learning Outcomes:

- Upon Completing the Course, Student will able to:
- Understand basics of thermodynamics and components of steam.
- Identify engineering materials, their properties, manufacturing methods encountered in engineering practice.
- Understand basics of internal combustion engines.
- Understand functions and operations of welding, casting and machine tools including milling, shaping, grinding and lathe machines.

BOOKS RECOMMENDED:

[1] Nag P K, Engineering Thermodynamics, The McGraw-Hill Companies, Fourth Edition.
[2] P N Rao, Manufacturing Technology, Vol. I and Vol.2 Tata McGraw-Hill, 4th Edition, 2014.
[3] Hajra & Chaudhary, Work Shop Technology, Vol. 1 & 2, 12th Edition, Media Promoters & Pub, 2007.
[4] Cengel Y A, Boles M A, Thermodynamics-An Engineering Approach, The McGraw-Hill Companies, Fifth Edition.
[5] Mikell P. Groover, Fundamentals of Modern manufacturing, 3rd Edition, John Wiley and Sons.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR1C4:
Basic Electronics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce the basic concepts of electronics along with the understanding of working fundamental circuit devises such as diode, transistors and op-amp. To apply the basics of diode to describe the working of rectifier circuits such as Full and half wave rectifiers and zener diode as a voltage regulator in line and load regulation.Describe the application of transistors for Current and voltage amplification, the characteristics of different configurations of the transistor, DC load line and bias point. List, explain, and design and analyse the different biasing circuits, to give basic knowledge of working of op-amp, its characteristics and applications
- **Prerequisite(s):** nil

COURSE OF CONTENTS

UNIT I
Discrete electronic devices: Diode, zener diode, BJT (Bipolar junction transistor), LED, photodiode phototransistor, varactor; characteristic and operation (qualitative description and quantitative behaviour with black box approach)

UNIT II
Diode circuits; clipper, clamper circuits, DC power supply: rectifier-half wave, full wave (center tapped, bridge), zener regulated power supply, regulation (with regulator IC-LM317)

UNIT III
BJT characteristics; BJT biasing; CE-biasing circuits: operating point; h-parameter model of transistor; large/small signal models (concept);large/small signal models of CE-BJT amplifier, Design of amplifier; Differential amplifier (using BJT).

UNIT IV
Operational amplifier: basic model; virtual ground concept; inverting amplifier; non-inverting amplifier; integrator; differentiator; Schmitt trigger; astable multivibrator, Simple active filters: low pass, high pass, bandpass, notch filter

UNIT V
Basic feedback theory; +ve and -ve feedback; concept of stability; oscillator, Waveform generator using op-amp schimitt trigger for Square wave, triangular wave Wien bridge oscillator for sinuisoidal waveform.

Learning outcomes:

- Students will be able to get the knowledge of Q point and can calculate it using different biasing circuits. They will easily compare different biasing circuits on the basis of stability factor.
- Students will be able to solve clipper and clamper circuits. They get the knowledge og op-amp

and its various applications as integrator, differentiator and as an oscillator.

BOOKS RECOMMENDED:

[1] Ralph J.Smith, R.C.Dorf circuits, devices and systems, john Wiley, 1992.
[2] R.L.Boylestad, L. Nashelsky, Electronic devices, and circuit theory, Prentice Hall, 2002.
[3] A. S. Sedra, K.C. Smith, Microelectrinic circuits, Oxfort University Press, 1998
[4] R.A. Gayakwad, OP-amps and linear integrated circuits, Prentice Hall of India.
[5] Millman, Grabel, Microelectronics, Mc-Graw-Hill.
[6] De Carlo, and Lin, Linear circuit analysis, Oxford Univesity Press, 2001 (second edition).
[7] Hayt, Kammerly and Durbin, Engineering Circuit Analysis, Tata McGraw Hill, sixth edition.

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<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE-I Year (Common to all branches)
Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SSR1S1:
Technical English</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

. **Learning Objectives:**

- To develop the English communication skills in terms of reading, writing and understanding of Engineering terms.
- To develop the technical ideas in English and to be able to express the technical ideas.

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT I

Basic of technical communication: Meaning of technical communication; process of communication; Forms of communication: Verbal and Non-verbal; technology-enabled communication; Barriers to communication; Essentials of effective communication; Types of communication; Defining audiences for technical communication; Aspects of communication: Global, Ethical and Legal.

UNIT II

Professional correspondence: Qualities of professional correspondence: Goodwill techniques; Types of correspondence: Letters, Memos, E-mails; Business Letters: Elements of a Letters, Basic Letter Formats; Types of Business Letters: Positive Letters, Negative Letters, Inquiry Letters, Sales Letters, Complain and Adjustment Letters. Memos: Meaning and Format of Memos. Writing job application letters & Designing Resumes; Meeting and Minutes.

UNIT III

Technical Writing: Meaning & Concept of Technical Writing: Process of Technical Writing: Forms of Technical Writing: Technical Description, Summaries, Instructions & User Manuals: Technical Reports: Meaning and Essentials of Good Report Writing: Classification of Reports; Report Formats: Formal and Informal; Common Informal Technical Reports: Progress Reports, Lab Reports, Feasibility reports, Problem Solving Reports.

UNIT IV

Reading Comprehension; Precis Writing; Expansion of an idea; Dialogue Writing; Paragraph Writing (Related to Technical Communication).

UNIT V

Foreign Words & Phrases; Antonyms and Synonyms; Transitional Words and Phrases; Articles, Use of Prepositions, Modal Verbs, Connectives, Relative Clauses, Noun/Nominal Compounds: Correction of Sentences and Homophones; Punctuation, Abbreviations, Capitalization and Number Usage; Use of Technical Words and Jargons.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply various technical terms and terminologies practically
- The course aims at developing the fundamentals of Technical English and mastery in the professional writing like Business letters, Business correspondence .designing Business Memorandum, Resume and E-mail writing.
- Will be able to write formal and informal reports in work place.
- Will have complete knowledge of comprehending different passages and Precis writing.
- Apply various grammatical skills practically.

BOOKS RECOMMENDED:

[1] A. Esenberg, A Beginner's Guide to Technical Communication, McGraw-Hills.
[2] A. J. Rutherford, Basic Communication Skills for Technology, Pearson Education Asia.
[3] C. L. Bovee, J. V. Thill & B Schatzman, Business Communication Today, 7/e, Pearson Education, 2002.
[4] R. V. Lesikar, J. D. Perrit, Jr., & ME Flately, Lesikar's Basic Business Communication.
[5] R. C. Sharma and K. Mohan, Business Correspondence and Report Writing, Tata McGraw-Hill, 2002.

Semester 2

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AMR2C1:
Applied Mathematics-II</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce the mathematical concepts of Matrix Algebra, Differential Equation Probability and Statistics and Fuzzy sets for solving engineering problems that shall be used in various branches of engineering.
- Provide the basics of Matrix mathematics useful in providing a more compact way to deal with groups of equations in linear algebra; Differential equations, a mathematical equation that relates some function (usually represent physical quantities) with its derivatives (represent their rates of change), and the equation defines a relationship between the two; Probability distributions describe the dispersion of the values of a random variable; Curve fitting and regression analysis, to find the "best fit" line or curve for a series of data points; Theory of equations, which tells when an algebraic equation has an algebraic solution; Fuzzy sets generalize classical sets (Crisp sets), as the characteristic functions of classical sets are special cases of the membership functions of fuzzy sets.

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT-I

Matrix Algebra: Review of Matrices; Elementary Operations on Rows and Columns; Normal Form; Linear Dependence; Rank; Application of Rank Theory in Solving System of Linear Equations; Linear Transformation; Orthogonal, Unitary and Hermitian Matrices; Characteristic Equation; Eigen- Values and Eigen-Vectors; Caley-Hamilton Theorem; Quadratic and Linear forms.

UNIT-II

First Order Ordinary Differential Equation: Exact Differential Equation; Equations Solvable for x, y and p; Clairaut’s Form; Application to Simple Problems.
Higher Order Ordinary Differential Equation: Linear Differential Equations with Constant & Variable Coefficients; Method of Variation of Parameters, Simultaneous Differential Equations; Application to Simple Problems.

UNIT-III

First Order Partial Differential Equations: Formation of Partial Differential Equations; Partial Differential Equations of First Order and First Degree i.e. $Pp + Qq = R$.
Higher Order Partial Differential Equations: Linear Homogenous Partial Differential equations of n^{th} order with constant coefficients; method of Separation of variables; their Simple applications.

UNIT-IV

Probability and Statistics: Conditional Probability, Baye’s Theorem; Binomial, Poisson and Normal distributions and their Mean and Variance, Methods of least squares and curve fitting, Correlation and Regression Analysis.

UNIT-V

Theory of Equations: Polynomial equations, relation between root and coefficients, symmetric functions of roots, cube roots of unity, Cardon’s method for solution of cubic equations.
Fuzzy sets: Membership function, definition, Operations on Fuzzy sets, Properties of Fuzzy sets.

Learning Outcomes:

Upon completing the course, students will be able to:

- Express a linear map between finite-dimensional vector spaces with a matrix, calculate the electrical properties of a circuit, with voltage, amperage, resistance, etc. with matrix arithmetic, use them in 3D geometry (e.g. computer graphics), can try to improve linear solvers efficiency. Matrices can also represent quadratic forms (for example, in analysis to study hessian matrices, which help us to study the behaviour of critical points) and also computers run Markov simulations based on stochastic matrices in order to model events ranging from gambling through weather forecasting to quantum mechanics.
- Use differential equations to model natural phenomena, engineering systems and many other situations like exponential growth and decay, the population growth of species or the change in investment return over time, describing the movement of electricity, in modelling chemical reactions, in finding optimum investment strategies, describing the motion of waves, pendulums or chaotic systems.
- Handle probability distributions, to indicate the likelihood of an event or outcome, which are used for making forecasts and risk assessments. Pdf's are quite important and widely used in insurance, engineering, physics, evolutionary biology, computer science and even social sciences such as psychiatry, economics and even medical trials.
- Use fitted curves as an aid for data visualization, to infer values of a function where no data are available, and to summarize the relationships among two or more variables.
- Apply Fuzzy sets and logic to reason like a human in terms of linguistic variables, design Traffic monitoring systems, AC and heating ventilation, Gene Expression data analysis, Facial pattern recognition, Weather forecasting systems and many more.

BOOKS RECOMMENDED:

[1] B.S.Grewal, Engineering Mathematics, 39/e, Khanna Publishers, 2006.

[2] Erwin. Kreyszig, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.

[3] Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.

[4] C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co. Ltd., 6/e, 2003.

[5] H.K.Das, Higher Engineering Mathematics, S.Chand New Delhi.

[6] Zafar Ahsan, Differential Equation and their Applications, Prentice Hall of India Pvt. Ltd., New Delhi, 2004.

[7] S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical statistics, Sultan Chand & Sons., 2000.

[8] Freund John E, Mathematical Statistics, PHI, N.D., 7th Ed., 2010.

[9] G. J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PHI, New Delhi, 2005.

[10] H. J. Zimmerman, Fuzzy Set Theory and its Applications, Allied Publishers, 1996.

[11]Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd Edition, John Wiley & Sons, Inc., 2010.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE - I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">APR2C2:
Applied Physics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce the basics concepts of physics and make a bridge between basics and their application.
- To introduce the concept of the modern science like Laser, Optical fire, X-rays and quantum physics.
- To introduce fundamental physics like wave optics, interference, diffraction polarization, and semiconductor physics.

Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I

Optics-I: Interference of Light Waves: Thin film, Newton's Ring experiment, Michelson interferometer; Diffraction of Light Waves: Fresnel's & Fraunhoffer diffraction, Zone plate, Single slit experiment, diffraction by double slit, Diffraction at Circular aperture, Plane transmission Grating.

UNIT-II

Optics-II: Polarization of Light Waves, Double refraction, Nicol Prism, Half Wave & Quarter Wave plates, Circularly & elliptically polarized light, Polarimeter; LASER: Stimulated & spontaneous emission, Population Inversion, Optical Resonator, Einstein's coefficients, He-Ne Laser, Co_2 Laser, Semiconductor Laser; Optical Fiber: types of Fibers (material, refractive index, mode), Acceptance angle, Numerical aperture, V-Number, Propagation of Light through Fibers, Applications.

UNIT-III

Crystal Structure and Semiconductors: Symmetry & properties of Simple crystal structure, Miller's Indices, Interplanar spacing, production and properties of x-ray, Bragg's law; Semiconductors: Band theory of Semiconductors, Intrinsic & extrinsic semiconductors, Fermi level , pn junction diode, LED, Zener diode, npn & pnp Transistors.

UNIT-IV

Electromagnetism: Continuity equation for Charge & Current, Inconsistency of Ampere's law for time varying field, Concept of Displacement current, Maxwell's equations; Wave equations for E & H, Propagation of one dimensional electromagnetic waves in dielectric medium, Energy density in electromagnetic field: Poynting Vector.

UNIT-V

Quantum Physics: Plank's law, Compton's effect, Concept of Matter Waves, Devison & Germer's experiment, Phase velocity & Group velocity, Heisenberg's Uncertainty Principle; Schrodinger 's Wave Equation, Interpretation of Wave function Ψ, Time dependent & Time Independent equations, Schrodinger's Wave equation for a free particle in a box.

Learning Outcomes:

- The student will demonstrate the ability to use concepts of Morden physics to their engineering applications.

- The course aims at developing the fundamentals of wave optics, crystal structure, structure of atoms and their applicable to obtain quantitative solutions of problems in physics.

BOOKS RECOMMENDED:

[1] R K Gaur & S L Gupta, Engineering Physics, Dhanpat Rai & Sons, 2006
[2] H.K. Malik & A.K.Singh, Engineering Physics, Tata McGraw Hill, 2011
[3] N. Gupta & S.K. Tiwary , A Text Book of Engineering Physics, Dhanpat Rai & Co. 2009.
[4] W. T. Silfast, Laser Fundamentals Cambr. Un. Press, 1996,
[5] D Halliday & R Resnick, Physics Vol-II, Wiley Eastern, 1993
[6] H White, Modern Physics: Van Nostrand; 15/e.
[7] D P Khandelwal, Optics and Atomic Physics.
[8] R Feyaman,Feyaman Lectures on Physics, /e, Narosa Publication, 1998.
[9] S.O. Pillai, Solid State Physics, New Age International Publication, 2010.
[10] R.S. Sedha, A Text Book of Applied Electronic, S. Chand & company Lmt. 2005.
[11] R.P. Goyal, Unified Physics-II,,and III Shivlal Agrawal & Co. ,1994.

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<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER2C3:
Engineering Drawing</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">1</td><td rowspan="2">4</td><td rowspan="2">2</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To understand the concepts of imagining, envisioning and visualizing the objects & machine parts and drawing them with the instruments & tools.
- To introduce the students to the "universal language of Engineers" for effective communication through drafting exercises of geometrical solids
- **Prerequisite(s):** Nil

COURSE OF CONTENTS

UNIT-I

Introduction, need & Classification of Engineering Drawings, Drawing Instruments and their uses, Indian Standards for Drawing, Drawing Sheet Layout, Various conventions used in drawing, Technical Lettering, Dimensioning, Basic Geometrical Constructions. Engineering Scales & Engineering Curves

UNIT - II

Orthographic Projections, Isometric Projections, Oblique Projections, Perspective Projections & Missing Views.

UNIT - III

Projection of Points, Straight Lines and Plane Surfaces.

UNIT - IV

Projection of Solids, Section of Solids and Development of Surfaces.

UNIT - V

Interpenetration of Solids / Intersection of Surfaces, Introduction to Computer Aided Drawings, Drawing of Machine elements like Riveted Joints, Screw fasteners and Welded Joints.

Learning Outcomes:

- Upon Completing the Course, Student will able to:
- Understand the importance of BIS and ISO Standards in Engineering Drafting.
- Graphically construct and understand the importance of mathematical curves in engineering applications.
- Visualize geometrical solids in 3D space through exercises in Orthographic Projections.
- Interpret Orthographic, Isometric and Perspective views of objects.
- Develop the surfaces of geometrical solids.

BOOKS RECOMMENDED:

[1] Bhatt N D, Engineering Drawing, Charoter Publishing House, Anand, Gujrat Agrawal B, and Agrawal C M, Engineering Drawing, Tata McGraw-Hill Publishing Company Limited.

[2] French T E, Vierck C J, Foster R J, Engineering. Drawing and Graphic Technology Mc Graw-Hill International, Singapore, Low Price Edition.

[3] Luzadder W J, Duff J M, Fundamentals of Engineering Drawing, Prentice- Hall India, New Delhi.
[4] Dhananjay A Jolhe, Engineering drawing, Tata McGraw Hill.
[5] Shah M B and Rana B C, Engineering Drawing, Pearson Education, New Delhi.

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<tr><td colspan="4">Devi Ahilya University, Indore, India
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Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR2C4:
Electrical Engineering</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To understand the concepts and practical ideas of AC/DC circuits along with basic 3 phase power management, Properties of different magnetic material used in Electromagnetic Circuits to create an idea among students that how different magnetic materials were choose for different practical machines.
- Practical concepts of Transformers and different Electric Machines to make students easy understanding of electrical machines surrounded by us and also they are basic to all the engineering streams.

COURSE OF CONTENTS

UNIT-I

AC circuits: Generation of EMF, Phasor Quantities, RMS, Average, Form Factor, Peak Factor Etc, Phasor Diagrams; Single Phase AC Circuits: R, L, C And Combinations, Resonance, Q-Factor, Bandwidth; Three Phase AC Circuits: Generation, EMF, Phase Sequence, Analysis of Star and Delta Connections, and Power Measurement In Single Phase& Three Phase Circuit.

UNIT-II

Circuit analysis tools: Kirchoff's laws, Analysis of DC and AC circuits, Thevenin's theorem, Norton's theorem, Max power transfer theorem, Superposition theorem, and Source transformation.

UNIT-III

Magnetic Circuits: Electromagnetism, Magnetic flux, Magnetic flux density, Intensity of magnetization, B-H curves, hysteresis and eddy current losses, Magnetic circuit calculations, laws of Electro-magnetic induction, Magnetic induction, Lifting power of an electromagnet.

UNIT-IV

Transformer: Construction, principle, ideal transformer, EMF equations, Analysis of transformer on no load and load conditions, Equivalent resistance and reactance, voltage regulations, transformer losses Transformer testing, transformer efficiency, Types of transformer, Cooling methods, Auto transformer.

UNIT-V

Rotating electric Machines: Construction, working principles, EMF equations, Characteristics, Torque equations of DC machines (generators & motors), 3-phase synchronous and induction motor, single phase induction motor.

Learning Outcomes:

Upon completing the course, students will be able :

- To solve circuit problems based on KVL,KCL laws and different network theorems which helps them to solve practical circuits for future industries exposure .
- The course also covers basic knowledge of alternating circuits and their practical applications, which helps students to understand their domestic home load in bettr way.
- Students were also able to understand uses of different magnetic materials available in market for constructing different electrical machines and they also able to solve their circuit parameters which helps in designing a electrical machine at initial level.
- After this course, students were able to understand different properties, characteristics and functioning of different parts of transformer and different rotating electrical machines at basic level.

BOOKS RECOMMENDED:

[1] V Del Toro, Electrical Engineering Fundamentals, 2/e, PHI, 2000.

[2] D P Kothari, I J Nagrath, Basic Electrical Engineering, 2/e, Tata McGraw Hill, 2002 (Fifth Reprint 2003).

[3] A Sudhakar, Network Theory, 2/e, Tata McGraw Hill, 2004

[4] P S Bimbhara, Electrical Machinery, 7/e, Khanna Publishers, New Delhi, 2006.

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<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">COR2C5:
Computer Programming in C++</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To learn to analyse a problem and construct a C++ program that solves it using C++ basic constructs and advanced constructs.
- To learn the syntax and semantics of the C++ programming language.
- To learn how to design C++ classes with constructors and class member functions.
- To understand the concept of data abstraction and encapsulation.
- To learn how to overload and override functions and operators in C++.
- To learn how containment and inheritance promote code reuse in C++.
- To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
- To learn how to use exception handling in C++ programs.

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Prerequisites: Nil.

COURSE OF CONTENTS

UNIT-I

Introduction to flowcharts and problem solving. Types of programming languages, Programming with C++:- C++ Data Types:-auto, bool, int, char, float, double, void. Variables and Constants, Operators, Arithmetic and Logical Expressions, Assignment Statements and Type Casting. Control structures- Iteration statements, Jump Statements and Selective statements. Common C++ Header files, Generation of Random numbers in C++.

UNIT-II

Functions: Introduction - Call by Value and Call by Reference – return values – recursion – Arrays - Introduction to Arrays - Initialization of Array - Multi dimensional Arrays - passing arrays to functions – Strings - Arrays of Strings - Standard Library String Functions.

Structures: Structure elements, Nested Structures, Array of Structures, Array within structures and passing structures to functions.

Unit- III

Pointers:-Declaration and Initialization of Pointers, Dynamic Memory allocation/deallocation operators:-new and delete. Pointers and Arrays:-Array of Pointers, Pointer to an array, Function returning a pointer, Reference variables and use of alias. Invoking functions by passing pointers. Files – Introduction – File Structure - File handling functions - File Types - Error Handling.

UNIT-IV

Object Oriented Programming Paradigm - Basic Concepts of OOP - Benefits of OOP. Class and object fundamentals and various visibility modes in class, Object as function arguments-pass by value and pass by reference. Constructor:-Special Characteristics, Declaration and Definition of a Constructor, Default Constructor, Overloaded Constructor, Copy Constructor and Constructor with default arguments.

Function Overloading:-Need and restrictions of overloaded functions, Steps involved in finding the best match, Default arguments versus overloading.

Destructor:- Special Characteristics, Declaration and Definition of a Destructor. Friend function and its characteristics and friend class.

UNIT-V

Introduction to Operator overloading - Rules for Operator overloading – overloading of binary and unary operators - Introduction to inheritance – Types of inheritance - Abstract Classes - new Operator and delete Operator - Pointers to Objects – this Pointer - Virtual Functions - Pure Virtual Functions - Introduction to Class Templates - Function Templates - Member Function Templates - Basics of Exception Handling - Types of exceptions - Exception Handling Mechanism - Throwing and Catching Mechanism - Rethrowing an Exception - Specifying Exceptions.

Learning Outcomes:-

Upon completing the course, students will be able to:

- To develop C++ programs using basic and advanced constructs that will solve real life problems.
- The course aims to understand the features of C++ supporting object-oriented programming.
- Apply the major object-oriented concepts to implement object-oriented programs in C++ i.e. encapsulation, inheritance and polymorphism.
- Understand advanced features of C++ specifically friends, pointers, virtual functions and operator overloading.

BOOKS RECOMMENDED:

[1] Coohoon and Davidson, C++ Program Design: An introduction to Programming and Object-Oriented Design (3rd edition), Tata McGraw Hill, New Delhi, 2003.
[2] Herbert Schildt, the Complete Reference, Tata McGraw Hill.
[3] E Balagurusamy, Object Oriented Programming with C++, McGraw Hill Education.
[4] Ravichandran, Programming With C++, Tata McGraw Hill.
[5] Dromey G, How to solve it by Computer, Prentice Halll – 1978.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE-I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SSR2S2:
Humanities</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce students to understand and interpret the human experience from individual to entire culture.
- It also helps to understand how human beings across time and cultures understand happiness & suffering, understand good from bad, debate political questions.
- To understand that their actions have a Social, economic and environmental impact. To inspire ethical & moral course of thinking.

Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I

Man and society- Theories of man and society, Methodological individualism, structuralism, Society and its features- Social Institutions; Social Stratification and Change; Contemporary Indian Philosophy-its characteristics andCross-cultural Issues.

UNIT-II

Human Behavior: Biological Bases of Behavior, Methods for understanding human psychophysiology, Working of brain, Psychobiology of learning, memory, emotions and personality, Temperament and personality: trait structure and persistence, Extraversion/sociability, Aggression-hostility/agreeableness, Philosophy of Mind & Cognition.Concepts of good life – quality of life and subjective well-being; happiness, life satisfaction, and positive affect.

UNIT-III

Perspectives on Knowledge, Science and Technology, Technological Shaping of Society and Social Shaping of Technology and its Human roots, Role of Humanities in Engineering: Professionalism in Engineering; Professional Engineering Bodies.

UNIT-IV

Governance and Engineers: Political parties; Types & Forms of Governance; Utilitarianism; capitalism, socialism and communism; Marxist and neo-Marxist thoughts; democracy in public and private spheres.

UNIT-V

Engineering and Corporate Social responsibility- Ecology and Natural Resources, Role of corporations in the society, Morals, Values, Consciousness, Experience: Basic codes of Ethics; Engineering Ethics, Evolution of CSR, Strategic CSR, Role of stakeholders in CSR, Consumer awareness towards CSR,CSR as competitive advantage, the Global Competitiveness Index (GCI) & Sustainability , Issues in CSR- organizational, economic & social.

Learning Outcomes:

On successful completion of course we will have

- Aspire students to be world citizens of broad perspective who can make educated and ethical decisions.
- Students who articulate their own values & beliefs and can apply them in their personal & professional life.
- To become a model human being.

BOOKS RECOMMENDED:

[1] D J Kemper, Introduction to Engineering Profession, 2/e, Suanders Publication, 1998.
[2] A S Chauhan, A Text Book of Social Science Jain Brothers 9/e, 2008.
[3] R C Agrawal, Principle of Political Science.
[4] NPTEL
[5] W.B. Werther & D. Chandler, Strategic Corporate Social Responsibility, Thousand Oaks, 2011.

B.E. (Civil Engineering)
Choice Based Credit System w.e.f. 2016-17

Semester-III

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	AVR3C1	Applied Mathematics - III	PC	3-1-0	4
2.	VLR3C2	Applied Mechanics & Strength of	PC	3-1-1	4+1(P)
3.	VLR3C3	Surveying	PC	3-1-1	4+1(P)
4.	VLR3C4	Construction Material & Technology	PC	3-1-1	4+1(P)
5.	VLR3G1	Structural Mechanics	GE	3-1-0	4
6.	VLR3L1	Drafting & Computational Skills	--	0-0-1	1
7.	SVR3S3	Life Management Skills	--	2-0-0	2
8.	VLR3V3	Comprehensive Viva – III	Virtual	0-0-4	4
			Total Credits		30

Semester-IV

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	AVR4C1	Engineering Geology	PC	3-1-0	4
2.	VLR4C2	Fluid Mechanics - I	PC	3-1-1	4+1(P)
3.	VLR4C3	Advanced Surveying	PC	3-1-1	4+1(P)
4.	VLR4C4	Design of RCC Structures – I	PC	3-1-1	4+1(P)
5.	VLR4G2	Environmental Engineering – I	GE	3-1-0	4
6.	VLR4L2	Lab of Engineering Geology	--	0-0-1	1
7.	SVR4S4	Communication Skills	--	2-0-0	2
8.	VLR4V4	Comprehensive Viva - IV	Virtual	0-0-4	4
			Total Credits		30

Semester-V

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	VLR5C1	Design of RCC Structures – II	PC	3-1-0	4
2.	VLR5C2	Fluid Mechanics - II	PC	3-1-1	4+1(P)
3.	VLR5C3	Quantity Surveying & Costing	PC	3-1-1	4+1(P)
4.	VLR5E1	Geotechnical Engineering - I	PE	3-1-1	4+1(P)
5.	VLR5G3	Water Resources Engineering	GE	3-1-0	4
6.	VLR5L3	Design Skills	--	0-0-1	1
7.	SVR5S5	Management for Engineers	--	2-0-0	2
8.	VLR5V5	Comprehensive Viva - V	Virtual	0-0-4	4
			Total Credits		30
Programme Electives for V Semester					
4.	VLR5E2	Advanced Rock Mechanics	PE	3-1-1	4+1(P)
4.	VLR5E3	Structural Mechanics & Vibrations	PE	3-1-1	4+1(P)
4.	VLR5E4	Physical Infrastructure and Planning	PE	3-1-1	4+1(P)

Semester-VI

SNo	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	VLR6C1	Structural Analysis - I	**PC**	**3-1-0**	**4**
2.	VLR6C2	Transportation Engineering - I	**PC**	**3-1-1**	**4+1(P)**
3.	VLR6C3	Design of Steel Structures – I	**PC**	**3-1-1**	**4+1(P)**
4.	VLR6E1	Geotechnical Engineering – II	**PE**	**3-1-1**	**4+1(P)**
5.	VLR6G4	Construction Planning & Management	**GE**	**3-1-0**	**4**
6.	VLR6L4	Technical Skills	**--**	**0-0-1**	**1**
7.	SVR6S6	Entrepreneurship Development & IPR	**--**	**2-0-0**	**2**
8.	VLR6V6	Comprehensive Viva - VI	**Virtual**	**0-0-4**	**4**
				Total Credits	**30**
Programme Electives for VI Semester					
4.	VLR6E2	<>	PE	3-1-1	4+1(P)
4.	VLR6E3	Design of Urban Water System	PE	3-1-1	4+1(P)
4.	VLR6E4	Rehabilitation of Structures	PE	3-1-1	4+1(P)

Semester-VII

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	VLR7PR	Project Phase - I	**--**	**0-0-7**	**7**
2.	VLR7C1	Transportation Engineering – II	**PC**	**3-1-1**	**4+1(P)**
3.	VLR7C2	Design of Steel Structures – II	**PC**	**3-1-1**	**4+1(P)**
4.	VLR7E1	Environmental Engineering – II	**PE**	**3-1-1**	**4+1(P)**
5.	VLR7G5	Structural Analysis – II	**GE**	**3-1-0**	**4**
6.	VLR7V7	Comprehensive Viva - VII	**Virtual**	**0-0-4**	**4**
				TOTAL CREDITS	**30**
Programme Electives for VII Semester					
4.	VLR7E2	Air pollution control and Management	PE	3-1-1	4+1(P)
4.	VLR7E3	Municipal solid waste Management	PE	3-1-1	4+1(P)
4.	VLR7E4	Systems engineering for civil engineers (Training to be undergone after VI semester)	PE	3-1-1	4+1(P)

Semester-VIII (Regular Mode)

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	VLR8P2	Project Phase - II	--	0-0-7	7
2.	VLR8C1	Design of Hydraulic And Irrigation Structure	PE	3-1-1	4+1(P)
3.	VLR8C2	Building Planning & Architecture	PE	3-1-1	4+1(P)
4.	VLR8E1	Disaster Modellingand Management	PE	3-1-1	4+1(P)
5.	VLR8G6	Construction Techniques	GE	3-1-0	4
6.	VLR8V8	Comprehensive Viva - VIII	Virtual	0-0-4	4
				TOTAL CREDITS	**30**
Programme Electives for VIII Semester					
2/3/4	VLR8E2	Design of Pre Stressed Concrete	PE	3-1-1	4+1(P)
2/3/4	VLR8E3	Instrumentation and Experimental	PE	3-1-1	4+1(P)
2/3/4	VLR8E4	Designof EarthquakeResistant Structures	PE	3-1-1	4+1(P)

Semester-VIII (Internship Mode)

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	VLR8I1	Industry Internship	--	0-0-18	18
2.	VLR8G1	Theory and Practice of Non Destructive Testing https://swayam.gov.in/courses/5515-jan-2019-theory-and-practice-of-non-destructive-testing	PE	4-0-0	4
3.	VLR8G2	Earth Sciences for Civil Engineering Part - I & II https://swayam.gov.in/courses/5377-jan-2019-earth-sciences-for-civil-engineering-part-i-ii	PE	4-0-0	4
4.	VLR8VI	Comprehensive Viva - VIII	Virtual	0-0-4	4
				TOTAL CREDITS	**30**

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">II Year B.E. (Civil Engineering)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AVR3C1: Applied Mathematics - III</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>DurationofTheory Paper:3 Hours</td></tr>
</table>

Learning Objectives: To develop an understanding of the underlying mathematics as a preparation for a specialist study of applications areas like, Laplace transform converts a given ordinary or partial differential equation into a polynomial- Partial Differential Equation can be used to describe a wide variety of phenomena such as sound, heat, electrostatics, fluid flow, elasticity and quantum mechanics, -Differential equation are used to calculate population growth, exponential decay of radioactive, substances, motion of a falling object, Newton's law of cooling and various electrical circuits; Statistics useful in risk assessment, random decrement analysis, to monitor remotely the structural health of a structure (such as a bridge, tall building, dams etc); Fourier analysis relevant for PDE-solving and probably the heat equation in three dimensions. The Fast Fourier Transform is employed as a method of Laplace transform inversion to solve problems in the civil engineering fields of viscous-elasticity and hydrology.
Numerical approach enables solution of a complex problem with a great number of very simple operations. It is useful to find the solution with use of computers making calculation easy and fast.

Pre requisites: Basic knowledge of determinants, matrices, differentiation and integration of functions and probability theory.

COURSE CONTENTS:

UNIT –1:
Laplace transform: Definition and properties of Laplace transform, Inverse Laplace Transforms. Convolution theorem, Application of Laplace transform in solution of ordinary differential equations, Simultaneous differential equations with constant coefficients.
UNIT – 2:
Statistics: Brief idea of sampling, t, F and χ^2 distributions and their applications, ANOVA, Statistical Quality Control (SQC), Control Charts, Sampling inspection, Acceptance sampling, Producer’s and Consumer’s risk, O. C. curve.
UNIT – 3:
Numerical solutions of algebraic and transcendental equations-Bisection method, Regula- Falsi method, Newton-Raphson method.
Solution of system of linear algebraic equation-Iterative methods: Gauss-Seidel and Gauss-Jacobi’s iterative methods.
Numerical Solutions of ordinary differential equations - Single and multi-step methods.
Numerical solution of partial differential equation: Classification of second order Partial differential equation, Solution of elliptic, parabolic and hyperbolic equations by Iteration method.
UNIT – 4:
Interpolation: Finite difference operator, Interpolation formula with equal and unequal intervals, Numerical differentiation, General quadrature formula, Numerical integration using Trapezoidal rule, Simpson’s 1/3rd rule, Simpson’s 3/8th rule, Weddle’s rule.
UNIT – 5:
Fourier series, Fourier Integral, Fourier transforms, Finite Fourier sine and cosine transform,

Parseval's theorem, continuous time and discrete time Fourier Transform, DFT and FFT, solution of partial differential equations with constant and variable coefficients.

Learning Outcomes:

Upon completing the course, students will be able to:

1. Apply Laplace Transform methods, useful in problems where mechanical/electrical driving force has discontinuities, is impulsive or is a complicated periodic function.
2. Learn how to apply Statistics in solving problems of modern Civil Engineering.
3. Apply Fourier Theory to analyze the quality of signals, how crosstalk, interference, noise, and distortion affect signal quality and to extract information from noisy signals.
4. Learn that many problems were analytical methods seems to fail, like solving highly nonlinear equation, numerical methods works very well.

Books Recommended:

1. B.S. Grewal, Engineering Mathematics, Khanna Publishers, 42/e, 2015.
2. Erwin. Kreyszig, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.
3. Gupta P.P. & Malik G.S., Calculus of Finite Differences and Numerical Analysis, Krishna Prakashan Mandir, Meerut, 21/e, 2006.
4. S.C.Gupta, Fundamentals of Statistics, Himalaya Publishing House, Mumbai, 6th Ed., 2009.
5. Freund John E, Mathematical Statistics, PHI, N.D., 7th Ed., 2010.
6. A.R. Vasishtha and R.K. Gupta, Integral Transforms, Krishna Prakashan Media Ltd, Meerut, India, 2000.
7. Murray R. Spiegel, Schaum's Outline of Fourier Analysis, McGraw-Hill, New York, 2004.
8. J. F. James, A Student's Guide to Fourier Transforms with Applications in Physics and Engineering, 3rd Edition, Cambridge University Press, 2011.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**II Year B.E. (Civil Engineering)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
SVR3S3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Life Management Skills	**2**	**-**	**-**	**2**	**-**	**-**	**2**
DurationofTheory Paper:3 Hours							

Learning Objectives:

- To provide an overview on Life Skills Management
- To make students able to understand themselves and their Role in Society
- To develop Healthy Personality
- To align them as complete self: Mind, Body and Soul

Pre requisites: Nil

COURSE CONTENTS:

UNIT-I

Basics of Life Skills Management: Understanding Self and Psychological Problems

Life Skills Management: Concepts and Applications, Basics of Brain-Structure, Hormones: Role of Hormones in changing mood and emotions, Role of genes, Understanding Memory.

Normal Self: Concept of Normality. Characteristics of Healthy Personality, Levels of Personality Dysfunctions, Ways to offset depression. Anxiety: Symptoms and Dealing with anxiety. Managing Anger, and Right attitude towards competition. Understanding the reasons behind OCD.

Unit-II

Managing Habits

Neurology of Habits, Developing Discipline in creating new habits, will-power, Causes of Addictions, Changing destructive habits, Habits of highly effective people.

Relaxation Techniques: Meditation, Effects of Meditation. Positive Attitude towards oneself, Equanimity in oneself, Happiness – a state of mind and related techniques.

Unit-III

Relationship Management

Emotional Intelligence: Core Domain: Self Awareness, Self Regulation, Social Awareness and Relationship Management. Relationship Management: Four Criteria for Effective Relationship Management, Competencies in the Relationship Management.

Ability to size-up situations, Role of Empathy Basics of Interpersonal Communication: Understanding and Observing Non-Verbal Behavior, Listening skills. Profiling Personal Environments. Understanding the types of Personality & their Motivating-Factors. Concepts of healthy relationships.

Unit-IV

Stress Management

Understanding the Physiology of Stress, Symptoms of Stress. Stress and Performance, effects of Stress on Learning, Oversensitivity, Focus and Concentration, Techniques of Stress Management. Concepts of Crisis Management, Dealing with Peer Pressure and Complexes, Assertiveness Training, Avoiding Groupthink, Dealing with distractions.

Unit-V

Mental Health and Wellness

Concept of Wellness: Measures to improve Wellness. Sleeping and Mind, Yoga and Exercise, Concepts of Balanced Diet, Importance of Recreational Practice, Role of art in wellness, How imagination shapes our Mind-Set. Wellness Programs for Professionals.

Learning Outcomes:

Upon completing the course, students will be able to:

- Handle Stressful Situations
- Understand their priorities
- Cope with different Psychological Problems
- Find Real Happiness

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Civil Engg.) (Full Time)			
Subject Code & Name:	**Instructions Hours per Week**			**Credits**			
VLR3C2:Applied Mechanics And Strength of Material	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To provide the fundamentals of the elastic behavior of the engineering materials.
- To provide the knowledge of Strength/Load Bearing capacity of Different Materials.
- To give basic concepts of different types of stresses & strain.
- To understand the applications of stress and strain in engineering field.
- To understand the geometrical properties of sections.
- To Analyze Pin Jointed Frames analytically and graphically.

Pre requisites: Engineering Physics, Engineering Mathematics.

COURSE CONTENTS

Unit I: Geometrical Properties of Sections

Centroid: Definition of centroid and Centre of gravity – Centroid of regular geometrical figures, Centroid of symmetric and anti-symmetric practical Sections, Built up structural sections- Numerical problems.

Moment of Inertia: Definition and notation of Moment of Inertia, Polar moment of inertia, Radius of gyration, Parallel and perpendicular axes theorems; M.I. of regular geometrical plane sections, MI of symmetric, asymmetric, and built up sections.

Unit II: Analysis of Trusses

Determinate and indeterminate frames, Classification of frames, Perfect and imperfect frames, Deficient and redundant frames, Assumptions, Analysis of statically determinate pin-jointed frames method of joints, method of section and Graphical method.

Virtual work: Concept and principle of virtual work, application of virtual work for problemsonbeam

Unit III: Simple Stress and Strain

Mechanical properties of materials**:** strength, stiffness, elasticity, plasticity, toughness, hardness, ductility.Normal stress and shear stress, Normal strain and shear strain, Hooke's law, Poisson's, Deformation of axially loaded bars of constant and varying section, Principle of superposition. Composite sections, Elastic constants, Relationship between elastic constants, Temperature stresses.

Unit IV: Principal Stresses and Principal Strains:

Principal Planes. Principal Stress. Stresses on an Oblique Section of a Body subjected to a Direct Stress in One direction and Two Mutually Perpendicular Directions. Stresses on an Oblique Section of a Body subjected to a Simple Shear Stress. Stresses on an Oblique Section of a Body Subjected to a Direct Stress in One Plane and Two Mutually Perpendicular Directions accompanied by a simple shear Stress. Mohr's circle of stress.

Unit V: Strain Energy

Resilience and Proof Resilience, Modulus of resilience, Strain Energy in Materials subjected to gradually applied load, suddenly applied load, impact load, strain energy stored in a body of varying section, strain energy stored in a body due to shear, Castigliano's theorem, Maxwell reciprocal theorem.

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Learn behavior of different material under different types of loading.
2. To understand the basic concepts of Principal Stress & Strain.
3. Learn basic fundamentals used in Designing a structural Component.

Books recommended:

1. R.K. Rajput, strength of materials
1. Nash; Strength of Materials (Schaum), TMH.
2. Rattan SS; strength of Materials; TMH
3. Negi; Strength of materials; TMH
4. Surendra Singh; Strength of Materials,
5. Ramamrutham; Strength of Materials,
6. Subramaniam; Strength of Materials; R; Oxford

List of Practical Assignment:

1. Performance of Tensile test to obtained tensile properties of the material.
2. Performance of Tensile test to obtained Stress-Strain curve for Different Material.
3. Performance of Compressive test to obtained Compressive properties of the material.
4. Performance of Shear test to obtained Shear properties of the material.
5. Performance of Bending test to obtained Bending properties of the material.
6. Performance of Brinell hardness Test.
7. Performance of Vickers Hardness Test.
8. Performance of Impact test to obtained Impact Strength of the materials.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">VLR3C3: Surveying</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:3 Hours</td></tr>
</table>

Learning Objectives:

- To make students aware with different advance surveying methodologies applied to carry out large scale survey works as modern instruments have largely changed the approach to survey works with the principles being same.
- To prepare the students to handle the errors they are likely to come across any large scale survey works

Unit-I

Introduction to Surveying:

Overview of Surveying, branches of surveying, principles of Surveying. Instruments Used for various measurements, Electronic Distance Measurement (EDM), Various EDM Instruments, Remote Sensing, GPS and GIS

Unit-II

Vertical Measurements:

Overview and terminologies, Leveling Instruments-Different Types of Levels, Leveling Staff. Temporary and Permanent Adjustments of a Level. Leveling: Classification Based on

Purpose of Leveling –Simple leveling, Differential or Compound or Continuous Leveling, Booking and Reducing Levels. Height of Collimation or Height of Instruments Method. Rise and Fall Method, Errors and Precautions in leveling, Balancing Back Sight and Foresight, Error Due to Earth's Curvature and Refraction, Field Problems or Difficulties in Leveling, Numerical Problems.

Unit-III

Angular measurements: Overview and terminologies, Principle of Compass, Types of Compass, Compass Surveying, Traversing, Traversing with Chain and Compass, Designation of Bearings, Calculation of Included Angle from Bearings, Calculation of Bearing From Included Angles Errors and Precautions in Compass Surveying, Local attraction, Correction to Measured Bearing for Local Attraction ,Adjustment of Closing Error. Magnetic Declination, Dip, Introduction Plane Table Surveying, Methods of Plane Table Surveying- Radiation Method and Intersection Method. Introduction to Theodolite. Numerical Problems

Unit –IV

Measurement of Area:

Measurement of Areas and Volumes: Introduction, Areas: Areas from Field Measurements –Area Consisting of Irregular Boundary, Area from Plan –Graphical Method, Measurement of area by Planimeter Errors & Precautions in Computation of Area.

Unit –V
Measurement of Volume:
Volumes: Measurement of Volume. –from Cross Sections, from Spot Levels , from Contours, Area of Sections, Capacity of a Reservoir, Elevation - Capacity Curve, Earthwork, Mass Diagram. Numerical Problems.

Learning Outcomes:

- On the successful completion of this course the students will get a diverse knowledge of surveying practices applied for real life problems.
- The students will learn to work with various surveying equipments, like, Theodolite, Total station, etc. in order to apply the theoretical knowledge to carry out practical field work.
- The knowledge of limits of accuracy will be obtained by making measurements with various surveying equipment employed in practice. H.

Reference Books: 1. Duggal, S. K., Surveying Vol. I & II, Tata Mcgraw Hill, New Delhi
2. Subramanian, R.,

3. Punamia, B.C., Surveying Vol. I, II & III, Laxmi Publications
4. Kanetkar, T.P. and Kulkarni, S.V., Surveying and Levelling Vol. I & II, Pune Vidhyarthi Gruh 5. Arora, K.R., Surveying Vol. I, II & III, Standard Book House. New Delhi 6. Basak, N.N., Surveying and Levelling, Tata Mcgraw Hill, New Delhi 7. Agor, R., Surveying and Levelling, Khanna

Devi Ahilya University Indore, India Institute of Engineering & Technology				II B.E.(Civil Engineering) (Full Time			
Subject Code and Name	**Instruction Hours Per Week**			**Credits**			
VLR3C4:Construction Materials and Technology	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 hours Hours	**3**	**1**	**2**	**3**	**1**	**1**	**5**

Learning Objectives:

1. To introduce students to various materials commonly used in civil engineering construction and their properties.
2. To make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities.
3. To understand the properties of ingredients of concrete, test and concrete mix design.
4. To study the behavior of concrete at its fresh and hardened state.

Pre-requisites: Engineering Chemistry:

COURSE CONTENTS

UNIT I

Lime: Impurities in limestone, Classification, Slaking and hydration, Hardening, Testing, Storage, Handling, IS Specifications, Uses Bricks: Classification, Characteristics of good bricks, and Ingredients of good brick

Earth, Harmful substance in brick Earth, Different forms of bricks, testing of bricks. Mortars: Classification, Uses, Characteristics of good mortar, Ingredients. Cement mortar, Lime Mortar, Lime cement mortar, special mortars

UNIT II

Glass: Definition, constituents, manufacture, classification commercial forms, uses of different types of Glasses.

Timber: Definition, Classification, Characteristics of good Timber, uses of Timber, Physical and Mechanical properties, defects, Seasoning, Preservation, Veneers , Plywood, Fiber Boards, Particle Boards, Chip Boards , Black Boards, Button Board and Laminated Boards, Applications of wood and wood products. Plastics: Classification, Ingredients, General properties, fabrication of plastic products.

UNIT III

Concrete Materials: Cement: OPC: Composition, PPC, Slag cement, Hydration, Setting time.
Aggregates: Classification, Characteristics, Deleterious substances, Soundness,
Alkali –aggregates reaction, Fine aggregates, coarse aggregates, testing of aggregates.
Admixtures, types and properties, Concrete, Workability, segregation and Bleeding, Tensile and Compressive Strength, Modulus of Elasticity, Effect of Shrinkage and Creep. Mixing and Transporting, Placing, Compaction, Finishing, Curing, Quality Control, Design of Concrete Mixes.

UNIT IV

Paints, Enamels and Varnishes: Composition of oil paint, characteristic of an ideal paint, preparation of paint, covering power of paints, Painting: Plastered surfaces, painting wood surfaces, painting metal Surfaces. Defects, Effect of weather, enamels, distemper, water wash and color wash, Varnish, French polish, Wax Polish.Plastering and Pointing: Plastering with cement mortar, Defects in plastering,Pointing, white washing, color washing, Distempering.

UNIT V

Foundations: Function of Foundations, Essential requirement of good foundation, Different types of shallow and deep Foundations.
Brick masonry: Definitions, Rules for bonding, Type of bonds – stretcher bond,
Header bond, English bond, Flemish Bond, Comparison of English Bond and
FlemishBond. Doors and Windows: Common types of doors and windows of timber and metal.
Flooring: Components of a floor, selection of flooring materials, Brick flooring, Cement concrete flooring, mosaic, marble, Terrazzo flooring, Tiled roofing.Roofs: Types, Pitched roofs and their sketches, Lean –to roof, King Post –Truss, Queen post truss and Simple steel Truss, Roof Covering materials: ACSheetsGI sheet

Learning Outcomes:

- Knowledge on properties of materials for concrete by suitable test and mix design of concrete.
- Compare the properties of most common and advanced building materials.
- Understand the typical and potential applications of these material.
- Understand the importance of experimental verification of material properties
- Will have understanding of different construction techniques, practices and equipments. They will be able to plan the requirements for substructure and superstructure a construction.

Books & References Recommended:

1. Surendra Singh, Engineering Materials, Vikas Publishing House.
2. Rangwala, Engineering Materials, Charatar Publications.
3. Shetty M.S., Concrete Technology, Theory and Practical, S. Chand & Co. Ltd., New Delhi.
4. Sushil Kumar, Building Construction.

List of Experiments:

1. To determine the Compressive Strength of Modular Brick.
2. To determine the Water Absorption of Modular Brick.
3. To determine the Fineness of Cement.
4. To determine the Consistency of Cement.

5. To determine Initial and Final Setting Time of cement by Vicat Apparatus.
6. To determine compressive strength of Cement.
7. Sieve Analysis of Fine and Coarse Aggregates and determination of Fineness Modulus.
8. To determine Flakiness and Elongation Index of Aggregates.
9. To determine workability of Fresh Concrete by Slump Cone Test.
10. To determine Compressive Strength of Hardened Concrete.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">VLR3G1:
Structural Mechanics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: Hours</td></tr>
</table>

Learning Objectives:

- To analyze determinate beams and sketch S.F. and B.M. diagram.
- To derive simple bending equation and understand its applications.
- To Analysis of propped cantilever & fixed beam and draw SFD, BMD.
- To understand the behavior of columns under different conditions
- To understand the concept of unsymmetrical bending

Pre requisites: Engineering Mechanics, Strength of materials

COURSE CONTENTS

Unit I: Shear force and Bending Moment

Types of beams, Types of supports, shear force and bending moment at any cross section of a beam. Sketching of shear force and bending moment diagrams for cantilever, simply supported and over hanging beams for any type of loading, Significance of point of contra flexure, Relationship between rate of loading, shear force and bending moment.

Unit II: **Stresses and Deflection in beams**

Theory of simple bending: Equation of bending. Neutral axis, Section-Modulus, Bending & shear stress distribution across a section in Beams.
Slope and deflection of beam by Double Integration Method. Conjugate Beam Method, Area Moment Method,

Unit III: Fixed and Continuous Beams

Beams fixed at ends, Beams of varying Cross-Sections, Partially Fixed at Ends. Effect of Settlement of Supports. Three Moment Theorem for Continuous Beams, Beams of uniform and varying Cross-Sections. Effect of Settlement of Supports.

Unit IV: Columns and Struts

Behavior of axially loaded short, medium and long column members, Buckling load, Euler's theory, Different

End conditions, Empirical formulae, Rankine's formula Straight line formula, Secant formula for columns subjected to eccentric loading.

UNIT V: Unsymmetrical Bending and Curved Beam

Unsymmetrical Bending: Principal Moment of Inertia, Unsymmetrical Bending of Standard Structural Section, Change in Orientation of Neutral axis-plane, Shear Centre.
Curved Beams: stresses due to bending by Winkler Bach theory rectangular, trapezoidal, circular solid sections, crane hook problem.

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Learn behavior of different beams under different types of loading.
2. Understand the basic concepts of columns and struts.
3. Learn the distribution of stresses along a structural Component.
4. Design the column & struts used in Mechanical as well as Civil Engineering.

Books recommended:

1. R.K. Rajput, strength of materials
1. Nash; Strength of Materials (Schaum), TMH.
2. Rattan SS; strength of Materials; TMH
3. Negi; Strength of materials; TMH
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">VLR3L1:
Drafting and
Computation Skills</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">1</td><td rowspan="2">1</td></tr>
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Learning Outcomes:

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3. Negi; Strength of materials; TMH
4. Surendra Singh; Strength of Materials,
5. Ramamrutham; Strength of Materials,
6. Subramaniam; Strength of Materials; R; Oxford

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (CIVIL)			
Subject Code & Name	Instructions Hours per Week			Credits			
AVR4C1	L	T	P	L	T	P	Total
Engineering Geology	3	1	2	3	1	1	5
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- Origin, Internal and surface structures of the earth.
- Identification of the minerals types of clay minerals their properties and effects on engineering project.
- Types of rock (Igneous, Sedimentary, and Metamorphic), Civil engineering importance of rock forming minerals.
- Sedimentary processes (Weathering, erosion, deposition), Metamorphism and volcanic eruptions.
- Geological structures (Joint, veins, crack, faults, and fold), reasons of formation for each type and their side effects on the engineering projects.
- Types of Dams and Tunnels.

COURSE CONTENTS

UNIT-1

Introduction: Objects and scope of engineering geology. The origin, age and internal structure of the earth. Volcanoes, earthquakes, continental drift and isostasy, weathering, denudation and deposition, wind, river, glacial and marine erosion.

Soil formation, soil profile, geological classification of soil and concept of plate tectonics.

UNIT-2

SECTION A:- mineralogy and crystallography:

Fundaments of mineralogy, study of common rock forming minerals, their origin, occurrence and physical properties for identification. Elements of crystallography and introduction to crystal systems.

SECTION B:-Petrology:

Composition of earth crust. Igneous sedimentary and metamorphic rocks and their mode of occurrence, structure and texture, characteristics, classification of rocks and their importance in civil engineering.

SECTION C: - Stereography and Indian geology:

General principles of stratigraphy, geological time scale, division of India in three units. Study of important Geological formation of the peninsular India. Archeans, Dharwars, Cuddapah, Vindhyan, Gondwana systems, Deccan traps.

UNIT-3

SECTION A:- Rock mechanics

Rock classification, engineering classification of intact rocks, rock quality designation, mechanical properties of rocks, tensile, compressive, shear strength, hardness, brittle failure of rock, stress deformation characteristics of rock masses, deformation modulas and elastic constants laboratory tests on rock spacing, point load index text, high pressure permeability test, triaxial test, brazillian test, instu test on rocks.

SECTION B:-Structural geology:
Structures related to rocks. Dip strike and out crops. Classification and detailed studies of geological structures i.e.,. Folds, fault, joints unconformity and their importance in civil engineering.

UNIT-4
Applied geology:-
Engineering properties of rocks and their relation to rock mass deformation. Physical characters of building stones and road metals.
Influence of geological conditions of foundation and designs of buildings, stability of hill slopes and transportation routes. Geology of reservoir and dam sites, it's location, strength, stability and water tightness of foundation rocks, their depth, physical characters and effects of structural features.
Tunnels-Effect of the structure of rocks competency of rocks, suitable location of a tunnels, problem of ground water seepage.

UNIT-5
Hydrology:- hydrology cycle, ground water in hydrological cycle. Origin of ground water and springs. Geological structures favoring ground water occurrence. Classification of aquifers, ground water provinces of India- their aquifers characteristics. Ground water occurrence and flow in Igneous, sedimentary and metamorphic rocks. Geophysical prospecting and water logging.
Books Recommended:
1. Subinoy Gangopadhyay, Engineering geology: Oxford university press.
2. Mukerjee P.K.A, Textbook of Geology, World Press Pvt. Ltd., Calcutta.
3. Legget R.F., Geology and Engineering, McGraw Hill.
4. Krgnine D.P. and Judd W.R., Principles of Engineering Geology, Mchgraw Hill

List of Experiments (Expandable)
1. Identification of simple rock forming minerals.
2. Identification if rock.
3. Simple map Exercises.
4. Field Visit/ Geological Excursion.

Learning Outcomes: The goal of the course is to increase the student's knowledge and understanding of geology, and apply this knowledge to engineering projects such as dams, landfills, rock quarries, roads, tunnels and slopes.

Another goal is to increase the students' presentation skills, both oral and in written.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">II Year B.E. (CIVIL ENGG.)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SVR4S4
COMMUNICATION SKILLS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td></tr>
<tr><td>Duration of Theory Paper: 2 Hours</td></tr>
</table>

Learning Objectives: introduced to skills involved in making a presentation at a conference.

- To help students acquire the basics of interpersonal skills and public speaking.
- To improve their communication skills and ability to understand others
- To provide the knowledge of Professional Speaking.
- To develop skills involved in making a presentation at a conference.
- To develop understanding about Dressing Sense, Telephone and Mobile Etiquettes.

COURSE CONTENTS

UNIT-I

Introduction to Communication: Purpose of Communication; Process of Communication; Importance of Communication in Business; Differences between Technical and General Communication; Barriers to Communication; Measures to Overcome the Barriers to Communication. Objectives and Principles of Communication.

UNIT-II

Types of Communication & Listening Skills: Types of Communication; Verbal Communication-Importance of verbal communication- Advantages of verbal communication, Significance of Non-verbal Communication. Listening Process: Classification of Listening, Purpose of Listening, Common Barriers to the Listening Process, Measures to Improve Listening. Listening as an Important Skill in Work Place.

UNIT-III

Communication Network: Scope and Types of Communication Network; Formal and Informal Communication Network; Upward Communication; Downward Communication; Horizontal Communication; Diagonal Communication.

UNIT-IV

Oral Communication Skills Attire and Etiquettes: Oral Business Presentation and Pubic Speaking: Self-Monitoring as tool for Public Speaking; Purpose, Analysis of Audience, Steps in Making a Presentation, Delivering a Presentation. Dressing Sense and Telephone/Mobile Etiquettes.

UNIT-V

Employment Communication – Job Interview: Importance and Factors Involving Job Interview; Characteristics of Job Interview; Job Interview Process; Job Interview Techniques- Manners and etiquettes to be maintained during an interview. **Group Discussion;** Purpose, Methods and Importance

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Analyze different Communication Pattern.

2. Understand Audience while speaking publically.
3. Implement Interview Technique and Group Discussion.
4. Develop understanding toward making own Style of Communication.

Suggested Readings:

1. Pal, R. & Korlahalli, J.S. Essentials of Business Communication, Sultan Chand & Sons, New Delhi.
2. Sethi, J & et al. A Practice Course in English Pronunciation, Prentice Hall of India, New Delhi.
3. Sen, Leena. Communication Skills, Prentice Hall of India, New Delhi.
4. Prasad, P. Communication Skills, S.K. Kataria& Sons.
5. A.S. Hornby's. Oxford Advanced Learners Dictionary of Current English, 7th Edition.
6. Bill Scott, The Skills of Communication, Bombay, Jaico
7. Ronald E. Dulek & John S. Fielden, Principles of Communicatin, New York, McMillan.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">II Year B.E.(CIVIL ENGG)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">VLR4C2
Fluid Mechanics - I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:
The course on fluid mechanics is devised to introduce fundamental aspects of fluid flow behaviour. Students will learn to develop steady state mechanical energy balance equation for fluid flow systems, estimate pressure drop in fluid flow systems and determine performance characteristics of fluid machinery.

COURSE CONTENTS

UNIT-1

Introduction: Scope and Application of Fluid Mechanics: Physical Properties of fluids; density; specific weight, specific volume, specific gravity, viscosity, dynamic and kinematic viscosity, Newton's law of viscosity, classification of fluids, compressibility, cohesion, adhesion, surface tension, capillarity, vapour pressure.

Equilibrium of fluids : Pressure at a point, variation, barometer, gauges, manometers, hydrostatic forces, equilibrium of fluid in motion, floatation – stability of floating and submerged bodies, fluid masses subjected to rotation, free and forced vortices.

UNIT-II

Kinematics of Fluid flow: Velocity field, classification of flows, stream, path and streak lines, continuity equation, stream function, velocity potential, flow-nets.

Dynamics of Fluid flow: Eulers equation of motion, Bernoulli's equation, pilot tube, prandil tube, flow through openings- orifices, mouth pieces etc., flow through notches weirs, empirical formulae.

UNIT-III

Dimensional Analysis & Model Study: Units and dimensions, dimensional homogeneity, Buckingham II Theorem, dimensionless numbers, principles of similitude and applications.

UNIT-IV

Flow through Pipes: Laminar flow, flow between parallel plates, measurement of viscosity, reynold's experiment, turbulent flow in pipes, solution of pipe flow problems, flow in pipe-Network- Handy Cross Method, Losses in pipes, measurement of pipe flow- orifice, nozzle, bend meters, rotameters, concept of water hammer and surges.

UNIT-V

Flow through Open Channels: classification, geometric elements, continuity, energy and momentum equations, pressure, velocity distributions, uniform flow, concept of normal depth, chezy, manning and other formulae, best hydraulic sections, specific energy, specific force, hydraulic jump and its characteristics, gradually varied flow, surface profiles, dynamic equations.

[Sessional Works: Experiments on basis principles of fluid mechanics, Practical Exams: experimental and oral exam based on above sessional work, measurement of flow in open channels]

Books & References Recommended:

Text Books:

1. Nagaratnam S, *Fluid Mechanics*
2. Jain A K, *Fluid Mechanics*
3. Subramanaya K, *Fluid Mechanics*
4. Modi P N & S M Seth, *Hydraulics & Fluid Mechanics*

Reference Books:

1. Chow V T, *Open Channel Hydraulics*.
2. Rangaraju K G, *Flow through open channels*
3. Streeder V L, *Fluid Mechanics.*

Learning outcomes:

- The student will understand stress-strain relationship in fluids, classify their behavior and also establish force balance in static systems. Further they would develop dimensionless groups that help in scale-up and scale-down of fluid flow systems. (Unit I)
- Students will be able to apply Bernouli principle and compute pressure drop in flow systems of different configurations (Unit II)
- Students will compute power requirement in fixed bed system and determine minimum fluidization velocity in fluidized bed (Unit III)
- Students will be able to describe function of flow metering devices and apply Bernoulli equation to determine the performance of flow-metering devices
- Students will be able to determine and analyze the performance aspects of fluid machinery specifically for centrifugal pump and reciprocating pump

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">II Year B.E. (Civil Engineering)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">VLR4C3:Advanced Surveying</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>DurationofTheory Paper:3 Hours</td></tr>
</table>

Learning Objectives:

- To make students aware with different advance surveying methodologies applied to carry out large scale survey works as modern instruments have largely changed the approach to survey works with the principles being same.
- To prepare the students to handle the errors they are likely to come across any large scale survey works.

UNIT-I

Modern equipments for surveying : Digital levels and theodolites, Electronic Distance measurement(EDM), Total Station and Global Positioning Systems (GPS), Digital Plannimeter .

UNIT-II

Surveying Astronomy: Definitions of astronomical terms, coordinate systems for locating heaven ly bodies, geographic, geodetic, geocentric, Cartesian, local and projected coordinates for earth resources mapping, convergence of meridian, parallel of latitude, shortest distance between two points on the earth, determination of latitude and longitude.

UNIT-III

GPS Surveying: Introduction & components of GPS, Space segment, control seg ment and user segment, Elements of Satellite based surveys-Map datums, GPS receivers, GPS observation methods and their advantages over conventional methods. Digital Terrain Model (DTM) : Topographic representation of the terrain and generation of DTM on computers using spot heights and contour maps.

UNIT-IV

Photogrammetry : Principle, definitions and classifications of terrestrial and aerial photogrammentry, flight planning for aerial photography, scale and relief displacements of vertical aerial photographs, stereoscopic vision on vertical photographs, computation of position, length and elevations of objects using photographs and photo mosaic.

UNIT-V

Remote Sensing: Principle, components, classification, remote sensing data acquisition process, different types of remote sensing satellite imagery with special relevance to Indian Remote Sensing Satellites (IRS) and applications. Geographic Information Systems (GIS) : Definition, components and advantages.

Learning outcomes:

- After studying this subject students will be able to:
- Conduct tacheometry and geodetic survey
- Apply principles of theory of errors for correction of measurements
- Apply knowledge of astronomy for solving civil engineering problems.
- Explain use of aerial camera, aerial photographs and procedure of aerial survey.
- Utilize stereoscope and parallax bars.
- Utilize total station and other modern survey instruments.
- Apply GIS in solving engineering problems

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">II Year B.E. (Civil Engg.)
(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">VLR4C4 :
Design of RCC Structures – I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives

- To bring about an understanding of the behavior of reinforced concrete.
- To bring about an understanding of the design philosophies.
- To perform analysis and design of reinforced concrete members.

COURSE CONTENTS

Unit-I.

Basic Principles of Structural Design: Basic concepts of Reinforced concrete, Various properties of concrete and reinforcing steel, Introduction to working stress method and limit state methods of design, partial safety factor for load and material. Calculation of various loads for structural design, Partial load factors. Neutral Axis Depth, limiting values of neutral axis for different grades of steel, Balanced, Under Reinforced and Over Reinforced Sections, Limit state of collapse in flexure, assumptions, stress strain curves for concrete and steel, Stress block, Moment of Resistance of beam Sections.

Unit-II

Design of Beams by L.S.M: Limit state of collapse in shear, design shear strength of concrete, design strengths of vertical / inclined stirrups and bent up bars in, Design of beam for flexure, shear and bond. Design of singly reinforced rectangular beams, Doubly reinforced rectangular & Flanged Beams, Lintel, Cantilever, simply supported and continuous beams, Beams with compression reinforcement, Redistribution of moments in continuous beams.

Unit-III

Design of slabs by L.S.M : Classification of slabs , Effective spans ,Imposed loads on slabs (IS: 875), strength and stiffness requirements, minimum and maximum permitted size, spacing and area of main and secondary reinforcement as per IS 456 -2000, Design of one way cantilever, simply supported, slabs and sunshades, Design of continuous slabs using B.M coefficients, check for stiffness, curtailment of tension reinforcement, Tension and torsion reinforcement requirement.

Unit -IV.

Design of columns by L.S.M: Classification of Columns, Limit state of collapse in compression, assumptions, limiting strength of short**,** axially loaded compression members, effective length of compression members, slenderness limits for columns, minimum eccentricity for column loads, longitudinal and transverse reinforcement as per I S 456-2000, Design of axially loaded short columns with lateral ties / helical reinforcement

Unit -V.

Design of column footings Types of footings, Footings with uniform thickness and sloped footings, minimum thickness, critical sections, minimum reinforcement, distribution of reinforcement, development length, anchorage, cover, minimum edge thickness requirements as per IS 456-2000 – Design of isolated footing (square and rectangular) and combined footings by limit state,

Unit -V.

Design of Staircases by L.S.M: Types of stairs according to geometry and structural behavior planning a staircase, effective span of stairs, effective breadth of flight slab, distribution of loads on flights Staircases with waist slab having equal and unequal flights with different support conditions, Slab less tread-riser staircase.

NOTE: - All the designs for strength and serviceability should strictly be as per the latest version of

IS:456. Use of SP-16 (Design aids)

Suggested Books: -

1. Plain & Reinforced Concrete Vol. I & II – O.P. Jain & Jay Krishna
2. Limit State Design by P.C.Varghese ; Prentice Hall of India, New Delhi
3. Design of Reinforced Concrete Elements by Purushothman; Tata McGraw Hill, New Delhi
4. Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH
5. Reinforced Cement Concrete by P. Dayaratnam, Oxford and IBH
6. Plain & reinforced concrete - Rammuttham
7. Plain & reinforced concrete – B.C. Punnia
8. Structural Design & Drawing by N.K.Raju.

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Understand the general mechanical behavior of reinforced concrete.
2. To understand the principles involved in analysis and design of reinforced concrete structures.
3. Analyze and design reinforced concrete flexural members.
4. Analyze and design reinforced concrete compression members.
5. Analyze and design for vertical and horizontal shear in reinforced concrete.
6. Analyze transfer and development length of concrete reinforcement.
7. Analyze and design for deflection and crack control of reinforced concrete members.
8. To employ the code of practice for design of reinforced concrete structural members and elementary structural systems.

<table>
<tr><td colspan="4">Devi Ahilya University Indore, India
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(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instruction Hours Per Week</td><td colspan="4">Credits</td></tr>
<tr><td>VLR4G2
Environmental Engineering-I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td><td>3</td><td>1</td><td>0</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
</table>

Learning Objectives:

1. To provide knowledge of Water Supply scheme to fulfil public demand.
2. To learn the Water treatment technological options for different quality of water.
3. To learn the sewerage treatment process for community waste water.
4. To know about the different pipe material and sewer materials and should be able to select the most appropriate material.

Pre-requisites: Engineering Chemistry.

COURSE CONTENTS

Unit – I

Planning for Water Supply System:

Public water supply system, planning, objectives, Design period, Population forecasting-different methods limitations and field practice., Water demand, fluctuation in demand (daily, hourly and seasonal), Sources of water and their characteristics,

Water Quality Characterisation and standards, types of impurities and their sources and effects, water borne diseases, examination of water (physical, chemical, bacteriological and sanitary), significance of important parameters, Water Quality Index.

Unit - II

Conveyance & Distribution System:

Water supply Intake structures, Pipes and conduits for water, Materials and class of pipes-specification, merits & demerits of pipes Cast iron ,mild steel pipes, asbestos cement, R.C.C and pre-stressed pipes. Selection of pump and pipe materials, types of pumps, Types of distribution systems, layout of Distribution System, Analysis of Water Distribution system by Hardy Cross Method.

Unit – III

Water Treatment:

Objectives of water treatment, unit operations and processes. Methods of water treatment, theory and design of sedimentation, coagulation, filtration, disinfection, aeration, water softening, modern trends in sedimentation & filtration, miscellaneous methods of treatment.

Unit-4

Quality of Waste Water

Characterisation & composition physical, chemical, microbiological, primary parameters of pollution BOD, COD, total solids, volatile solids total organic carbon, nitrogen & its forms, pH, Chlorides, Colour, Toxic Substances, Micro Organisms etc.

Unit - 5

Design of Sewerage System:

Types of systems, sanitary sewers, storm sewers, combined and partially combined sewers, quantity of sewerage, infiltration, design period, factors, self cleaning velocity, maximum velocity depth/section of sewers, minimum size, slope, alignments. Sewer Appurtenances like Manholes, drop manhole, lamp hole, ventilating shafts etc, Use of Manning's Formula, Partial Flow in Sewers, Design of Sewers from Flow Charts, Pumping of Sewage.

Learning Outcomes: upon completion of this course the students will be able to

- Design the Water Treatment plant for a given population and characteristics of raw water.
- Project the population of community for given design period by different methods.
- Design the Sewerage system for domestic waste water.
- To understand the layout of distribution system to supply water to community.

Books & References Recommended :

1. Kshirsagar K.R., *Water Supply Engg*.
2. Kshirsagar K.R., *Sanitary Engg*.
3. Hussain, *Water Supply and Sanitary Engg*.
4. Birdi G.S., *Public Health Engg*.
5. Punmia, B.C. *Water Supply Engineering* - Laxmi Publications (P) Ltd. New Delhi
6. Garg S.K., "Environmental Engineering", Vol 1,Khanna Publishers, New Delhi 2005.
7. Garg S.K., Environmental Engineering", Vol 2, Khanna Publishers, New Delhi
8. Relevant IS Codes.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (CIVIL)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
SVR5S5: MANAGEMENT FOR ENGINEERS	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	2	**-**	**-**	**2**	**-**	**-**	**2**
Duration of Theory Paper: 2 Hours							

Learning objectives: To prepare the engineering students for a successful carrier by understanding the concepts of Management.

LEARNING OBJECTIVES:

1. Understanding Management Concepts.
2. Acquire the knowledge of business environment.
3. Managing behavior of human at organizations with modern management concepts.
4. Understanding business ethics and social responsibility as Engineers.
5. To develop the capacity to lead in a variety of circumstances.

UNIT I – INTRODUCTION TO MANAGEMENT

Basic concepts of management: Definition, Essence, Principles, Roles, Level; Functions of management: Planning, Organizing, Staffing, Directing, Coordinating and controlling; Organizational efficiency & effectiveness; Roles of manager, Skills required in a manager.

UNIT II – MANAGEMENT AND SOCIETY

Organization: Types and Structure; Business environments: Political, Economic, Legal, Social, Technological and International environment; Designing effective organization: Span of management, Delegation, Centralization and Decentralization; Formal and Informal organization.

UNIT III – MANAGEMENT OF HUMAN AT WORK

Human Resource Development: Interrelationship of managerial function; significance of staffing, Personnel management: Recruitment, Training, Performance appraisal, Employee retention; Managerial communication; Motivating individuals and work groups, Leadership for managerial effectiveness.

UNIT IV – MANAGEMENT ETHICS FOR ENGINEERS

Business ethics, Social responsibility of Business: Economical, Legal, Ethical and Philanthropic; Ethical responsibilities of Engineers toward society; Business and environment protection; Impact of engineering on society.

UNIT V – MODERN MANAGEMENT CONCEPTS

MBO: Principles, steps, advantages and disadvantages; Strategic management-SWOT analysis; Team Building: Definition of Team, Team Formation, Approaches, Goal Setting and Communication among Team Members. Models of relationship between professional and client.

Case Study

LEARNING OUTCOMES:

At the end of the course, students should be able to do the following:

1. Identify the key management processes and the relevance of management in organisations.
2. Understand the key management skills required in organisations and how these might be applied.
3. Evaluate their own managerial skills and the ways in which these might be developed.
4. Understand Team members while working with people from different background.

BOOKS RECOMMENDED:

[1]. R.D Agrawal, Organization & Management.1/E PHI 1997.
[2]. Tripathy PC And Reddy PN, Principles of Management, Tata McGraw-Hill, 5th Edition, 2012.
[3]. Dinkar Pagare, Principles of Management, Sultan Chand & Sons, 2000.
[4]. G.K.Vijayaraghavan and M.Sivakumar, Principles of Management, Lakshmi Publications, 5th Edition, 2009.
[5]. Harold Koontz & Heinz Weihrich, Essentials of Management – An International perspective,8th edition. Tata McGraw-Hill, 2009.
[6]. Charles W.L. Hill and Steven L McShane, Principles of Management, Tata Mc Graw-Hill, 2009.
[7]. Fleddermann, C.B., "Engineering Ethics," Pearson Prentice Hall, Upper Saddle River, NJ, 2004.
[8]. Stephen P. Robbins, Timothy A Judge, Sanghi Seema Organizational Behavior, Pearson Education 13th Ed 2009.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Civil) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
VLR6C1 **Structural Analysis - I**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**0**	**-**	**-**	**-**	**4**
Duration of Theory Paper: **3 Hours**							

Objective of the subject:

- To understand the concept of determinate and indeterminate structures, analyses of determinate and indeterminate structures.
- To understand the principle of virtual work and the application of influence line diagrams in structural analysis problems.

Prerequisite(s): Mechanics of Materials.

COURSE CONTENTS

Unit I:

Fundamental Concepts In Structures: Definition and Determination of Static and Kinematic Indeterminacy , Beams, Trusses and Frames , Degree of Freedom, Equilibrium and Kinematic Stability , Principle of Superposition , Basic Methods of Structural Analysis. **Virtual work and Energy Principles:** Principles of Virtual work applied to deformable bodies, strain energy and complementary energy, Energy theorems, Maxwell's Reciprocal theorem, Analysis of Pin-Jointed frames for static loads.

Unit II:

Slope Deflection Method: Analysis of Continuous beams and Rigid plane frames with and without sway.

Moment Distribution Method: Stiffness and Distribution factors, Carry over factors, Analysis of Continuous beams, Plane rigid frames with and without sway

Kani's method and Column analogy method applied to indeterminate beams.

Unit III:

MovingLoadsAndInfluenceLines

Effect of moving load , Description of Influence line , Influence line for Reaction, Shear Force and Bending Moment , Load position , Absolute maximum bending moment , Muller Breslau's Principle , Application to beams with one degree of indeterminacy , Influence line for forces in members of determinate trusses.

UnitIV :

Analysis of Three Hinged and Two Hinged Arches : Parabolic and Circular principles of analyzing Fixed Arches, Influence lines for Three and Two hinged arches for Horizontal thrust, Shear force and B.M. at any section , absolute maximum bending moment, axial thrust **Suspension bridges**: Length of Cable, Maximum tension ,Types of supports, Forces in Towers,two hinged and three hinged stiffening girders, influence line diagrams for bending moment

Unit V:

Indeterminate Trusses : Energy method , application to analysis of indeterminate pin jointed Plane trusseslackoffittemperatureeffects.

REFERENCE

1. Menon, D., “Structural Analysis”, Alpha Science International, Limited, 2008.
2. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, “Theory of Structures”, Laxmi Publications, New Delhi, 12th Edition, 2004.
3. Ghali A & Neville M., Structural Analysis - A Unified classical and matrix Approach, Chapman and Hall, New York.
4. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
5. Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.
6. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
7. Pandit .G.S, “Theory Of Structures”, Vol-I, McGraw-Hill Education (India) Pvt Limited, 1999.
8. Norris C.H., Wilbur J.B. and Utku. Elementry Structural Analysis, McGraw Hill International, Tokyo
9. Timoshenko. S.P & Young. D.H, “Theory of Structures”,. McGraw Hill Book Company, International Ed. 1965.

Course Outcomes:

At the end of the course, the student will be able to:

1. Analyze one dimensional and two dimensional problems using classical methods
2. Analyze indeterminate structures
3. Analyze structures for gravity loads, moving loads and lateral loads

Devi Ahilya University, Indore, India Institute Of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
	L	**T**	**P**
VLR6C2 : Transportation Engineering - I	**PC**	**3-1-1**	**4+1(P)**

Objective of the subject:

- To know about railway planning and geometric design of railways.
- To know about highway planning and geometric design of roads.
- To know about highway maintenance and public transportation systems.

Prerequisite(s):NIL

COURSE CONTENTS

Unit I: **Railway:** Introduction, Rails, Sleepers, Rail fastenings. fish bolts, spikes, bearing plates, chain keys, check and guard rails, Requirement of good ballast, various materials used as ballast, quantity of ballast, different methods of plate laying, material trains, calculation of materials required, relaying of track.

Unit II: **Railway:** Geometric Design, Station & Yards; Points and Crossings & Signaling and interlocking: Formation, cross sections, Super elevation, Equilibrium, Cant and Cant deficiency, various curves, speed on curves. Types, locations, general equipment, layouts, marshaling yards, Definition, layout details, design of simple turnouts, Types of signals in stations and yards, principles of signaling and inter-locking.

Unit III:

HighwayPlanningandAlignment

Different modes of transportation , historical Development of road construction, Highway Development in India , Classification of roads, Road pattern , Highway planning in India, Highway alignment , Engineering Surveys for alignment , Highway project.

Unit IV:

GeometricDesignofHighways

The highway crosses sectional elements, Sight Distance ,Types of sight distances, Design of horizontal alignments , Super elevation, Widening of Pavements on horizontal curves- transition Curves, Design of Vertical alignments, Gradients- summit and Valley Curves.

UNIT V:

HighwayMaintenanceandPublicTransportation

Importance of highway drainage ,Surface Drainage, Subsurface drainage , Road construction in water logged areas, maintenance of various roads, History and present state of public transportation, role of public transportation in urban development, transit systems, route development.

REFERENCES

1. Khana .S.K, Justo .C.E.G – "Highway Engineering," Nemchand & Bros, Rookies. 2001.
2. Chakroborty, P. and A. Das Principles of Transportation Engineering, Prentice Hall of India Pvt. Ltd, New Delhi, India, 2005.
3. Rangwala SC; Railway Engineering; Charotar Publication House, Anand
4. Railway Engineering by Arora & Saxena - Dhanpat Rai & Sons

5. Kadiyali .L.R, “Traffic Engineering And Transport Planning”, Khanna publishers, Delhi,2009.
6. Ministry of Road Transport and Highways. Specifications for Road and Bridge Works, Fourth Edition, Indian Roads Congress, New Delhi, India, 2001.
7. IRC Codes of Practices
8. Jotin Khisty C. and B. Kent Lall. Transportation Engineering – An Introduction, Third Edition. Prentice Hall of India Pvt. Ltd, New Delhi, India, 2002.
9. Rao G.V. Principles of Transportation and Highway Engineering, Tata McGraw-Hill Publishing Company Ltd., New Delhi, India, 1996.
10. McShane, W.R. and R.P. Roess Traffic Engineering, Prentice Hall, New Jersey, USA, 1990.

Course Outcomes: At the end of the course, the student will be able to:

1. Design railway geometrics
2. Plan highway networks
3. Design highway geometrics.
4. Understand the principles of construction and maintenance of highways

Devi Ahilya University, Indore, India Institute Of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
	L	**T**	
VLR6C3: Design of Steel Structures – I	**PC**	**3-1-1**	**4+1 (P)**

Objective of the subject:

i. To learn the properties of steel sections and design basics and codal provisions Design of connections
ii. To design steel members subjected to tension and compression members
iii. Design steps involved in beams, built up beams and connections in beam column etc.
iv. Design of element in roof trusses, joints, etc. use of hand hooks in steel trusses design
v. To design plate girders, gantry girders and light gauge sections

Prerequisite(s): Mathematical Methods and Mechanics of Materials.

COURSE CONTENTS

Unit I: Introduction

Properties of structural steel, Structural steel sections, Limit state and working stress design concepts, Types of connections, Design of bolted, riveted and welded joints, Eccentric connections - Efficiency of joints, High Tension bolts.

Unit II : Tension members and Ccompression members

Types of sections, Net area, Net effective sections for angles and Tee in tension, Design of connections in tension members, Use of lug angles, Design of tension splice , Concept of shear lag

Types of compression members, Theory of columns, Basis of current codal provision for compression member design, Slenderness ratio, Design of single section and compound section compression members, Design of lacing and battening type columns, Design of column bases , Gusseted base

UnitIII:Beams

Design of laterally supported and unsupported beams, Built up beams, Beams subjected to biaxial bending , Design of plate girders riveted and welded , Intermediate and bearing stiffeners, Web splices

UnitIV :Roof Trusses And Industrial Structures

Roof trusses , Roof and side coverings – Design loads, design of purlin and elements of truss; end bearing , Design of gantry girder

Unit V: Light Gauge Sections

Light gauge steel structures – Types of sections, Flat width ratio, Buckling of thin elements, Effective design width, Form factor, Design of tension, compression members and beams.

NOTE: - All the designs for strength and serviceability should strictly be as per the latest version of IS:800.

REFERENCE: -

1. Design of steel structures by Arya & Azmani Nemchand & Bros, Roorkee
2. Design of steel structures by P.Dayaratnam
3. Design of steel structures Vol. I & II by Ramchandra
4. Design of steel structures by L.S. Negi
5. Design of steel structures by Ramammutham

6. Design of steel structures by Punmia
7. Design of Steel Structures – Duggal.
8. IS-800-2007.

Course Outcomes:

- At the end of the course, the student will be able to:
- Design tension and compression members
- Design beams and beam columns
- Design bolt and weld connections
- Design built up members and column base

Devi Ahilya University, Indore, India Institute of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
VLR6E1: Geotechnical Engineering – II	**L**	**T**	
	PE	**3-1-1**	**4+1 (P)**

Objective of the subject:

- Familiarize the students with a basic understanding of the essential steps involved in a geotechnical site investigation.
- Introduce to the students, the principal types of foundations and the factors governing the choice of the most suitable type of foundation for a given solution.
- Familiarize the student with the procedures used for: a) bearing capacity estimation, b) load carrying capacity of pile, c) determining earth pressure and e) concept on stability of slope.

Prerequisite(s): Geotechnical Engineering - I.

COURSE CONTENTS

Unit - I

Shallow Foundations : Type of foundations shallow and deep. Bearing capacity of foundation on cohesion less and cohesive soils. General and local shear failures. Factors effecting B.C. Theories of bearing capacity - Prandle, Terzaghi, Balla, Skempton, Meyerh of and Hansan. I.S. code on B.c. Determination of bearing capacity. Limits of total and differential settlements. Plate load test.

Unit - II

Deep Foundation : Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae.. Pile load test, Settlement of pile group, Negative skin friction, under- reamed piles and their design. Piles under tension, inclined and lateral load Caissons. Well foundation. Equilibrium of wells. Analysis for stability tilts and shifts, remedial measures.

Unit - III

Soil Improvement Techniques: Compaction. Field and laboratory methods, Proctor compaction tests, Factors affecting compaction. Properties of soil affected by compaction. Various equipment for field compaction and their suitability. Field compaction control. Lift thickness. Soil stabilization : Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical stabilization and stabilization by grouting. Geo-synthetics, types, functions, materials and uses.

Unit - IV

Soil Exploration and Foundations on Expansive and Collapsible soils: Methods of soil exploration. Planning of exploration programme for buildings, highways and earth dams. Disturbed and undisturbed samples and samplers for collecting them. Characteristics of expansive and collapsible soils, their treatment, Construction techniques on expansive and collapsible soils. CNS layer.

Unit - V

Sheet piles/Bulkheads and Machine foundation: Classification of sheet piles/bulkheads. Cantilever and anchored sheet piles, Cofferdams, materials, types and applications. Modes of vibration. Mass-spring analogy, Natural frequency. Effect of vibration on soils. Vibration isolation. Criteria for design. Design of block foundation for impact type of machine.

REFERENCE

1. Punmia .B.C, “Soil Mechanics and Foundations Engineering”, Laxmi Publications Pvt.Ltd. New Delhi, 2005
2. Murthy V.N.S (2007): Soil Mechanics and Foundation Engineering – CBS publications, Delhi.
3. Das .B.M, “Principles of Foundation Engineering” (Fifth edition), Thomson Books, 2010.

4. Gopal Ranjan, Rao ASR (2000): Basic and applied soil mechanics – New age publication, Delhi.
5. Iqbal H Khan (2007): Geotechnical Engineering – Prentice Hall, Delhi.
6. Arora .K.R, “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors, New Delhi, 2011.
7. Bowles .J.E, “Foundation analysis and design”, McGraw Hill, 2001.

Course Outcomes:

At the end of the course, the student will be able to:

- Determine the earth pressures on foundations and retaining structures
- Analyze shallow and deep foundations
- Calculate the bearing capacity of soils and foundation settlements
- Understand soil exploration methods
- Understand the behavior of machine foundation under vibrations

Devi Ahilya University, Indore, India Institute of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
	L	**T**	
VLR6G4: Construction Planning & Management	**PE**	**3-1-1**	**4+1 (P)**

Objective of the subject:

- To study the concepts of construction resource planning, scheduling .
- To study the CPM and PERT models in the construction industry.
- To know the materials and equipment used in construction projects
- To make aware of labour management and regulations for construction activities
- To create awareness on resource leveling and resource allocation

Prerequisite(s):

COURSE CONTENTS

Unit-I

Preliminary and detailed investigation methods: Methods of construction, form work and centering. Schedule of construction, job layout, principles of construction management, modern management techniques like CPM/PERT with network analysis.

Unit-II

Construction equipment: Factors affecting selection, investment and operating cost, output of various equipment, brief study of equipment required for various jobs such as earth work, dredging, conveyance, concreting, hoisting, pile driving, compaction and grouting.

Unit-III

Contracts: Different types of controls, notice inviting tenders, contract document, departmental method of construction, rate list, security deposit and earnest money, conditions of contract, arbitration, administrative approval, technical sanction.

Unit-IV

Specifications & Public Works Accounts: Importance, types of specifications, specifications for various trades of engineering works. Various forms used in construction works, measurement book, cash book, materials at site account, imprest account, tools and plants, various

Unit-V

Site Organization & Systems Approach to Planning: Accommodation of site staff, contractor's staff, various organization charts and manuals, personnel in construction, welfare facilities, labour laws and human relations, safety engineering. Problem of equipment management, assignment model, transportation model and waiting line modals with their applications, shovel truck performance with waiting line method.

Reference Books :-

1. Construction Equipment by Peurify
2. CPM by L.S. Srinath

3. Construction Management by S. Seetharaman
4. CPM & PERT by Weist & Levy
5. Construction, Management & Accounts by Harpal Singh
6. Tendering & Contracts by T.A. Talpasai

Course Outcomes:

At the end of the course, the student will be able to:

- Understand the roles and responsibilities of a project manager
- Prepare schedule of activities in a construction project
- Prepare tender and contract document for a construction project
- Understand safety practices in construction industry
- Identify the equipment used in construction

Devi Ahilya University Indore, India Institute of Engineering & Technology				II B.E.(Civil Engg) (Full Time)			
Subject Code and Name	Instruction Hours Per Week			Credits			
VLR5C1:Design of RCC Structures – II	L	T	P	L	T	P	Total
Duration of Theory Paper: 3 hours	3	1	2	3	1	1	5

Learning Objectives:

1 . To bring about an understanding of the behavior of advanced reinforced concrete structures.

2 . To bring about an understanding of the analysis and design philosophies for advanced reinforced concrete structures.

3 . T o perform analysis and design of advanced reinforced concrete members.

COURSE CONTENTS

Unit-I

Design of Multistory Buildings - Sway and Non sway buildings, Shear walls and other bracing elements.

Unit-II

Earth Retaining Structures: Cantilever and counter fort types retaining walls.

Unit-III

Water Tanks: Tanks on ground and underground tanks: Square, rectangular, circular tanks, Overhead tanks: square, rectangular, circular & intze tanks.

Unit -IV

T-beam & Slab bridges- for highway loading (IRC Loads).

Unit -V

Prestressing concepts materials, systems of prestressing & losses
Introduction to working & limit State Design.

NOTE: - All the designs for strength and serviceability should strictly be as per the latest version of S:456,IS:13920,IS:1893,IS:875,IS:3370,IRC: 6 ,IRC 21; Use of SP-16 (Design aids)

Suggested Books: -

1. Plain & Reinforced Concrete Vol. I & II – O.P. Jain & Jay Krishna
2. Advanced Reinforced Concrete Design by P.C.Varghese ; Prentice Hall of India, New Delhi
3. Design of Reinforced Concrete Elements by Purushothman; Tata McGraw Hill, New Delhi
4. Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH
5. Design of concrete Structure – B.C. Punnia&A.K.Jain ; Laxmi publication
6. Advanced Reinforced Concrete Design by N.K.Raju;CBS publisher

7. Essentials of Bridge engineering – D.J. Victor
8. Bridge Engineering - Ponnuswamy

Learning Outcomes:

On completing the Course, the student will be able to:

1. Understand the general behavior of advanced reinforced concrete structures.
2. Understand the principles involved in analysis and design of advanced reinforced concrete Structures.
3. Analysis and design of reinforced concrete Multistory Buildings.
4. Analysis and design of retaining walls.
5. Analysis and design of reinforced concrete Water Tanks.
6. Analysis and design of reinforced concrete bridges.
7. Understand the principles of prestressed concrete.
8. Analysis and design of prestressed reinforced concrete members.
9. To employ the code of practice for design of reinforced concrete structural members and elementary structural systems.

Devi Ahilya University Indore, India Institute of Engineering & Technology				II B.E. (Civil Engineering)			
Subject Code and Name	**Instruction Hours Per Week**			**Credits**			
VLR5C2: Fluid Mechanics - II	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: **3 hours**	**3**	**1**	**2**	**3**	**1**	**1**	**5**

Learning Objectives:

- The course on fluid mechanics is devised to introduce fundamental aspects of fluid flow behaviour.
- Students will learn to develop steady state mechanical energy balance equation for fluid flow systems, estimate pressure drop in fluid flow systems and determine performance characteristics of fluid machinery.

COURSE CONTENTS

UNIT-I

Turbulent flow: Laminar and turbulent boundary layers and laminar sub layer, hydro dynamically smooth and rough boundaries, velocity distribution in turbulent flow, resistance of smooth and artificially roughened pipes, commercial pipes, aging of pipes. Pipe flow problems: Losses due to sudden expansion and contraction, losses in pipe fittings and Valves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, Pipes in parallel, branching of pipes. Pipe Network: *Water Hammer (only quick closure case). Transmission of power. *Hardy Cross Method

Unit-II

Uniform flow in open channels: Channel geometry and elements of channel section, velocity distribution, energy in open channel flow, specific energy, types of flow, critical flow and its Computations, uniform flow and its computations, Chezy's and Manning's formulae, Determination of normal depth and velocity, Normal and critical slopes, Economical sections, Saint Vegnet equation.

Unit-III

Non uniform flow in open channels: Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing, venturi flume.

Unit-IV

Forces on immersed bodies: Types of drag, drag on a sphere, a flat plate, a cylinder and an aerofoil development of lift, lifting vanes, magnus effect.

Unit-V

Fluid Machines: Turbines: Classifications, definitions, similarity laws, specific speed and unit quantities, Pelton turbine-their construction and settings, speed regulation, dimensions of various elements, Action of jet, torque, power and efficiency for ideal case, characteristic curves. Reaction turbines: construction & settings, draft tube theory, runaway speed, simple theory of design and Characteristic curves, cavitation. Pumps: Centrifugal pumps: Various types and their important components, manometric head, total head, net positive suction head, specific speed, shut off head, energy losses, cavitation, and principle of working and characteristic curves. Reciprocating pumps: Principle of working, Coefficient of discharge, slip, single acting and double acting pump, Manometric head, Acceleration head.

List of Experiments:

1. Study the performances characteristics of Pelton Wheel
2. Study the performances characteristics of Francis Turbine
3. Study the performances characteristics of Kaplan Turbine
4. Caliration of multistage (Two) Pump & Study of characteristic of variable speed pump
5. To study the performance & details of operation of Hyd. Ram
6. Determination of coefficient of discharge for a broad crested weir & to plot water surface Profile over weir
7. Study of the characteristic of the Reciprocating pump

Suggested Books & Study Material:

1. Fluid Mechanics - Modi & Seth - Standard Book house, Delhi
2. Open Channel Flow by Rangaraju - Tata Mc Graw - Hill Publishing Comp. Ltd., New D
3. Fluid Mechanics - A.K. Jain - Khanna Publishers, Delhi
4. Fluid Mechanics, Hydraulics & Hydraulic Machanics - K.R. Arora - Standard Publishers Distributors 1705- B, Nai Sarak, Delhi-6
5. Hyd. of open channels By Bakhmetiff B.A. (McGraw Hill, New York)
6. Open Channel Hyd. By Chow V.T. (McGraw Hill, New York)
7. Engineering Hydraulics By H. Rouse
8. Centrifugal & Axial Flow Pump By Stempanoff A.J. New York

9. Relevant IS codes.

Learning Outcomes:

- The student will understand stress-strain relationship in fluids, classify their behavior and also establish force balance in static systems. Further they would develop dimensionless groups that help in scale-up and scale-down of fluid flow systems.
- Students will be able to apply Bernouli principle and compute pressure drop in flow systems of different configurations
- Students will compute power requirement in fixed bed system and determine minimum fluidization velocity in fluidized bed
- Students will be able to describe function of flow metering devices and apply Bernoulli equation to determine the performance of flow-metering devices
- Students will be able to determine and analyze the performance aspects of fluid machinery specifically for centrifugal pump and reciprocating pump

<table>
<tr><td colspan="4">Devi Ahilya University Indore, India
Institute of Engineering & Technology</td><td colspan="4">II B.E.
(Civil Engineering)
(Full Time)</td></tr>
<tr><td>Subject Code and Name</td><td colspan="3">Instruction Hours Per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">VLR5C3: Quantity Surveying & Costing</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 hours Hours</td></tr>
</table>

Learning Objectives:

- Students will be able to:
- Decide approximate cost of civil engineering structure.
- Prepare check list of items of construction.
- Prepare estimate for civil engineering work.
- Prepare rate analysis of item of construction.
- Take measurement of completed work.

COURSE CONTENTS

Unit I: Introduction:
Purpose and importance of estimates, principles of estimating. Mode of measurement, measurement sheet and abstract sheet; bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

Unit II: Rate Analysis:
Importance, Task for average artisan, various factors involved in the rate of an item, material and labour requirement for different items of work; analysis of Rates for important items of work. Current schedule of rates. (C.S.R.)

Unit III: Detailed Estimates:
Methods of taking out quantities of items of work. Long wall and Short wall method , Centre line method, Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads , Pitching of Slopes and estimating of culverts , Services for building such as water supply, drainage and electrification.

Unit IV: Specification & Report Writing:
Specification – Necessity – Types of specifications – Essential requirements of specifications – Specifications for various items of works – steps involved in standard specification
Detailed project report.

Unit V: Valuation and Rent fixation

Gross and net income– Market value – Book value – Scrap value – Salvage value – Capitalized values – sinking fund – depreciation – Valuation of a building – Rent fixation of buildings.

Learning outcomes:

- Discuss contemporary issues affecting the role of the consultant quantity surveyor throughout the construction process.
- Select appropriate tendering arrangements and contract procurement methods to ensure that the contract is placed in the most appropriate manner. This also involves evaluating tenders received.
- Appraise cost management theories and evaluate techniques employed by the quantity surveyor during the precontract stage of the construction process
- Select appropriate cost advice and cost planning strategies and techniques to enable building work to be designed within agreed expenditure limits.
- Appraise the purpose and content of the range of tender and contract documents to enable competitive tenders to be obtained

References ;

5. IS Code of Practice – IS 1200
6. Civil Estimating, Casting and Valuation – Kalson Publication Ludhiuyana.
7. Rangawala," Estimating & Casting, Charotor Publishing, 8th Edition,1990.
8. N.A.Shaw," Quantity surveying & Valuation", Khana Publishers,2001.
9. PL Bhasin," Quantity Surveying" S. Chand & Co. IIIrd Edition,1992.
10. L.N.Dutta, Estimating and Costing, Dhanpat Rai & sons, IInd Edition,1986.
11. Bridie, "Estimating and Costing",1989.
12. Vazirani & Chandolu," Estimating and Costing" 2001.

Practical & Sessional Works:

- Preparation of detailed estimate.
- Detailed estimate for services of plumbing and water supply or Electrification work.
- Detailed estimate for earth work for the road construction or arched culvert.
- 4.Rate analysis for at least 8 items of construction.
- 5.Preparation of DPR of Civil Engineering Project.

Devi Ahilya University Indore, India Institute of Engineering & Technology				II B.E.(Civil Engg) (Full Time)			
Subject Code and Name	Instruction Hours Per Week			Credits			
VLR5E1: Geotechnical Engineering - I	L	T	P	L	T	P	Total
Duration of Theory Paper: 3 hours Hours	3	1	2	3	1	1	5

Learning Objectives:

- In depth understanding of specialist bodies of knowledge within the engineering discipline.
- Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the specific discipline.
- Application of established engineering methods to complex engineering problem solving.
- Fluent application of engineering techniques, tools and resources.

COURSE CONTENTS

UNIT -1

Definition and scope of soil mechanics, soil origin and it's composition, influence of clay minerals on engineering behavior. Soil texture and structure. Three phase system, index properties and their determination. Classification systems based on partical size, texture, consistency limits unified and AASHTO. Details of it's classification.

UNIT-2

Soil properties, density, void ratio porosity, moisture- content, grain size analysis. Dry and wet sieve analysis and sedimentation soil consistency. Atterberg Limits, explanation of various indices like Flow- Index, plasticity- index, toughness index, liquid index, activity ratio.

UNIT-3

Capillary and gravitational water. Permeability of soil, Darcy's law, laboratory determination of permeability and affecting factors. Seepage and flow net, effective neutral and total pressure, quick sand phenomenon. Compaction characteristics of soil, moisture/density relationship, factor affecting compaction and control. Compressibility and consolidation of soil, Terzaghi's one Dimensional Consolidation theory, pressure valid ratio relationship.

UNIT-4

Strength of soils, stress distribution beneath loaded areas by Boussinesq and water guard's analysis, Newmark's influence chart, contact pressure distribution Mohr-coulomb's theory of shear failure of soils. Measurement of shear strength. Shear box test, triaxial and unconfined compression test, vane shear test. Measurement of pore pressure parameters, critical void ratio, liquefaction.

UNIT-5

Stability of slopes, infinite and finite slopes, types of slope failures, rotational slips, stability number, effect of ground water. Selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis, stability of earth dams.

LIST OF EXPERIMENTS:-

1. Determination of moisture content of soil
2. Determination of specific gravity of soil
3. Determination of field density by sand replacement method
4. Determination of field density by core cutter method
5. Sieve analysis of soil and sedimentation analysis
6. Determination of liquid limit of soil by Casagrande method and cone penetrometer
7. Determination of plastic limit and shrinkage limit of soil.
8. Determination of permeability of soil by:
(a)constant head method (b) variable head method
9. Determination of OMC of soil by Standard proctor compaction test.

Learning outcomes:

1. Define geotechnical engineering, determine soil physical characteristics (including unit weight / density - water content relationship), classify soils and describe field compaction methods and related quality control.
2. Determine the coefficient of permeability and equivalent hydraulic conductivity in stratified soil (according to established scientific principles for the flow of water through saturated soils) and calculate seepage, pore water pressure distribution, uplift forces and seepage stresses for simple geotechnical systems.
3. Describe the purposes and different phases of a soil investigation, soil exploration program, soil exploration methods and soil identification in the field.
4. Discuss the concept of effective stress and determine stress distribution within a soil mass.
5. Explain the 'shear strength' of soil, describe the direct shear test method and interpret direct shear test results.
6. Calculate the bearing capacity of shallow foundations and factor of safety.

Books and references:-

1. Soil Mech. & found. By Dr. B.C. Punmia Lakshmi Publications, Delhi
2. Modern Geotech Engg. By Dr. I Aram Singh- IBT Publishers Delhi
3. Geotech. Engg. By C Venkatramaiah- New Age International Publishers, Delhi
4. Soil Testing for Engg. By T.W. Lambe- John Wiley and Sons. Inc
5. Soil Mech. & Found. By S.K. Garg-Khanna Publishers, Delhi
6. Geotechnical Engineering- Shashi.k.Gulhati & Manoj Datta- MC Craw Hill Education(India) Pvt. Ltd. New Delhi.

Devi Ahilya University Indore, India Institute of Engineering & Technology				II B.E.(Civil Engg) (Full Time)			
Subject Code and Name	**Instruction Hours Per Week**			**Credits**			
VLR5G3: Water Resources Engineering	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 hours Hours	**3**	**1**	**-**	**3**	**1**	**-**	**4**

Learning Objectives:

- The knowledge of hydrology is prerequisite for the irrigation engineering and also for design of hydraulic structure. So one of the objective of this course is to impart the knowledge of hydrology that deals with the occurrence, distribution, movement and properties of water on the earth
- 2. To impart the knowledge of various irrigation techniques, requirements of the crops,
- To learn about distribution systems for canal irrigation, design of unlined and lined irrigation canals design sediment problems associated with canal

COURSE CONTENTS

Unit – I

Irrigation Water Requirement and Soil-Water-Crop Relationship: Irrigation, definition, necessity, advantages and disadvantages, types and methods, Irrigation development.

Soils - Types and their occurrence, suitability for irrigation purposes, wilting coefficient and field capacity, optimum water supply, consumptive use and its determination. Irrigation methods surface and subsurface, sprinkler and drip irrigation.

Duty of water, factors affecting duty and methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation.

Unit – II

Ground Water and Well Irrigation: Confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow conditions, infiltration galleries. Ground water recharge, necessity and methods of improving ground water storage.

Water logging- causes, effects and its prevention. Salt efflorescence causes and effects. Reclamation of water logged and salt affected lands.

Type of wells, well construction, yield tests, specific capacity and specific yield, advantages and disadvantages of well irrigation.

Unit-III

Hydrology : Hydrological cycle, precipitation and its measurement, recording and non recording rain gauges, estimating missing rainfall data, rain gauge net works, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves, Infiltration and infiltration indices, evaporation stream gauging, run off and its estimation, hydrograph analysis, unit hydrograph and its derivation from isolated and complex storms, S-curve hydrograph, synthetic unit hydrograph.

Unit – IV

Canals and Structures: Types of canals, alignment, design of unlined and lined canals, Kennedy's and Lacey's silt theories, typical canal sections, canal losses, lining-objectives, materials used, economics. Introductions to Hydraulic Structures viz. Dams, Spillways, Weirs, Barrages, Canal Regulation Structures.

Unit-V

Floods : Types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control,

Learning Outcomes:

1 Various components of hydrologic cycle that affect the movement of water in the earth

2 Various Stream flow measurements technique

3 the concepts of movement of ground water beneath the earth

4 the basic requirements of irrigation and various irrigation techniques, requirements of the crops 5 Distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals design

6 Basic components of river Training works. CO- 7 Apply math, science, and technology in the field of water resource

Suggested Books:-

1. Irrigation & Water Power Engg. by Punmia & Pandey B.B.Lal
2. Engg. Hydrology by K. Subhramanya - Tata Mc Graw Hills Publ. Co.
3. Engg. Hydrology - J.NEMEC - Prentice Hall
4. Hydrology for Engineers Linsley, Kohler, Paulnus - Tata Mc.Graw Hill.
5. Hydrology & Flood Control by Santosh Kumar - Khanna Publishers
6. Engg. Hydrology by H.M. Raghunath G

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Civil) (Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">VLR6C1
Structural Analysis - I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Objective of the subject:

- To understand the concept of determinate and indeterminate structures, analyses of determinate and indeterminate structures.
- To understand the principle of virtual work and the application of influence line diagrams in structural analysis problems.

Prerequisite(s): Mechanics of Materials.

COURSE CONTENTS

Unit I:

Fundamental Concepts In Structures: Definition and Determination of Static and Kinematic Indeterminacy , Beams, Trusses and Frames , Degree of Freedom, Equilibrium and Kinematic Stability , Principle of Superposition , Basic Methods of Structural Analysis. **Virtual work and Energy Principles:** Principles of Virtual work applied to deformable bodies, strain energy and complementary energy, Energy theorems, Maxwell's Reciprocal theorem, Analysis of Pin-Jointed frames for static loads.

Unit II:

Slope Deflection Method: Analysis of Continuous beams and Rigid plane frames with and without sway.

Moment Distribution Method: Stiffness and Distribution factors, Carry over factors, Analysis of Continuous beams, Plane rigid frames with and without sway

Kani's method and Column analogy method applied to indeterminate beams.

Unit III:

Moving Loads And Influence Lines

Effect of moving load , Description of Influence line , Influence line for Reaction, Shear Force and Bending Moment , Load position , Absolute maximum bending moment , Muller Breslau's Principle , Application to beams with one degree of indeterminacy , Influence line for forces in members of determinate trusses.

UnitIV :

Analysis of Three Hinged and Two Hinged Arches : Parabolic and Circular principles of analyzing Fixed Arches, Influence lines for Three and Two hinged arches for Horizontal thrust, Shear force and B.M. at any section , absolute maximum bending moment, axial thrust **Suspension bridges**: Length of Cable, Maximum tension ,Types of supports, Forces in Towers,two hinged and three hinged stiffening girders, influence line diagrams for bending moment

Unit V:

Indeterminate Trusses : Energy method , application to analysis of indeterminate pin jointed Plane trusselackoffittemperatureeffects.

REFERENCE

- Menon, D., “Structural Analysis”, Alpha Science International, Limited, 2008.
- Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, “Theory of Structures”, Laxmi Publications, New Delhi, 12th Edition, 2004.
- Ghali A & Neville M., Structural Analysis - A Unified classical and matrix Approach, Chapman and Hall, New York.
- Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
- Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.
- Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
- Pandit .G.S, “Theory Of Structures”, Vol-I, McGraw-Hill Education (India) Pvt Limited, 1999.
- Norris C.H., Wilbur J.B. and Utku. Elementry Structural Analysis, McGraw Hill International, Tokyo
- Timoshenko. S.P & Young. D.H, “Theory of Structures”,. McGraw Hill Book Company, International Ed. 1965.

Course Outcomes:

At the end of the course, the student will be able to:

- Analyze one dimensional and two dimensional problems using classical methods
- Analyze indeterminate structures
- Analyze structures for gravity loads, moving loads and lateral loads

Devi Ahilya University, Indore, India Institute Of Engineering &Technology			
Subject code and name	Type	L-T-P	Credits
	L	T	P
VLR6C2 : Transportation Engineering - I	PC	3-1-1	4+1(P)

Objective of the subject:

- To know about railway planning and geometric design of railways.
- To know about highway planning and geometric design of roads.
- To know about highway maintenance and public transportation systems.

Prerequisite(s):NIL

COURSE CONTENTS

Unit I: **Railway:** Introduction, Rails, Sleepers, Rail fastenings. fish bolts, spikes, bearing plates, chain keys, check and guard rails, Requirement of good ballast, various materials used as ballast, quantity of ballast, different methods of plate laying, material trains, calculation of materials required, relaying of track.

Unit II: **Railway:** Geometric Design, Station & Yards; Points and Crossings & Signaling and interlocking: Formation, cross sections, Super elevation, Equilibrium, Cant and Cant deficiency, various curves, speed on curves. Types, locations, general equipment, layouts, marshaling yards, Definition, layout details, design of simple turnouts, Types of signals in stations and yards, principles of signaling and inter-locking.

Unit III:

HighwayPlanningandAlignment

Different modes of transportation , historical Development of road construction, Highway Development in India , Classification of roads, Road pattern , Highway planning in India, Highway alignment , Engineering Surveys for alignment , Highway project.

Unit IV:

GeometricDesignofHighways

The highway crosses sectional elements, Sight Distance ,Types of sight distances, Design of horizontal alignments , Super elevation, Widening of Pavements on horizontal curves- transition Curves, Design of Vertical alignments, Gradients- summit and Valley Curves.

UNIT V:

HighwayMaintenanceandPublicTransportation

Importance of highway drainage ,Surface Drainage, Subsurface drainage , Road construction in water logged areas, maintenance of various roads, History and present state of public transportation, role of public transportation in urban development, transit systems, route development.

REFERENCES

- Khana .S.K, Justo .C.E.G – “Highway Engineering,” Nemchand & Bros, Rookies. 2001.
- Chakroborty, P. and A. Das Principles of Transportation Engineering, Prentice Hall of India Pvt. Ltd, New Delhi, India, 2005.
- Rangwala SC; Railway Engineering; Charotar Publication House, Anand
- Railway Engineering by Arora & Saxena - Dhanpat Rai & Sons

- Kadiyali .L.R, "Traffic Engineering And Transport Planning", Khanna publishers, Delhi,2009.
- Ministry of Road Transport and Highways. Specifications for Road and Bridge Works, Fourth Edition, Indian Roads Congress, New Delhi, India, 2001.
- IRC Codes of Practices
- Jotin Khisty C. and B. Kent Lall. Transportation Engineering – An Introduction, Third Edition. Prentice Hall of India Pvt. Ltd, New Delhi, India, 2002.
- Rao G.V. Principles of Transportation and Highway Engineering, Tata McGraw-Hill Publishing Company Ltd., New Delhi, India, 1996.
- McShane, W.R. and R.P. Roess Traffic Engineering, Prentice Hall, New Jersey, USA, 1990.

Course Outcomes: At the end of the course, the student will be able to:

- Design railway geometrics
- Plan highway networks
- Design highway geometrics.
- Understand the principles of construction and maintenance of highways

Devi Ahilya University, Indore, India Institute Of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
	L	**T**	
VLR6C3: Design of Steel Structures – I	**PC**	**3-1-1**	**4+1 (P)**

Objective of the subject:

- To learn the properties of steel sections and design basics and codal provisions Design of connections
- To design steel members subjected to tension and compression members
- Design steps involved in beams, built up beams and connections in beam column etc.
- Design of element in roof trusses, joints, etc. use of hand hooks in steel trusses design
- To design plate girders, gantry girders and light gauge sections

Prerequisite(s): Mathematical Methods and Mechanics of Materials.

COURSE CONTENTS

Unit I: Introduction

Properties of structural steel, Structural steel sections, Limit state and working stress design concepts, Types of connections, Design of bolted, riveted and welded joints, Eccentric connections - Efficiency of joints, High Tension bolts.

Unit II : Tension members and Ccompression members
Types of sections, Net area, Net effective sections for angles and Tee in tension, Design of connections in tension members, Use of lug angles, Design of tension splice , Concept of shear lag

Types of compression members, Theory of columns, Basis of current codal provision for compression member design, Slenderness ratio, Design of single section and compound section compression members, Design of lacing and battening type columns, Design of column bases , Gusseted base

UnitIII :Beams
Design of laterally supported and unsupported beams, Built up beams, Beams subjected to biaxial bending , Design of plate girders riveted and welded , Intermediate and bearing stiffeners, Web splices

UnitIV :Roof Trusses And Industrial Structures
Roof trusses , Roof and side coverings – Design loads, design of purlin and elements of truss; end bearing , Design of gantry girder
Unit V: Light Gauge Sections
Light gauge steel structures – Types of sections, Flat width ratio, Buckling of thin elements, Effective design width, Form factor, Design of tension, compression members and beams.

NOTE: - All the designs for strength and serviceability should strictly be as per the latest version of IS:800.
REFERENCE: -

9. Design of steel structures by Arya & Azmani Nemchand & Bros, Roorkee
10. Design of steel structures by P.Dayaratnam
11. Design of steel structures Vol. I & II by Ramchandra
12. Design of steel structures by L.S. Negi
13. Design of steel structures by Ramammutham
14. Design of steel structures by Punmia
15. Design of Steel Structures – Duggal.
16. IS-800-2007.

Course Outcomes:
At the end of the course, the student will be able to:
1. Design tension and compression members
2. Design beams and beam columns
3. Design bolt and weld connections
4. Design built up members and column base

Devi Ahilya University, Indore, India Institute of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
VLR6E1: Geotechnical Engineering – II	**L**	**T**	
	PE	**3-1-1**	**4+1 (P)**

Objective of the subject:

- Familiarize the students with a basic understanding of the essential steps involved in a geotechnical site investigation.
- Introduce to the students, the principal types of foundations and the factors governing the choice of the most suitable type of foundation for a given solution.
- Familiarize the student with the procedures used for: a) bearing capacity estimation, b) load carrying capacity of pile, c) determining earth pressure and e) concept on stability of slope.

Prerequisite(s): Geotechnical Engineering - I.

COURSE CONTENTS

Unit - I

Shallow Foundations : Type of foundations shallow and deep. Bearing capacity of foundation on cohesion less and cohesive soils. General and local shear failures. Factors effecting B.C. Theories of bearing capacity - Prandle, Terzaghi, Balla, Skempton, Meyerh of and Hansan. I.S. code on B.c. Determination of bearing capacity. Limits of total and differential settlements. Plate load test.

Unit - II

Deep Foundation : Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae.. Pile load test, Settlement of pile group, Negative skin friction, under- reamed piles and their design. Piles under tension, inclined and lateral load Caissons. Well foundation. Equilibrium of wells. Analysis for stability tilts and shifts, remedial measures.

Unit - III

Soil Improvement Techniques: Compaction. Field and laboratory methods, Proctor compaction tests, Factors affecting compaction. Properties of soil affected by compaction. Various equipment for field compaction and their suitability. Field compaction control. Lift thickness. Soil stabilization : Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical stabilization and stabilization by grouting. Geo-synthetics, types, functions, materials and uses.

Unit - IV

Soil Exploration and Foundations on Expansive and Collapsible soils: Methods of soil exploration. Planning of exploration programme for buildings, highways and earth dams. Disturbed and undisturbed samples and samplers for collecting them. Characteristics of expansive and collapsible soils, their treatment, Construction techniques on expansive and collapsible soils. CNS layer.

Unit - V

Sheet piles/Bulkheads and Machine foundation: Classification of sheet piles/bulkheads. Cantilever and anchored sheet piles, Cofferdams, materials, types and applications. Modes of vibration. Mass-spring analogy, Natural frequency. Effect of vibration on soils. Vibration isolation. Criteria for design. Design of block foundation for impact type of machine.

REFERENCE

8. Punmia .B.C, "Soil Mechanics and Foundations Engineering", Laxmi Publications Pvt.Ltd. New Delhi, 2005

9. Murthy V.N.S (2007): Soil Mechanics and Foundation Engineering – CBS publications, Delhi.
10. Das .B.M, "Principles of Foundation Engineering" (Fifth edition), Thomson Books, 2010.
11. Gopal Ranjan, Rao ASR (2000): Basic and applied soil mechanics – New age publication, Delhi.
12. Iqbal H Khan (2007): Geotechnical Engineering – Prentice Hall, Delhi.
13. Arora .K.R, "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2011.
14. Bowles .J.E, "Foundation analysis and design", McGraw Hill, 2001.

Course Outcomes:
At the end of the course, the student will be able to:

- Determine the earth pressures on foundations and retaining structures
- Analyze shallow and deep foundations
- Calculate the bearing capacity of soils and foundation settlements
- Understand soil exploration methods
- Understand the behavior of machine foundation under vibrations

Devi Ahilya University, Indore, India Institute of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
	L	**T**	
VLR6G4: Construction Planning & Management	**PE**	**3-1-1**	**4+1 (P)**

Objective of the subject:

- To study the concepts of construction resource planning, scheduling .
- To study the CPM and PERT models in the construction industry.
- To know the materials and equipment used in construction projects
- To make aware of labour management and regulations for construction activities
- To create awareness on resource leveling and resource allocation

Prerequisite(s):

COURSE CONTENTS

Unit-I

Preliminary and detailed investigation methods: Methods of construction, form work and centering. Schedule of construction, job layout, principles of construction management, modern management techniques like CPM/PERT with network analysis.

Unit-II

Construction equipment: Factors affecting selection, investment and operating cost, output of various equipment, brief study of equipment required for various jobs such as earth work, dredging, conveyance, concreting, hoisting, pile driving, compaction and grouting.

Unit-III

Contracts: Different types of controls, notice inviting tenders, contract document, departmental method of construction, rate list, security deposit and earnest money, conditions of contract, arbitration, administrative approval, technical sanction.

Unit-IV
Specifications & Public Works Accounts: Importance, types of specifications, specifications for various trades of engineering works. Various forms used in construction works, measurement book, cash book, materials at site account, imprest account, tools and plants, various types of running bills, secured advance, final bill.

Unit-V
Site Organization & Systems Approach to Planning: Accommodation of site staff, contractor's staff, various organization charts and manuals, personnel in construction, welfare facilities, labour laws and human relations, safety engineering. Problem of equipment management, assignment model, transportation model and waiting line modals with their applications, shovel truck performance with waiting line method.

Reference Books :-
1. Construction Equipment by Peurify
2. CPM by L.S. Srinath
3. Construction Management by S. Seetharaman
4. CPM & PERT by Weist & Levy
5. Construction, Management & Accounts by Harpal Singh
6. Tendering & Contracts by T.A. Talpasai

Course Outcomes:
At the end of the course, the student will be able to:

- Understand the roles and responsibilities of a project manager
- Prepare schedule of activities in a construction project
- Prepare tender and contract document for a construction project
- Understand safety practices in construction industry
- Identify the equipment used in construction

Devi Ahilya University, Indore, India Institute of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
	L	**T**	**P**
VLR7C1: Transportation Engineering - II	**PC**	**3-1-1**	**4+1(P)**

Objective of the subject:

To know about various pavement materials.
To know about procedure of designing pavements
To know about method of construction of different pavements.
To know about traffic principles

COURSE CONTENTS

Unit I: **Pavement Materials and Mix Design:** Subgrade soil properties, CBR test, aggregates, desirable properties, tests, bituminous materials, bitumen and tar, tests. Bituminous mixes, requirements, design,Marshall Method. pavements.

Unit II: **Design of Pavements:** Types of pavement structures, functions of pavement components, design factors. Design of flexible pavements, methods, GI method, CBR method, IRC method, Burmister's method. Design of rigid pavements, design considerations, wheel load stresses, temperature stresses, frictional stresses, design of joints, IRC method of rigid pavement design.

Unit III:
Highway Construction : Types of highway construction, construction of earth roads, gravel roads, WBM roads. Bituminous pavements, types, surface dressing, penetration macadam, built up spray grout, bitumen bound macadam, bituminous carpet, bituminous concrete. Cement concrete, Pavement failures, causes, failures in flexible pavements and rigid pavements.

Unit IV: Traffic Engineering Principles: Traffic characteristics; components of traffic stream: flow-speed Density, measurement and analysis, q-k-v relationships, design hourly volume, concept of EPCU, capacity and level of service. Parking studies and accident studies. Design of intersections, at grade intersections, channelized and rotary. Introduction to grade separated intersections, cloverleaf, trumpet, flyovers.Traffic regulations, one-way streets, traffic signs, road markings, signals, warrants.

UNIT V: Airport Plaaning, Runway & Taxiway: Airport site selection. air craft characteristic and their effects on runway alignments, windrose diagrams, basic runway length and corrections, classification of airports.
Airport, Obstructions, Lightning & Traffic control: Zoning regulations, approach area, approach surface-imaginary, conical, horizontal. Rotating beacon, boundary lights, approach lights, runway and taxiway lighting etc. instrumental lending system, precision approach radar, VOR enroute traffic control.

REFERENCES

1. Khana .S.K, Justo .C.E.G – “Highway Engineering,” Nemchand & Bros, Rookies. 2001.
2. Chakroborty, P. and A. Das Principles of Transportation Engineering, Prentice Hall of India Pvt. Ltd, New Delhi, India, 2005.
3. Rangwala SC; Railway Engineering; Charotar Publication House, Anand
4. Railway Engineering by Arora & Saxena - Dhanpat Rai & Sons
5. Kadiyali .L.R, “Traffic Engineering And Transport Planning”, Khanna publishers, Delhi,2009.
6. Ministry of Road Transport and Highways. Specifications for Road and Bridge Works, Fourth Edition, Indian Roads Congress, New Delhi, India, 2001.
7. IRC Codes of Practices
8. Jotin Khisty C. and B. Kent Lall. Transportation Engineering – An Introduction, Third Edition. Prentice Hall of India Pvt. Ltd, New Delhi, India, 2002.
9. Rao G.V. Principles of Transportation and Highway Engineering, Tata McGraw-Hill Publishing Company Ltd., New Delhi, India, 1996.
10. McShane, W.R. and R.P. Roess Traffic Engineering, Prentice Hall, New Jersey, USA, 1990.

Course Outcomes: At the end of the course, the student will be able to:

- Design Intersections and prepare traffic management plans.
- Design flexible and rigid pavements.
- Understand the principles of construction and maintenance of highways
- Estimate basic characteristics of traffic stream
- Conduct traffic studies and analyze traffic data

<table>
<tr><th colspan="5">Devi Ahilya University, Indore, India
Institute of Engineering &Technology</th></tr>
<tr><th>Subject Code and Name</th><th>Type</th><th>L-T-P</th><th>Credits</th></tr>
<tr><td rowspan="2">VLR7C2: Design of Steel Structures – II</td><td>L</td><td>T</td><td>P</td></tr>
<tr><td>PC</td><td>3-1-1</td><td>4+1(P)</td></tr>
</table>

COURSE CONTENTS

Unit I: **Plate Girders**

Necessity of plate girders- equivalent uniformly distributed load – design of welded plate girders – intermediate stiffeners – vertical and horizontal – bearing stiffeners

Unit – II

Trussed girder bridges for railways and highways (IRC & IRS holding). Bearings for bridges.

Unit – III

Water Tanks: Pressed steel tanks, tanks with ordinary plates, square, rectangular, circular with hemispherical bottom and conical bottom.

Unit - IV

Guyed and self supporting steel stacks (Chimneys). Bunkers, Silos

Unit – V

Transmission line towers : Introduction, types of towers, tower configuration, load analysis and design of members.

Reference Books :-

1. Design of Steel Structures , Ramammutham
2. Design of Steel Structures Punmia B.C
3. Design of Steel Structures, Ramchandra Vol II
4. Design of Steel Structures, Arya and Azmani
5. Design of steel structures, L.S. Negi

Course Outcomes: At the end of the course, the student will be able to:

- Design steel gantry girders
- Design railway and highway trussed bridges
- Design storage structures water tank, bunkers and silos
- Design chimney and towers

Devi Ahilya University, Indore, India Institute of Engineering &Technology			
Subject Code and Name	**Type**	**L-T-P**	**Credits**
	L	**T**	**P**
VLR7E1: Environmental Engineering – II	**PC**	**3-1-1**	**4+1(P)**

COURSE CONTENTS

Unit I : Sewage And Sewerage Engineering

Definition & Classification of Sewage - Quantity of Sanitary Sewage and Storm Water – Fluctuations in Flow Pattern – Design Flow of Sewage – Physio-chemical and Biological Characteristics – Assessment of Organic Solids by BOD, COD, TOC, ThOD, & TOD – Microbiology of Sewage – Systems and Layouts of Sewerage – Analysis and Design of Sewers under Different Flow Situations - Sewer Sections – Materials for Sewers – Laying, Jointing, and Testing of Sewers – Appurtenances and Maintenance - Pumping of Sewage and Pumping Stations.

Unit II : Preliminary And Primary Treatments Of Sewage

Principles and Objectives of Sewage Treatment – Operation and Design of Bar Rack and Grit Chamber with Velocity Control Devices – Principles of Primary Treatment and Design of Primary Sedimentation Tank – Disposal of Rackings, Gritty Materials, and Sludge Solids.

Unit III : Biological Treatment Processes

Objectives of Biological Treatment – Path Ways of Decomposition – Aerobic, Anaerobic, and Anoxic Processes – Operation & Design of Convensional Activated Sludge Process with Diffuser and Mechanical Aerators – Process Modifications – Analysis and Design of Trickling Filter – High rate and Standard Rate Filters – Low Cost Waste Water Treatments – Principles and Design of Stabilization Ponds, Oxidation Ponds and Aerated Lagoons – Rural Sanitation – Operation and Design of Septic and Imhoff Tanks – Excreta Disposal Schemes.

Unit IV : Engineering Methods Of Sludge Disposal

Objectives of Sludge Disposal – Types and Characteristics of Sludges in a Typical Treatment Plant – Operation and Design of Sludge Digestions – Energy Recovery Aspects regarding Methane Production – Sludge Lagooning, Unconvensional Methods of Disposal - Disposal of Sewage by Dilution in Streams, Rivers, and Estuaries – Self-purification and Oxygen Sag-curve Analysis – Trophic Status of Aquatic Bodies.

Unit V : Advanced Waste Water treatment

Diatomaceorus earth filters, ultrafiltration, Adsorption by activated carbon, Phosphorus removal, Nitrogen removal, Physico chemical waste water treatment, Solid waste disposal - classification, composition, collection, & disposal methods. Rural sanitation - collection & disposal of refuse, sullage & night soil

Reference Books :-

1. Water Supply & Sanitary Engg. - G.S. Birdie - Dhanpat Rai Publishing Company 2.Waste Water Engg. by B.C. Punmia - Laxmi Publication (P) Ltd. New Delhi
3. Environmental Engg. - M.L. Davis & D.A. Cornwell - Mc Graw Hill Company
4. Chemistry for Environmental Engg. - Sawyer & Mc Carty - Mc Graw Hill Book Company

5. Water & Waste Water Technology - Mark J Hammer - Prentice - Hall of India, New Delhi
7. Waste Water Engineering - Metcalf & Eddy - Mc Graw Hill Book Company New Delhi

Devi Ahilya University, Indore, India Institute of Engineering &Technology			
Subject Code and Name	**Type**	**L-T-P**	**Credits**
	L	**T**	**P**
VLR7G5 : Structural Analysis – II	**PC**	**3-1-1**	**4+1(P)**

COURSE CONTENTS

Unit I : Force Method : Consistent Deformation Method – General Concept – Application to Truss subjected to Loads – Application of Clapeyron's Theorem of Three Moments to fixed and continuous beams – Temperature, Lack of fit, Settlement of Support – effects in structures

Unit II : Analysis of tall frames, wind and earthquake loads, codal provisions for lateral loads. Approximate analysis of multistory frames for vertical and lateral loads.

Unit III : Matrix Methods of Structural Analysis: Basic structural principles. static and kinematics indeterminacies of a structure .flexibility and stiffness matrices, flexibility and stiffness influence coefficients .

Matrix Force (Flexibility) Method : Basic principles - choice of redundants - released structure - application of fixed beams, continuous beams and portal frame upto two degree static indeterminacy.

Matrix Displacement (Stiffness) Method: Concept of stiffness method - restrained structure - applications to continuous beams and portal frames upto two degree of kinematic indeterminacy.

Unit IV : Influence lines for intermediate structures, Muller Breslau principle, Analysis of Beam-Columns. Plastic analysis of beams and frames.

Unit V : Introduction to Structural Dynamics

Free Vibration damped - undamped vibrations for Single degree of freedom system
- Forced vibration - displacement and force isolation.

Reference Books :-

1. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
2. Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.
3. Reddy C.S., Basic Stgructural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
4. Norris C.H., Wilbur J.B. and Utkys. Elementary Structural Analysis, McGraw Hill International, Tokyo.
5. Weaver W & Gere JM, Matrix Methods of Framed Structures, CBS Publishers & Distributors, Delhi
6. Junarkar. S. B and Shah H.J- Mechanics of Structures Vol 1 & Vol.2 – 27th Edition, Charotar Publishers, 2008.
7. Mario Paz, Structural Dynamics-Theory and Computation, 2nd Edition, CBS Publishers, 2010.

Devi Ahilya University, Indore, India Institute of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
VLR8C1 : Design of Hydraulic And Irrigation Structure	**L**	**T**	**P**
	PE	**3-1-1**	**4+1(P)**

Learning Objectives:

1. To Understand Principles of Design of Hydraulic Structures.
2. To Implement Geotechnical engineering principles in design of hydraulic structures.
3. To get a knowledge of various types of dam.
4. To Understand the different elements of dam.

COURSE CONTENTS

Unit - I

Introduction - Classification of dams, Gravity dams, Earth dams, Arch dam, Buttress dam, Steel dams, Timber dams, selection of site for dam, selection of type of dam, investigations of dam sites, Engineering surveys, Geological investigations, Types of hydropower plants, site selection for power plant, General arrangement of a hydropower project.

Unit - II

Principles of Design of Hydraulic Structures - Hydraulic structures on permeable foundations, Theories of subsurface floor, Khosla's method of independent variables, Exit gradient, Location of Hydraulic jump, water surface profiles, scour due to subsurface flow, Design Principles, Energy dissipation principles.

Unit - III

Gravity Dams - Types of storage head works, Forces acting on gravity dams, Analysis of gravity dams, Profile of a gravity dam, Finite Element Method, Design of gravity dam, joints in gravity dam, Galleries in gravity dam, Adits and shafts, Construction of gravity dam, Foundation Grouting, Instrumentation of gravity dams.

Unit - IV

Earth dams - Types of earth dams, Causes of failure of earth dams, Seepage analysis, phreatic line, flow net construction, criteria for safe design of gravity dams, typical cross sections of earth dams, Stability analysis, Seepage control, design of filters.

Unit - V

Spillways and energy dissipation systems - Essential requirements of spillways, Required spillway capacity, component parts of spillway, Types of spillways, Design of Ogee spillway, Design of shaft spillway, Design of siphon spillway, Design of stilling basins. Hydropower structures - Storage power plant, Runoff River plant, Pumped storage plant, Water conveyance systems, Tunnels and Penstocks, Gates, Surge tanks, Power house layout.

Reference Books: -

13. Engineering for Dams (Volumes I, II & III) by Creager, Justin & Hinds
14. Hydroelectric Hand Book by Creager
15. Hydraulic Structures by Varshney
16. Irrigation & Water Power Engg. by Punmia & Pandey
17. Water Power Engineering by Dandekar

6.Arora K.L. Irrigation Water Resources Engineering, Standard Book Publishing Co., Delhi,1996.

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Select hydraulic structural elements.
2. Evaluate surface water dam.
3. Integrate relevant concept and methodologies in the area of hydraulics,
4. To select the type of dam, design and to construct.

Devi Ahilya University, Indore, India Institute of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
VLR8C2 : Building Planning & Architecture	**L**	**T**	**P**
	PE	**3-1-1**	**4+1(P)**

Learning Objectives:

- To have the knowledge of various building components.
- To understand the fundamental principles and concepts of planning and architecture for buildings.
- To study about different views of layout.
- To learn the development controls covered by building bye laws and national building code for buildings.

COURSE CONTENTS

UnitI

Drawing of Building Elements- Drawing of various elements of buildings like various types of footing, open foundation, raft, grillage, pile and well foundation, Drawing of frames of doors, window, various types of door, window and ventilator, lintels and arches, stairs and staircase, trusses, flooring, roofs etc.

UnitII

Building Planning- Classification of buildings, Provisions of National Building Codes and Rules, Building bye-laws, open area, Setbacks, FAR terminology, Design and drawing of Building, Design concepts and philosophies, Preparing sketch plans and working drawings of various types of buildings like residential building, institutional buildings and commercial buildings, site plans, presentation techniques, pictorial drawings, perspective and rendering, model making, introduction to computer aided design and drafting, Applying of principle of architectural composition (i.e. unity, contrast, etc.), Principles of planning, orientation in detailed drawings.

UnitIII

Building Services- Introduction of Building Services like water supply, sewerage and drainage systems, sanitary fittings and fixtures, plumbing systems, principles of internal & external drainage systems, principles of electrification of buildings, intelligent buildings, elevators & escalators their standards and uses, air-conditioning systems, fire fighting systems, building safety and security systems, ventilation and lightening and staircases, fire safety, thermal insulation, acoustics of buildings.

UnitIV

Principles of architectural composition- Unity, balance, proportion, scale, rhythm, harmony, accentuation and contrast.Organising Principles in architectural- Symmetry, hierarchy, axis, linear, concentric, radial, and asymmetric grouping, primary and secondary masses, Role of colour, texture, shapes/forms in architecture. Architectural space and mass, visual and emotional effects of geometric forms, space activity and tolerance space. Forms related to materials and structural systems. Elements of architecture : Functions – Pragmatic utility , circulatory function, symbolic function, Physiological function. Structure – Physical structure, Perceptual structure.

UnitV

Concepts of master plan, structure plan, detailed town planning scheme and action plan, estimating future needs - planning standards for different land use, allocation for commerce, industries, public amenities, open areas etc., planning standards for density distributions, density zones, planning standards for traffic network, standard of roads and paths, provision for urban growth, growth models, plan implementation, town planning legislation and municipal acts, panning of control development schemes, urban financing, land acquisition, slum clearance schemes, pollution control aspects

Learning Outcomes:

Upon Completing the Course, Student will able to:

- Comprehend local building bye-laws and provisions of National Building Code in respect of building and town planning.
- Discuss various aspects of principles of planning and architecture in planning building and mass composition.
- Explain the principles of planning and design considerations to construct earthquake resistant building.
- Prepare working drawings, foundation plans and other executable drawings with proper details for residential buildings.

Reference Books: -

1. Shah, Kale &Patki; Building Design and Drawing; TMH
2. Malik &Meo; Building Design and Drawing
3. W B Mckay,Orient Blackswan Building Construction Vol 1 -4, Pearson
4. Gurucharan Singh and Jagdish Singh, Building Planning, Designing and Scheduling, Standard Publishers Distributors.
5. Layal JS, Dongre A, Building Design and Drawing, Satya Prakashan
6. Ghose D.N., Civil Engineering Design and Drawing, CBS publisher
7. Das B M, Principles of Foundation Engineering, Cengage Learning.
8. Agrawal S. C., Architecture and Town Planning, Dhanpat Rai & Co.
9. S.C. Rangwala, Town Planning, Charotar Publishing House.
10. Lewis Keeble, Principles and Practice of Town and Country Planning.
11. Rame Gouda, Principles & Practices of Town Planning, University of Mysore, Manasa Gangotri

Devi Ahilya University, Indore, India Institute of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
VLR8E1:	**L**	**T**	**P**
Disaster Modeling And Management	**PE**	**3-1-0**	**4**

COURSE CONTENTS

Learning Objectives:

- To spell out the need for better disaster management which may help to bring relief immediately to the victims of the tragedy.
- To understand and appreciate the nature of disaster management, in its pre-disaster, during disaster and post disaster phases.

Unit - 1

Disasters: Definition- Hazard Risk, Mitigation, Natural and human-induced disasters types of hazards, disasters and catastrophes – Disaster Management.

Unit - 2

Hydrological Hazards: Cyclone – damage assessment- Flooding: Topography, land use and flooding– flood prone area analysis and management Tsunami and floods.

Unit - 3

Drought- types of drought, -factors influencing drought - delimiting drought prone areas - drought index, SPI and Palmer.

Unit - 4

Geological Hazards: Earthquakes; location, faults, causes, types, associated hazards and impacts, Richter scale and Modified Mercalli scale. Important examples from India. Structural damage and its prevention - Dams and earthquakes.-Tsunamis - earthquake induced landslide.

Geomorphic Hazards: Mass movements: Definition of landslides, causes, debris flows, landslides in soil and rock, slope stability analysis.

Unit - 5

Mitigation and Management: Hazard, Risk and Vulnerability mapping and modeling using GIS. Case studies for earth quake zonation.Preparedness- GIS case studiesfor earthquake, landslide–risk assessment–GIS case studies for earthquake, landslide and cyclones. Emergency Management Systems (EMS) in the Disaster Management Cycle.

Books & References Recommended:

1. National Disaster Management Division (2004) Disaster Management in India - A Status Report, Ministry of Home Affairs, Government of India, New Delhi.
2. UNDRO (1995) Guidelines for Hazard Evaluation Procedures, United Nations Disasters Relief Organization, Vienna.
3. Nagarajan, R., (2004) Landslide Disaster Assessment and Monitoring, Anmol Publications, New Delhi.
4. Ramkumar, Mu, (2009) Geological Hazards: Causes, Consequences and Methods of Containment, New India Publishing Agency, New Delhi.
5. Arnold M et.al Ed. (2006) Natural Disaster Hotspots:Case Studies. The World Bank Hazard Management Unit Washington, D.C.204p.

Learning Outcomes:

Upon Completing the Course, Student will able to:

- Know the types of Disasters and its triggering factures.
- Understand the stages of emergency management and GIS capabilities and kinds of data are required to support emergency management work during the disasters.
- Assess the potential of new, evolving GIS technologies to meet vulnerability mapping, modeling and emergency management needs.
- Develop a report or project proposal that identifies or responds to needs for GIS solutions in emergency management.
- Develop a Disaster Management Systems (DMS) for regional and large scale.

Devi Ahilya University, Indore, India **Institute of Engineering &Technology**			
Subject code and name	**Type**	**L-T-P**	**Credits**
VLR8E2:	**L**	**T**	**P**
Design of Pre Stressed Concrete Elements	**PE**	**3-1-0**	**4**

COURSE CONTENTS

Unit - 1

Principles of prestressing - Materials of prestressing - Systems of prestressing - Loss of prestress - Deflection of Prestressed Concrete members.

Unit - 2

Slabs - Pre-tensioned and Post-tensioned beams - Design for flexure, bond and shear - IS code provisions - Ultimate flexural and shear strength of prestressed concrete sections - Design of end anchorage zones using IS code method.

Unit - 3

Composite beams - Analysis and design.Partial prestressing - non-prestressed reinforcements.

Unit - 4

Analysis of Continuous beams - Cable layout - Linear transformation - Concordant cables.

Unit - 5

Design of compression members and tension members. Circular prestressing - Water tanks - Pipes - Analysis and design - IS Codal provisions.

Books & References Recommended:

1.Lin. T.Y., Burns, N.H., Design of Prestressed Concrete Structures, John Wiley & Sons, 1982.
2. RajaGopalan N. Prestressed Concrete, Narosa Publishing House, New Delhi, 2002.

Course outcomes

On completion of the course, the students will be able to:

Design a pre-stressed concrete beam accounting for losses.

Design the anchorage zone for post tensioned members.

Design composite members. Design continuous beams.

Design water tanks

Devi Ahilya University, Indore, India Institute of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
VLR8E3: Instrumentation and Experimental Techniques	**L**	**T**	**P**
	PE	**3-1-1**	**4+1(P)**

COURSE CONTENTS

Unit - 1

Generalised Measurement Systems : Purpose and methods of measurements, Generalised system of three stages, Calculation and sensitivity. Standards of measurements of various quantities. Legal Status of Standards.

Classification of first stage, Basic Detector - Sensor Element, Transducers and Devices, Mechanical and Electrical Members as a Primary Detectors, Advantages of Electrical - System Elements, Introduction of different types of Sensors.

Unit - 2

Statistical Treatment of Data : Accuracy and Precisions, Reliability of Data. Classification of Errors – Systematic and Random Errors.

Treatment of Multi Sample Data. Mean, Mode and Medians as Measures of Central Tendancy. Standard Deviation and Normal Distribution. Error Estimates based on Normal Distribution. Confidence Limits. 2 -Tests.

Unit - 3

Measurement of Elastic Strains : Mechanical, Optical, Acoustic, Pneumatic and Electrical Strain Measuring Devices, Electrical Resistance, Strain Gauges - Wire and Foil Type. Construction Application and their Characteristics. Potentiometric and Wheatstone Bridge Circuit and Modifying Devices. Strain Rossets. Analysis of Data.

Unit - 4

Introduction to Moire Fringe's Technique, Stress Analysis by Photoelasticity : Optical Theory. Stress-Optic Relationship. Polariscopes and Photoelastic Materials. Determination of Isoclinics and Isochormatics, Separation Techniques and Fractional Fringe Order.

Unit - 5

Determination of Model Studies : Models for Investigation and Verification. Design of Models, Principles of Similitude. Material Scale Factor, Load Scale Factor and Geometric Scale Factors. Correlation of Model Studies and Prototype Behaviour.Distribution. Analysis of Crack Pattern, Photoelastic Coating. Techniques to Elastic Strain Gauges.

Books & References Recommended:

6. Jain R.K., Mechanical & Industrial Measurements
7. Dally & Riley, Experimental Stress Analysis.
8. Shrinath L.S., Experimental Analysis
9. Buck & Beckwith, Mechanical Measurments.
10. Sirohi & Radhakrishan, Mechanical Measurments.
11. Dove & Adams, Experimental Stress Analysis.

Devi Ahilya University, Indore, India Institute of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
VLR8E4: Design of Earthquake Resistant Structures	**L**	**T**	**P**
	PE	**3-1-0**	**4**

COURSE CONTENTS

Unit - 1

Elements of Earthquake Engineering: Earthquake magnitude and intensity, Focus and Epicentre, Causes and Effects of Earthquakes, Characteristics of Earthquake, Seismic zone mapping.

.Unit - 2

Structural Systems For Seismic Resistance:
Structural systems – building configuration, frames,walls, dual systems – response in elevation – plan – influence of structural classificationConcepts of seismic design.

Unit - 3

Analysis for Earth Quake Loads: IS: 1893-2002- Seismic Coefficient method- modal analysis Applications to multi-storied building frames – water tanks – chimneys.

Unit - 4

Ductile Detailing: Ductility of R.C structures- Confinement- detailing as per IS-13920-1993- moment redistribution – principles of design of beams, columns – beam column joints – soft story concept.

Unit - 5

Base Isolation: Isolation systems – Effectiveness of base isolation.

Books & References Recommended:

1. Dynamics of structures – A.K. Chopra, Prentice Hall.
2. I.S. 1893 - 2002, Criteria for Earthquake Resistance design of Structures.
3. Pankaj Agarwal and Manish Shrikhande, Earthquake resistant design of structures, PHI 2006.

Course Outcomes: At the end of the course, the student will be able to:
1.Apply seismic coefficient and response spectrum methods for analysis of multi storied buildings
2. Apply concepts of ductility in the design of multi-storeyed structures
3. Analyse a water tank structure based on latest earthquake code

Devi Ahilya University, Indore, India Institute of Engineering &Technology			
Subject code and name	**Type**	**L-T-P**	**Credits**
VLR8G6 : Construction Techniques	**L**	**T**	**P**
	GE	**3-1-0**	**4**

Learning Objectives:

- To give an experience in the implementation of new technology concepts
- To understand the use of form work and temporary structure.
- To Create awareness about construction practices for sub structures under various conditions..
- To Study process of repair and rehabilitation of structures.

COURSE CONTENTS

UNIT –I

Formwork and Temporary structures : Scaffolding – Definition, Component, parts, Types of scaffolding, Shoring – Definition, Types, Raking, flying and dead shores, Underpinning: definition, Purpose, Types, Pit Methods, Pile Method. Form work: Definition – Materials used Requirements of a good formwork , Form work for column, RC beams and RC slab.

UNITII

Sub Structure Construction : Box Jacking -pipe jacking - diaphragm walls types and methods - piling techniques - driving well and caisson – sheet piles – construction procedures and applications-cofferdam - methods -cable anchoring and grouting - laying operations for built up offshore system - shoring for deep cutting - well points - dewatering and stand by plant equipment for underground open excavation - Trenchless Technology.

UNITIII

Common Strengthening Techniques

Mud Jacking grout through slab foundation - micro piling for strengthening floor and shallow profile pipeline laying - protecting sheet plies, screw anchors - sub grade water proofing -under pinning , crack stabilizing techniques ,advanced techniques. Explosives and its classification. Sequenceindemolitionand dismantling.

UNITIV

Construction of Earthquake Resistant Building Planning of earthquake resistant building, Construction of walls – provision of corner reinforcement, construction of beams and columns, Base isolation. Expansion and
construction, joints in buildings,

UNIT- V

Repair And Rehabilitation Of Structures: Diagonising the cause and damage- identification of different types of structural and non structural cracks – repair and rehabilitation methods for Masonry Concrete and Steel Structures. Guniting and grouting, use of epoxy and crack fills. Settlement- causes and remedial measures, plinth protection – necessity and materials used.

Books & References:

1. Mohan Rai & M.P. Jai Singh; Advance in Building Materials & Construction,.
2. S.C. Rangwala; building construction.
3. Sushil Kumar; Building Construction,
4. B.C. Punmia; Building Construction ,.
5. Roy Chudley, Roger Geeno ,"Advanced Construction Technology" Latest Edition, 2005.
6. Gahlot .P.S & Sanjay Sharma ,"Building repair and maintenance management" , CBS Publications.2006.

<table>
<tr><td colspan="3">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">IV Year B.E. (Electronics and Telecommunication)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">VLR8G1
Theory & practice of non destructive Testing</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

The Above Course VLR8G1 Theory & Practice of Non Destructive Testing is as per the course available at

MOOC/SWAYAM Course - I
Applications

They will be offered in self study/ MOOCS mode for students who have opted for internship and went at other institutions/organization.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">VLR8G2
Earth science for Civil Engineering Part-I & Part-II</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

The Above Course VLR8G2 Earth Science For Engineering Part-I & Part-II is as per the course available at

MOOC/SWAYAM Course - I
Applications

They will be offered in self study/ MOOCS mode for students who have opted for internship and went at other institutions/organization.

DEVI AHILYA VISHWAVIDYALAYA, INDORE

FACULTY OF ENGINEERING

SCHEME OF EXAMINATION (CBCS)
&
COURSE OF CONTENTS

BE I Year-IV Year Programme

Effective from July 2015

INSTITUTE OF ENGINEERING & TECHNOLOGY
(www.iet.dauniv.ac.in)

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

CBCS SCHEMES OF EXAMINATION FOR BE I PROGRAMME
(Subject to Revision)

B. E. I YEAR (Common to all branches)

(Computer Engineering, Information Technology and Civil Engineering*)

SEM - 1				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR1C1	Applied Mathematics-I	3-1-0	PC1
2.	ACR1C2	Chemistry & Environment Science	3-1-1	PC2
3.	MER1C3	Elements of Mechanical Engineering	3-1-1	PC3
4.	ETR1C4	Basic Electronics	3-1-1	PC4
5.	MER1C5	Workshop Practice	0-1-2	PC5
6.	SSR1S1	Technical English	3-1-0	SS1
7.	BER1V1	Comprehensive Viva I	0-0-4	Viva1
Total Credit for SEM I			**26 actual + 4 Virtual credits**	

SEM – 2				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR2C1	Applied Mathematics-II	3-1-0	PC1
2.	APR2C2	Applied Physics	3-1-1	PC2
3.	MER2C3	Engineering Drawing	2-1-2	PC3
4.	EIR2C4	Electrical Engineering	3-1-1	PC4
5.	COR2C5	Computer Programming in C++	3-1-1	PC5
6.	SSR2S2	Humanities	2-0-0	SS2
7.	BER2V2	Comprehensive Viva II	0-0-4	Viva2
Total Credit for SEM II			**26 actual + 4 Virtual credits**	

* Semester 1 for three branches and Semester 2 for other three branches for the teaching load balancing.

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

CBCS SCHEMES OF EXAMINATION FOR BE I PROGRAMME
(Subject to Revision)

B. E. I YEAR (Common to all branches)

(Mechanical Engineering, Electronics & Telecommunication Engineering and Electronics & Instrumentation Engineering*)

SEM - 2				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR2C1	Applied Mathematics-II	3-1-0	PC1
2.	APR2C2	Applied Physics	3-1-1	PC2
3.	MER2C3	Engineering Drawing	2-1-2	PC3
4.	EIR2C4	Electrical Engineering	3-1-1	PC4
5.	COR2C5	Computer Programming in C++	3-1-1	PC5
6.	SSR2S2	Humanities	2-0-0	SS2
7.	BER2V2	Comprehensive Viva II	0-0-4	Viva2
Total Credit for SEM II			**26 actual + 4 Virtual credits**	

SEM – 1				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR1C1	Applied Mathematics-I	3-1-0	PC1
2.	ACR1C2	Chemistry & Environment Science	3-1-1	PC2
3.	MER1C3	Elements of Mechanical Engineering	3-1-1	PC3
4.	ETR1C4	Basic Electronics	3-1-1	PC4
5.	MER1C5	Workshop Practice	0-1-2	PC5
6.	SSR1S1	Technical English	3-1-0	SS1
7.	BER1V1	Comprehensive Viva I	0-0-4	Viva1
Total Credit for SEM I			**26 actual + 4 Virtual credits**	

* Semester 1 for three branches and Semester 2 for other three branches for the teaching load balancing.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">COR2C5:
Computer Programming in C++</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Course Objectives: To provide introduction to problem solving with computers using a modern language C++, Perform object oriented programming and to demonstrate relevance of object oriented programming in developing solutions to engineering problems demonstrating usage of data abstraction, encapsulation, and inheritance, To learn exception handling techniques.

Prerequisites: Nil.

COURSE OF CONTENTS

UNIT-I

Introduction to flowcharts and problem solving. Types of programming languages, Programming with C++:- C++ Data Types:-auto, bool, int, char, float, double, void. Variables and Constants, Operators, Arithmetic and Logical Expressions, Assignment Statements and Type Casting. Control structures-Iteration statements, Jump Statements and Selective statements. Common C++ Header files, Generation of Random numbers in C++.

UNIT-II

Functions: Introduction - Call by Value and Call by Reference – return values – recursion – Arrays - Introduction to Arrays - Initialization of Array - Multi dimensional Arrays - passing arrays to functions – Strings - Arrays of Strings - Standard Library String Functions.

Structures: Structure elements, Nested Structures, Array of Structures, Array within structures and passing structures to functions.

Unit- III

Pointers:-Declaration and Initialization of Pointers, Dynamic Memory allocation/deallocation operators:- new and delete. Pointers and Arrays:-Array of Pointers, Pointer to an array, Function returning a pointer, Reference variables and use of alias. Invoking functions by passing pointers. Files – Introduction – File Structure - File handling functions - File Types - Error Handling.

UNIT-IV

Object Oriented Programming Paradigm - Basic Concepts of OOP - Benefits of OOP. Class and object fundamentals and various visibility modes in class, Object as function arguments-pass by value and pass by reference. Constructor:-Special Characteristics, Declaration and Definition of a Constructor, Default Constructor, Overloaded Constructor, Copy Constructor and Constructor with default arguments.

Function Overloading:-Need and restrictions of overloaded functions, Steps involved in finding the best match, Default arguments versus overloading.

Destructor:- Special Characteristics, Declaration and Definition of a Destructor. Friend function and its characteristics and friend class.

UNIT-V

Introduction to Operator overloading - Rules for Operator overloading – overloading of binary and unary operators - Introduction to inheritance – Types of inheritance - Abstract Classes - new Operator and delete Operator - Pointers to Objects – this Pointer - Virtual Functions - Pure Virtual Functions - Introduction to Class Templates - Function Templates - Member Function Templates - Basics of Exception Handling - Types of exceptions - Exception Handling Mechanism - Throwing and Catching Mechanism - Rethrowings an Exception - Specifying Exceptions.

Learning Outcomes: After the completion of the course student will be able to create their own application based on daily life problems and will able to sort out the data handling problems etc

BOOKS RECOMMENDED:

[1] Coohoon and Davidson, C++ Program Design: An introduction to Programming and Object- Oriented Design (3rd edition), Tata McGraw Hill, New Delhi, 2003.
[2] Herbert Schildt, the Complete Reference, Tata McGraw Hill.
[3] E Balagurusamy, Object Oriented Programming with C++, McGraw Hill Education.
[4] Ravichandran, Programming With C++, Tata McGraw Hill.
[5] Dromey G, How to solve it by Computer, Prentice Halll – 1978.

II year B.E. (Computer Engineering)
New Scheme on Choice Based Credit System w.e.f. 2016-17

Semester - III

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	ACR3C1	Applied Mathematics - III	PC	3-1-0	4
2.	CER3C2	Object Oriented Programming	PC	3-1-1	4+1(P)
3.	CER3C3	Data Structures	PC	3-1-1	4+1(P)
4.	CER3C4	Digital Electronics	PC	3-1-1	4+1(P)
5.	CER3G1	Computer Organization & Architecture	GE	3-1-0	4
6.	CER3L1	Computer Hardware Lab	--	0-0-1	1
7.	SCR3S3	Environmental Studies	--	2-0-0	2
8.	CER3V3	Comprehensive Viva - III	Virtual	0-0-4	4
				Total Credits	**30**

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ACR3C1 APPLIED MATHEMATICS – III</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- Numerical approach enables solution of a complex problem with a great number of very simple operations. It is useful to find the solution with use of computers making calculation easy and fast.
- The optimization techniques make the students aware of the various techniques, which provide an analytical and objective basis for decisions.

Prerequisites: Matrix, probability theory, elementary statistics.

UNIT-I

Numerical solutions of algebraic and transcendental equations: Bisection method, Regula-falsi method, Newton-Raphson method.
Solution of system of linear algebraic equation: Gauss-Seidel, Gauss Jacobi’s and relaxation methods.
Numerical solution of first order ordinary differential equations by Euler’s and Runge’s methods.

UNIT-II

Interpolation: Finite difference operators, Newton’s and central difference interpolation formulae, divided differences, Lagrange’s interpolation.
Numerical differentiation using newton’s formulae, maxima and minima.
Numerical integration- general quadrature formula, trapezoidal rule, Simpson’s 1/3 and 3/8 rules, Weddle’s rule.

UNIT-III

Correlation and regression analysis – linear correlation and regression, regression plane, multiple and partial correlation.
Random variables-discrete and continuous random variables, probability and density functions, cumulative distribution function, mathematical expectation, normal distribution.

UNIT-IV

Testing of hypothesis- parameter and statistics, sampling distribution of a statistic, standard error, null and alternative hypothesis, test of significance of large samples and small samples, test of goodness of fit and independence of attributes.

UNIT-V

Random (stochastic) processes and their classifications, special random process –Markov process, Markov chain, classification of Markov chains-regular, homogeneous, irreducible (ergodic) and reducible Markov chains, classification of states-period and aperiodic, persistent (recurrent) and transient, absorbing states, steady state distribution.

Learning Outcomes:

Upon completing the course, students will be able to:

- Learn that many problems were analytical methods seems to fail, like solving highly nonlinear equation, numerical methods work very well.
- Use the optimization techniques to provide a mathematical model to represent complex functional relationships.

Books Recommended:

1. B.S.Grewal, Engineering Mathematics, Khanna Publishers, 42/e, 2015.
2. Erwin. Kreyszig, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.
3. Gupta P.P., Malik G.S., Calculus of Finite Differences and Numerical Analysis, Krishna Prakashan Mandir, Meerut, 21/e, 2006.
4. T Veerarajan, Probability, statistics and random processes, 2nd edition, Tata McGraw-Hill, New Delhi, 2005.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">CER3C2
OBJECT ORIENTED PROGRAMMING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

1. To provide the knowledge of Object Oriented Programming Paradigm.
2. To learn basic constructs of programming language that are implementing tools for object oriented program development.
3. To develop skill to analyze and code for problem solution in object oriented approach.

Pre-requisites: Basic skills of Programming

COURSE CONTENTS

UNIT-I

Introduction to Object Oriented Programming: Object Oriented Concepts, Merits of Object Oriented Technology. Abstraction, Encapsulation, Information Hiding. Object Model: definition, State, behaviour, Identity and messages. Concept of object initialization, constructors, constructor overloading. Access modifiers: Class attributes and methods. Introduction to object model of software development.

UNIT-II

Introduction to Java classes and objects: Java features: Java syntax, data types, data type conversions, control statements, operators and their precedence. Introduction to Class: Instance members and member functions. String Handling, Wrapper classes: Arrays and Vectors.

UNIT-III

Inheritance and Polymorphism : Class relationships: Inheritance and its types, Merits and Demerits. Association. Association inheritance, Polymorphism: Dynamic method dispatch, Runtime polymorphism, Abstract classes, Interfaces and Packages.

UNIT-IV

Exception Handling and Multithreading: Exceptions: Need for exceptions, Checked Vs Unchecked exceptions, creating custom exceptions. Multithreading: Introduction, Priorities and scheduling, Inter-thread communication, Thread Synchronization and its life cycle.

UNIT-V

Java I/O, Applets and Event Handling: Basic concept of streams I/O stream & reader-writer classes. File handling. Applet and its Life Cycle, Basic GUI elements, Event Delegation Model and event handling

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Analyze and code the solution to problem using object oriented paradigm.
2. Understand Java language constructs.
3. Apply object model for software development

BOOKS RECOMMENDED:

[1] Cay S.Horstmann, *Core JAVA Vol-1*, 9/e, Pearson Education 2012.
[2] Herbert Schildt, *The complete Reference*, 9/e, Tata McGraw Hill 2014.
[3] Scott W Amber, *The Object Primer*, 3/e, Cambridge 2004.
[4] Timothy Budd, *Object Oriented Programming*, 3/e, Pearson Education 2002.
[5] Kathy Sierra, Bert Bates, *Head First Java*, 2/e , Oreilly Publications 2005.

List of Practical Assignment:

1. Experiments to understand program development environment for Java language.
2. Writing program to learn basic language constructs like identifier, variables, data types and console input/output..
3. Writing program to learn control statements.
4. Writing program to use class and objects to model problem domain entity in program domain.
5. Writing program to use inheritance and polymorphism features.
6. Programs to use exception and understanding modeling errant condition in execution as class and objects.
7. Experiments to learn Multi-Thread execution.
8. Writing program to code applications needing concurrency and exploring inter-thread communication mechanism.
9. Experiments to understand stream concept and study various stream abstractions and implementation available in the language
10. Exploring GUI components and understanding Event Delegation Model. Understanding (GUI) objects and their communication based program to realize object oriented programming in action.

<table>
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Institute of Engineering & Technology</td><td colspan="4">II Year B.E. (Computer Engineering)
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">CER3C3
DATA STRUCTURES</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

1. To provide the knowledge of basic data structures and their implementations.
2. To understand importance of data structures in context of writing efficient programs.
3. To develop skills to apply appropriate data structures in problem solving.

Prerequisites: Computer Programming knowledge

COURSE CONTENTS

Unit-I

Arrays and List: Array: Definition, Representation, Address Calculation; Searching: Linear search, Binary search; Sorting: Bubble sort, Insertion sort, Selection sort, Radix sort, Shell sort; List: Introduction, Implementation as Linked list, Circular linked List, Doubly linked list, Applications of linked list.

Unit-II

Stacks: Definition, Representations: static and dynamic, Implementation of stack, Applications of stack: Polish notation representation and conversion, Tower of Honoi problem, Implementation of recursion, Quick sort and Merge sort.

Unit-III

Queues and Hashing: Definition, Representations, Static and dynamic, Circular Queue, Double ended Queue, Priority Queue, applications of queues. Hash Structures: Representation, Search and Implementation and other issues.

Unit-IV

Trees: Definition, Basic terminology, Binary tree, Complete Binary Tree, representations: Static and dynamic, Traversal techniques in binary tree, Heap tree & its applications, Binary Search tree, AVL tree, M-way search trees, B-tree & its variations.

Unit-V

Graphs: Definition, Basic terminology, Graph Types, Representations: static, dynamic; Implementations, Searching in graphs – BFS, DFS, Shortest path in graphs, Applications.

Learning Outcomes :

Upon Completing the Course, Students will able to:

1. Learn the basic types for data structure, implementation and application.
2. Know the strength and weakness of different data structures.
3. Use the appropriate data structure in context of solution of given problem..
4. Develop programming skills which require to solve given problem.

BOOKS RECOMMENDED:

[1] E. Horowitz & Sahni,Fundamental Data Structure, Galgotia Book Source, 1983.

[2] A. Tannenbaum, Data Structure Using C, Pearson Education, 2003.

[3] Kruz, Data Structure and Programming Design, 1987.

[4] N. Wirth, Algorithms +Data Structure = Program, Prentice Hall of India, 1979.

[5] Goodrich & Tamassia, Data Structures and Algorithms in C++, 2nd Edition, John Wiley & Sons, 2011.

List of Practical Assignments:

1. Implementation of searching and sorting techniques.
2. Implementation of list using array and linked list.
3. Implementation of push and pop operation on stack
4. Implementation of polish notation and its conversion
5. Write a program to solve the problems using iteration/recursion
6. Program for recursion removal using stack
7. Program for insertion /deletion operation on various queue & Implementation of priority queue for process scheduling
8. Program for storing data as tree structure and implementation of various traversal techniques
9. Program for storing data as graph structure and implementation of various traversal techniques
10. Program for finding shortest path in graph

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<tr><td rowspan="2">CER3G1
COMPUTER ORGANIZATION & ARCHITECTURE</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- Provide a framework for understanding the fundamentals of computing.
- To familiarize students with relationship between hardware and software to focus on the concepts that are the basis for current computers.
- Develop skills to understand how to design a computer.
- Develop ability to understand how to enhance performance of a computer system.

Prerequisites: NIL

COURSE CONTENTS

Unit-I

Introduction: Difference Between Computer Organization and Computer Architecture, Computer Types, Flynn's Classification, Functional Units, Basic Operational Concepts: Bus Structures, Software; Performance: Processor Clock, Basic Performance Equation, Clock Rate, Compiler, Performance Measurement; Multiprocessors and Multicomputers, Historical Perspective: Generation of computer, Evolution of Performance; Arithmetic for Computers: Addition and Subtraction of Signed Numbers, Multiplication of Positive Numbers, Booth Algorithm, Floating Point Arithmetic: Addition and Multiplication.

Unit-II

Memory System: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories: ROM, PROM, EPROM, EEPROM, Flash Memory; Memory Speed, Size and Cost Considerations; Cache Memories: Mapping Functions, Replacement Algorithms, Performance Considerations, Hit Rate and Miss Penalty, Caches on the Processor Chip; Virtual Memories: Address Translation; Memory Management Requirements.

Unit-III

Processing Unit: Addressing Modes, Connections between the Processor and the Memory, Processor Activity, Instruction cycle, John Von Neumann Architecture, State Machine Concept, Processor as a State Machine, Data Path Architecture, Data Path Controller: Microprogrammed; Hardwired Design, Firmware Design, Microcontroller Design, Design of Flip-Flop to understand the Design of CPU.

Unit-IV

Input Output Organization: I/O Devices: Introduction**,** Typical Collection, Diversity; Dependability, Reliability, Availability, Disk Storage, Flash Storage, Connecting Processor Memory and I/O Devices, Connection Basics, Interfacing I/O Devices to the Processor Memory and Operating System: Giving Commands to I/O Devices, Communicating with the Processor, Interrupt Priority Levels, Transferring the Data between a Device and Memory, Direct Memory Access and the Memory System; I/O Performance Measures, Impact of I/O on System Performance.

Unit-V

Pipelining & Multiprocessors: Principles of Pipelining, Principles of Linear Pipelining, Clock Period, Speedup, Efficiency, Throughput, Classification of Pipeline Processor, General Pipelines and Reservation Tables, Collision Vector, State Diagram for a Pipeline, Pipeline Hazards, Shared Memory Multiprocessors, Clusters and Other Message-Passing Multiprocessors, Introduction to Graphics Processing Units, Introduction to Multiprocessor Network Topologies.

Learning Outcomes:

Upon completing the course, students will be able to:

- Acquire advance knowledge and understanding of computing.
- Use skills in computer design.
- Apply acquired knowledge to improve performance of a computer.
- In addition to development in technology student will be able to innovate in the architecture of computers, such as the use of caches and pipelining.

Books Recommended:

1. Computer Organization, 5th Ed., C. Hamacher, Z. Vranesic, S. Zaky, McGraw Hill International Edition 2002.
2. Computer Organization and Design, 5th Ed. ,David A. Patterson, John L. Hennessy, The hardware/software interface, Morgan Kaufmann Publisher, 2014.
3. Patterson & Hennessy, Computer Organization and Design, Morgan Kaufmann Publisher, 2007.
4. Computer Architecture and Parallel Processing, Kai Hwang, Faye A. Briggs, McGraw Hill Education, 2012.

List of Assignments (Theory):

During the learning of course, students need to do assignments:

1. Performance measurement of a Computer.
2. Arithmetic for Computers.
3. Cache Hit Rate/Miss Penalty issues.
4. Virtual Memory: Address Translation.
5. Use of Addressing Modes.
6. Study on designs of CPU.
7. Secondary storage performance.
8. Impact of I/O on system performance.
9. Pipelining performance.
10. Multi-core, GPU Processor and Multiprocessor : A Comparison.

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<tr><th>Subject Code & Name</th><th colspan="3">Instructions Hours per Week</th><th colspan="4">Credits</th></tr>
<tr><td rowspan="2">SCR3S3
Environmental Studies</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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Learning Objectives: The Solving the e-Waste Problem (StEP) Initiative, an organization composed of various UN agencies, NGOs and companies working in the Information and Communication Technology Sector & to create understanding of Basel Ban form an effective and sustainable means of addressing the health and environmental problems caused by the export of e-waste from developed countries to developing nations

Pre requisites: Basic Knowledge about Electronic & Electrical components.

COURSE CONTENTS

UNIT-I

Introduction - What is & how is Electronic Waste generated, Toxins in E- waste , issues, Business Model, Basel Convention, Basel Ban.

UNIT-II

Classification of E-Waste - Composition of E-Waste, Components of E-Waste, Possible hazardous substances present in e-waste, E-waste scenario, Basis for Defining e-waste, Proposed definition of E-Waste, RoHS in the Electronic & electrical Equipments ,EPR.

UNIT-III

Legal Framework - The Hazardous Wastes (Management and Handling) Rules, The Municipal Solid Wastes (Management and Handling) Rules, Basel Convention, European Union policy and regulation on e-waste, US Policy for E-Waste

UNIT-IV

The Global Impact of E-waste - E-waste management in India, Global E-Waste Management, Analysis of systems and best practices

UNIT-V

Recycling From E-waste to Resources - Perspectives of WEEE/E-waste Management, Fundamentals Of E-Waste Recycling, Markets For Recycling Technology, Application Of A “technology Transfer Framework” For Selected Recycling Technologies, Innovation Hubs And Knowledge Centers Of Excellence In Emerging Economies

Learning Outcomes:

- Students will have knowledge about controlling E-waste & business models available.
- Students will have insight about recycling the E-waste.
- Students will have information about the different authorized E-waste collectors and government policies.

Books Recommended:

- Products From Waste (Industrial & Agro Waste) 2nd Edition
  Author: NIIR Board ISBN: 818662337X

- Modern Technology of Waste Management: Pollution Control, Recycling, Treatment & Utilization
  Author: NIIR board ISBN: 8178330849

- The Complete Book on Managing Food Processing Industry Waste
  Author: H. Panda ISBN: 9788178331454

- The Complete Technology Book on E-Waste Recycling (Printed Circuit Board, LCD, Cell Phone, Battery, Computers)
  Author: NPCS Board of Consultants & Engineers ISBN: 9788178331577

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">CER3L1
Computer Hardware Lab</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
</table>

Learning Objectives:

1. To provide the knowledge of computer Hardware parts and latest technology.
2. To give basic Knowledge of working internal part of system.
3. To develop skill to analyze and find the fault in System.
4. To know how to assembling the hardware parts.

Pre requisites : NIL

COURSE CONTENTS

UNIT-I

Central Processing Unit - Basics of Processor and Computer Generation, Study of Different Processor, Pentium, Dual Core, Quad Core , I3, I5, I7 Processor, Motherboards, Chipset and Controllers, BIOS and the Boot Process.

UNIT-II

Internal Components - IDE and SATA Devices: Hard Disk Drive and CD/DVDs Drives,SCSI Devices, Floppy Disk, Zip Drive, Backup Drive, Expansion Cards- LAN Card, IDE Card , VGA and SVGA Cards, Sound Card, Interface Cards, I/O cards, Video Cards, USB Card, Internal Ports, Cables and Connector Types, SMPS.

UNIT-III

Computer Peripherals - Monitors:- CRT, LCD and LED Displays, Printers:- Dot-Matrix Printer, Inkjet Printer, Laser Printer

Scanner:- Photo Scanner, Documents Scanner, Bar Cord Scanner, Keyboards, Mouse, External Modem, Ports and Connectors, Batteries, Pen Drives, SCSI interface devices, Laptop Computers, Digital Advance storage technology.

UNIT-IV

Memory and Networking Devices - Computer memory: Primary Memory- RAM, ROM, Secondary memory, Switches, Routers, Modems.

UNIT-V

Assembling and Installation - Assembled the Hardware Parts, Different types of Operating systems, System files FAT and NTFS, DOS, Windows XP, Windows Vista, Windows 7 and Windows 8 and Red Hat Linux and Multi Boot Operating System and latest OS.

Learning Outcomes:

Upon Completing the Course, Student will able to: learn the knowledge of hardware parts and Assemble a computer System and Installation & Uninstallation of Software.

BOOKS RECOMMENDED:

[1] PC AND CLONES Hardware, Troubleshooting and Maintenance B. Govinda rajalu, TataMc-graw-Hill Publication

[2] PC Troubleshooting and Repair Stephen J. Bigelow Dream tech Press, New Delhi.

[3] Windows XP Professional and Windows 7 Edition By BPB Publication.

[4] Red Hat Linux By BPB & SYBEX publication.

List of Assignments*:*

1. To study motherboard.
2. Study of Processor.
3. To study SMPS and UPS.
4. To study the CD-ROM and DVD-ROM.
5. To study working of keyboard and mouse.
6. To study different ports and slots.
7. To study various types of Cables &Connectors.
8. Study of monitors.
9. To study different types of printers.
10. DOS Commands (Internal and External).
11. To study Floppy Disk Drive.
12. Installation of different Operating Systems.
13. Installation of different device drivers.
14. Installation of different Application Softwares.
15. Assembling and Dissembling of a Computer System.

Semester-IV

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	CER4C1	Discrete Structures	PC	3-1-0	4
2.	CER4C2	Operating Systems	PC	3-1-1	4+1(P)
3.	CER4C3	Abstraction & Paradigms for	PC	3-1-1	4+1(P)
4.	CER4C4	Data Base Management Systems	PC	3-1-1	4+1(P)
5.	CER4G2	Digital Signal Processing	GE	3-1-0	4
6.	CER4L2	Hands-on Android Programming	--	0-0-1	1
7.	SCR4S4	Engineering Economics	--	2-0-0	2
8.	CER4V4	Comprehensive Viva - IV	Virtual	0-0-4	4
				Total Credits	**30**

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">CER4C1 DISCRETE STRUCTURES</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce students to ideas and techniques from discrete mathematics that are widely used in Computer Science.
- Provide the fundamentals of formal techniques for solving the problems in mathematical Reasoning, combinatorial analysis, discrete structures, algorithmic thinking, and applications and modeling.

Prerequisites: Nil

Course Contents

Unit-I

Sets: Algebra of sets, laws of sets, computer representation, cardinality of a set, principle of inclusion-exclusion.

Functions: Characteristic function of a set, floor and ceiling functions**,** mod function, hashing function.
Relations: Binary Relation, properties, closure of a relation, equivalence and partial order relations, partially ordered set, Hasse Diagram, totally ordered set, maximal and minimal elements, upper bound, lower bound, greatest lower bound and least upper bound, lattice, sub lattice, properties of lattices, distributive lattices, complemented lattices, modular lattices, topological sorting.

Unit-II

Propositional Logic: Proposition, logical connectives, bit operations, conditional and bi-conditional propositions, logical equivalence, algebra of propositions, tautology, contradiction and contingency, normal forms, logic in proof, predicates and quantifiers, rules of inferences, Applications of propositional logic to logic puzzles, Boolean searches, logic circuits and system specifications.

Unit-III

Mathematical Induction: Strong induction, well-ordering, Recursive definitions.
Advanced Counting techniques: Pigeon-hole principle, sequences and summations, generating functions.
Recurrence relations:-Formation, methods of solution and application.

Unit-IV

Graph Theory: Terminology, graph representation-incidence and adjacency matrices, walk, path, cycle, graph isomorphism, connectedness, Euler & Hamiltonian graphs, planar graph, graph coloring, shortest paths algorithms.

Trees: Terminology, spanning trees, minimum spanning trees, tree traversals; prefix codes.

Unit-V:

Binary operation, groupoid, semi group, monoid, group, subgroup, cyclic group, permutation group, definition and examples of Rings, Integral domain and Fields; Application to coding theory.

Boolean Algebra-Definition, laws of Boolean algebra, Boolean functions, sum of products and product of sum form, normal form, simplification of Boolean function by algebraic method, Boolean expression for logic and switching network, Karnaugh Map Method for simplification of Boolean expressions.

Learning Outcomes:

Upon completing the course, students will be able to:

- Learn a particular set of mathematical facts and know how to apply them.
- Think logically and mathematically.
- Use and analyze recursive definitions.
- How to count some different types of discrete structures.
- Techniques for constructing mathematical proofs and to reason about the efficiency of an algorithm.

Books Recommended:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th ed., Tata McGraw-Hill Edition 2007.
2. Kolman, Busby & Ross, Discrete Mathematical Structures, 6th edition, Pearson Education, 2008.
3. C.L.Liu, Introduction to Discrete Mathematics, McGraw Hill, 1986.
4. Trembley and Manohar, Discrete Mathematical structures for Computer Science, McGraw Hill, 1986.
5. Edgar G. Goodaire, Michael M. Parmenter, Discrete Mathematics with Graph Theory, 3rd edition Prentice Hall, 2005

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Computer Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
CER4C2 **Operating Systems**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**2**	**3**	**1**	**1**	**4+1(P)**

Learning Objectives: To provide an introduction to Operating System concepts and its design issues.

Pre-requisites: Computer Organization.

COURSE CONTENTS

UNIT- I

Introduction: Role of OS: Types of OS, Batch Systems; Multiprogramming; Time Sharing; Distributed & Real time OS. Computer structure and OS: System Architecture – I/O, Storage, Processors; System components- OS Services, System Calls , System Programs; System Design, Implementation and Generation.

UNIT- II

Process Management: Concepts of process: Process status, Process description, Process model. Process Scheduling: Concepts, Scheduler organization, preemptive and non- preemptive scheduler strategies, scheduling algorithms: FCFS, SJN, Priority Scheduling, Round Robin Scheduling, Multiple Processor scheduling, Thread Concepts and Multiple threaded OS.

UNIT- III

Process Synchronization and Deadlock: Process Co-operation, Concepts of Inter-process communication, Process Synchronization, Synchronization Issues, Critical Section problem, Mutual exclusion Primitives and Algorithms, Process Synchronization with semaphores. Concepts of Deadlock, Conditions for Deadlocks, Resource Concepts & Abstractions, Deadlock Prevention, Avoidance and Recovery, Banker Algorithms for Deadlock Avoidance

UNIT- IV

Memory Management and File system: Paging, Segmentation and Contiguous memory allocation. Virtual Memory: Demand Paging, Page replacement and Frame Allocation policies, Thrashing. File System: Concepts, Access Method, Directory Structure, and File System Management.

UNIT- V

Disk management and other issues: Disk management: Disk Structure and Scheduling. File systems, and operating system support for distributed systems. Protection and Security related issues. Case studies of contemporary operating systems.

Learning Outcomes: To learn operating System concepts and its design issues.

BOOKS RECOMMENDED:

[1] Silberschatz, Galvin and Gagne, Operating System Principles, 7th Ed. Addison Wesley.

[2] Gary Nutt, Operating Systems, 3rd Ed. Pearson Education, India

[3] Tanenbaum, Modern Operating Systems, PHI.

[4] W. Stalling, Operating Systems, Macmillan.

[5] H. M. Dietel , Operating Systems, Addison Wesley Longman.

[6] Maurice J. Bach, The design of Unix Operating system, Pearson Education, India.

[7] Sumitabha Das, Unix Concepts & Applications: includes SCO Unix & Linux, Tata McGraw Hill.

Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**II Year B.E. (Computer Engg.)** **(Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
CER4C3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Abstraction and Paradigms for Programming	**3**	**1**	**1**	**3**	**1**	**1**	**4+1(P)**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

To develop an understanding of different paradigms of programming languages. Students will gain both a conceptual understanding of specification and design issues in different paradigms of programming languages and their implementation

Prerequisites: Discrete Structures, Programming Fundamentals.

COURSE CONTENTS

UNIT I

Study of Programming Languages- History of Programming Languages, Features of good Language; Language Design Issues, Static and Dynamic type Checking, Type Checkin Dynamic Type Checking Static Type Checking, Strong Typing, Type of Bindings, Language Paradigms:-Imperative, Object Oriented, Functional Programming, Logic Programming, Parallel Programming, Concurrent Programming .Introduction to Open Source Software.

UNIT II

Programming with Python:-Basic Syntax, Variable Types, Basic Operators, Decision Making, Loops, Numbers, Strings, Lists, Tuples, Dictionary, Functions, Modules, Class/Object, Regular Expression, Database Access, Multithreading, Web programming with Python, Web Scraping, File I/O, Package Management Tools, Python Exercises

Unit III

Imperative Programming with Advanced C++: - Types and Declarations, Pointers, Arrays, Structures, Unions, Enumerations, Statements, Expressions, Functions.

Abstraction Mechanisms: Classes, Special Operators, Hierarchies, Templates, Generic Programming

Standard Template Library in C++: -

Containers: Abilities, Operations, Types. Examples: Vector, Lists, Maps and Multimaps, Unordered containers .

Algorithms: Non-Modifying, Modifying Iterators: Input, Output, Forward, Bidirectional, Random Access. Programming Exercises.

UNIT IV

JavaScript : Overview, Syntax, Placement, Variables, Operators, Data Types Control Structures, String ,Number, Regular Expressions ,Math ,Arrays, Array Methods, Array Sort, Events, Cookies, Page Redirect, Dialog Box, Void Keyword , Page Printing, Objects, Forms, Functions, Error handling, Validation, Animation, Basics of MVC Architecture

JavaScript Frameworks : JQuery, Introduction to Node.js and Angular.js

Unit V:-

XML : Basics, Namespaces , Schema, XSLT, XPATH, Document Object Model, Simple API for XML

Learning Outcomes:

Students will able to apply different paradigms of programming languages in real world problems.

BOOKS REOMMENDED:

[1]T. W. Pratt, M. V. Zelkowitz, Programming Languages: Design and Implementation, 4/e, Pearson Education, 2000.

[2]D. P. Friedman, M Wand, Essentials of Programming Languages, 3/e, MIT Press, 2008. [3]R. W. Sebesta, Concepts of Programming Languages, 8/e, Addison Wesley, 2008

[4] David Hunter "Beginning XML", Wiley Dreamtech, Fourth Edition,2007.

[5] Kal Ahmed, Sudhir Ancha "Professional Java XML",SPD 2004.

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<tr><td rowspan="2">CER4C4 DATBASE MANAGEMENT SYSTEMS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To understand the need of databases, its architecture and schemas.
- To familiarize students with representing domains using entity-relationship modelling.
- How to design a normalized schema in the relational data model.
- Develop skills in students to implement schema and query using SQL.
- Develop ability to develop database applications based on the requirements.

Prerequisites: Knowledge of Data Structures and Computer Programming and some topics of operating systems.

COURSE CONTENTS

Unit-I

Introduction: Database Environment: Basic Concepts, Advantages of Database approach, Comparison with Traditional file systems, DBMS Architecture, Database Users, Data Models and Schemas, Database languages and Interfaces; Database development process: Development Lifecycle, Types of Application.

Unit-II

Database Analysis & Modeling: Introduction to Data Analysis and Modeling, Modeling the rules, Entity Relationship Model, ER Model Constructs- Attributes, Relationship etc., Enhanced ER Model and Business Rules, Modeling Enhanced relationships – Specialization and Generalization, Union Types. Binary and Ternary relationship Issues.

Unit-III

Database Design: Introduction to Logical Database Design, Relational Data Model – Codd's Rules, Relational Algebra etc.; Integrity Constraints, Transforming ER diagrams into relations, Functional Dependencies, Normalization – 1NF, 2NF, 3NF, BCNF and 4NF etc..

Unit-IV

System Implementation & Transaction Processing: Introduction to SQL – Inserting , Updating, and Deleting data, Processing Single Tables, Processing Multiple Tables, PL/SQL Constructs - Views, Triggers, Cursors etc; Transaction Processing – Properties, Schedules and Serializability Issues. Concurrency Control – Introduction, Locking etc.

Unit-V

Advance Topics: File Organization and Indexes, Hashing Techniques, B-trees, B+ Trees etc; Database Recovery, Database Security, Introduction to Data Warehousing and Data Mining, Emerging Database Technologies and Applications etc., Overview of MySQL.

Learning Outcomes:

Upon completing the course, students will be able to:

- Understand the fundamentals of relational database system including: data models database architectures and database manipulations.
- Understand the theories and techniques in developing database applications and be able to demonstrate the ability to build databases using DBMS such as MySQL.
- Be familiar with managing database systems.
- Understand new developments and trends in databases.

Books Recommended:

1. Fundamentals of Database Systems, By R. Elmasri and S. Navathe, 6th Ed. Pearson Education, 2010.
2. Database System Concepts, By A. Silberschatz, H. Korth and S. Sudarshan, 6th Ed. McGraw Hill Education, 2013.
3. A First Course in Database Systems, By J. Ullman, J. Widom, 3rd Edition, Pearson Education, 2014.
4. Database Systems, By T. Connolly and C. Begg, 4th Edition, Pearson Education, 2008.
5. Database Management Systems, R. Ramkrishnan and J. Gehrke, 3rd Edition, McGraw Hill Education, 2014.
6. MySQL : The Complete Reference, 1st Edition, McGraw Hill Education, 2004.

List of Assignments:

During the learning of course, students need to do assignments:

1. Designing an E-R model.
2. Solving basic SQL assignments.
3. Solving intermediate SQL assignments involving Nested and Join queries.
4. Using PL/SQL constructs involving procedures, triggers, views etc.
5. Exploring how transaction processing is handled by MySQL.
6. Minor Project on developing a database application.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Computer Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
CER4G2 DIGITAL SIGNAL PROCESSING	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**-**	**3**	**1**	**-**	**4**
Duration of Theory Paper: 3 Hours							

Objectives: To provide the analysis techniques like for discrete time system analyse the discrete time systems in time and frequency domain using Z- transform, Fourier transform, Discrete Fourier transform to learn the signal processing.

Prerequisites: Awareness about the analysis of signals and systems

COURSE CONTENTS

Unit-I

Introduction to signal processing, discrete time signals and sequence operation, properties. Discrete time systems, their properties, linear time invariant systems, convolution, properties of LTIV systems, inverse system, linear constant coefficient difference equation and their solutions.

Unit-II

Frequency Domain Representation of discrete time signals and systems, suddenly applied complex exponentials inputs, representation of sequences by Fourier transform, condition of their convergence, symmetry properties of FT, Fourier transform theorems.

Unit-III

Introduction to Z transforms, ROC and their properties, Inverse Z transform, Z transform properties, initial value theorem, structure for discrete time systems, and block diagram representation of linear constant coefficient difference equations. Signal flow graph representation of LCCDE, basic structure for IIR system, direct forms, cascade, parallel forms, transposed forms.

Unit-IV

Representation of periodic sequences, discrete Fourier series, properties of DFS, Fourier transform of periodic signals, sampling the FT, Fourier representation of finite duration sequences, the discrete Fourier transform, Circular convolution, linear convolution using DFT, implementing LTIV system using DFT.

Unit-V

Basic structure for FIR systems, direct form, cascade form structures. Efficient Computation of DFT, Goertzel algorithm, decimation in time FFT algorithm, In place Computation, alternative forms, decimation in frequency FFT algorithm, algorithm for N composite number, prime factor algorithm.

Books Recommended:

1. Oppenheim and Schafer, discrete time signal processing, 2/E PHI, 2005.
2. Proakis and Manolakis, discrete time processing, PHI, 2005.
3. S.Mitra, discrete time processing, Pearson Education.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Computer Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
CER4L2 Hands-on Android Programming	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	0	**0**	**2**	**0**	**0**	**1**	**1**

Learning Objectives:

- To familiarize students with Android operating systems internals.
- To learn and develop skills for developing an Android application.

Prerequisites: Knowledge of Java programming and Operating Systems basics.

COURSE CONTENTS

Unit – I
Introduction – What is Android, Installing softwares, Hello Android examples, software stack, android core building blocks, Emulator.

Unit – II

Android UI – Working with buttons & other components, Activity lifecycle, Intent – implicit and explicit, Fragment lifecycle, Android Menu, Layout manager, Adaptor and view.

Unit – III

Android Service & Data Storage – Introduction, Android service API, Android service life cycle, Shared preferences, internal storage, external storage, SQLite, XML & JSON.

Unit – IV

Android Content Provider & Notification – Contact content provider, Other built-in content providers, Understanding content URI, ContentResolver, Notification API, Setting notification properties, issuing notification.

Unit – V

Android APIs & Connectivity – Overview of TextToSpeech API, Telephony API, Location API and Sensor API, Working with WiFi and Bluetooth.

Learning Outcomes : By the end of the course, student will be able to write simple GUI applications, use built-in widgets and components, work with the database to store data locally, and much more.

Books Recommended:

1. Programming Android, Z. Mednieks, L. Dornin, G. Blake, M. Nakamura, ORIELY's.

List of Assignments:

During the learning of course, students need to do assignments:

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Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Computer Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
SCR4S4 ENGINEERING ECONOMICS	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	2	**0**	**0**	**2**	**0**	**0**	**2**

Learning Objectives:

- To make fundamentally strong base for decision making skills by applying the concepts of economics.
- Educate the students on how to systematically evaluate the various cost elements of a typical manufactured product, an engineering project or service, with a view to determining the price offer.
- Prepare engineering students to analyze profit/revenue data and carry out make economic analysis in the decision making process to justify or reject alternatives/projects.

Course Contents:

Unit-I

Introduction to Engineering Economics: Definitions, Nature and Scope of Economics; Difference between Microeconomics and Macroeconomics; Concepts of Engineering Economics- Engineering Efficiency and Economic Efficiency.
Consumer Demand Analysis: Meaning, Features and Determinants of demand; Law of Demand and its Exceptions; Reasons for Law of Demand; Importance of Law of Demand; Elasticity of Demand.

Unit-II

Supply Analysis: Meaning, Supply Function, Law of Supply, Determinants of Supply, Fluctuation of supply; Elasticity of supply and its measurement.

Unit-III

Theory of Production: Production Function, Factors of Production; Law of Variable Proportions; Law of returns to scale
Cost, Revenue and Profit Analysis: Cost Classifications for Predicting Cost Behavior; Concept of Profit, Gross Profit and Net Profit; Break Even Point (BEP).

Unit-IV

National Income: Circular Flow of Income, Meaning and Concept of National Income: GNP/GNI, NNP/NNI, Personal Income and Disposable Income; Methods of Computing National Income - Production Method, Income Method, Expenditure Method.

Unit-V

Economic Stabilization: Monetary Policy- Meaning, Objectives, Tools; Fiscal Policy- Meaning, Objectives, Tools.

Learning Outcomes:

Upon completing the course, students will be able to:

- Understand major principles of economic analysis for decision making among alternative courses of action in engineering.
- Apply economic principles to prices and quantities in competitive supply and demand for

goods and for money.

- Solve economical problems involving comparison and selection of alternatives by using analytical techniques including benefit-cost ratio and breakeven analysis.

Books Recommended:

[1] C S Park, Contemporary Engineering Economics, Pearson Education, 2002.
[2] J S Chandan, Statistics for Business and Economics, Vikas Publishing.
[3] H. L. Ahuja, Principles of Microeconomics, S. Chand (G/L) & Company Ltd, 2002.
[4] D. N. Dwivedi, Macroeconomics Theory and Policy, Tata McGraw-Hill Publishing Company, 2010.
[5] S Damodaran, Managerial Economics, Oxford University Press, 2010.

List of Assignments (Theory):

During the learning of course, students need to do assignment:

- Students are required to research and submit an outline of the past, present and future position of a company of their choice. The outline must include at least one properly labelled table and figure and at least two references.

Semester-V

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	CER5C1	Theory of Computation	PC	3-1-0	4
2.	CER5C2	Software Engineering	PC	3-1-1	4+1(P)
3.	CER5C3	Computer Networks	PC	3-1-1	4+1(P)
4.	CER5E1	Server Side Programming	PE	3-1-1	4+1(P)
5.	CER5G3	Object Oriented Analysis & Design	GE	3-1-0	4
6.	CER5L3	Software Lab	--	0-0-1	1
7.	SCR5S5	Engineering Leadership	--	2-0-0	2
8.	CER5V5	Comprehensive Viva - V	Virtual	0-0-4	4
				Total Credits	**30**
Programme Electives for V Semester					
4.	CER5E2	Software Vulnerabilities and Security	PE	3-1-1	4+1(P)
4.	CER5E3	Methods of Software Development	PE	3-1-1	4+1(P)
4.	CER5E4	Embedded Systems	PE	3-1-1	4+1(P)

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Computer Engineering)(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">CER5C1
Theory of Computation</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:3 Hours</td></tr>
</table>

Learning Objectives:

1. Course should provide a formal connection between algorithmic problem solving and the theory of languages and automata and develop them into a mathematical (abstract) view towards algorithmic design and in general computation itself.
2. The course should in addition clarify the practical view towards the applications of these ideas in the engineering part as well.

Prerequisite:

Students should have a background in discrete mathematics, data structures, and programming languages.

COURSE CONTENTS

UNIT-I:Finite Automata and Regular Languages

Motivation for studying theory of computation, Notion of formal languages and grammars, Kleene's Closure, Regular Expressions and Regular languages, closure properties of regular languages, Finite Automata. Finite Automata with output: Mealy and Moore machines, applications.

UNIT-II: Nondeterminism and Minimization

Nondeterministic Finite Automata, Acceptance condition. Kleene's Theorem, Myhill-Nerode relations, Minimization Algorithm, Non-Regular languages, Pumping Lemma for regular languages.

UNIT-III: Grammars and Context-Free Languages

Grammars and Chomsky Hierarchy, Context-Free Grammars, Context-Free Languages (CFLs),Inherent Ambiguity of CFLs, closure properties of CFLs,Eliminating useless symbols;null-productions; and unit productions, Chomsky Normal Form, Greibach Normal Form, Cock-Younger-Kasami(CYK) Algorithm, Applications to Parsing.

UNIT-IV: Pushdown Automata

Pushdown Automata (PDAs), PDAs vs CFLs. Deterministic PDAs and CFLs, applications, notion of acceptance for PDAs: acceptance by final states, and by empty stack; the equivalence of the two notions, Proof that CFGs generate the same class of languages that PDAs accept, Pumping Lemma for CFLs.

UNIT-V: Turing Machines and Computability

Introduction to Turing Machines, Configurations, Halting vs Looping, Turing computability, Nondeterministic, multitape and other versions of Turing machines. Church`s thesis, Universal Turing Machines,Linear Bounded Automata (LBAs) and context-sensitive languages,Recursive and Recursively enumerable languages,Undecidability of Halting Problem and unsolvable problems about Turing Machines, the diagonalization language and proof that it is not Recursively enumerable.

Learning Outcomes:

After completing the course, the student will be able to:

1. Model, compare and analyse different computational models.
2. Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata.
3. Identify limitations of some computational models and possible methods of proving them.
4. Have an overview of how the theoretical study in this course is applicable to and engineering application like designing the compilers.
5. Have an understanding of the solvable and unsolvable problems and their computational behaviors.

BOOKS RECOMMENDED:

[1] Daniel I.A. Cohen, Introduction to Computer Theory, John Wiley, 1990

[2] John C. Martin, Introduction to Languages andthe Theory of Computation, 3/e Tata McGraw Hill, 2005

[3] J.E. Hop croft and J.D.Ullman, Introduction to Automata, Languages and Computation, Narosa Publishing House, 1995

[4] J.E. Hop croft, Rajeev Motwani and J.D.Ullman, Introduction to Automata, Languages and Computation, Pearson Education, Asia, 2002

[5] H.R. Lewis and C.H.Papadimitrou, Elements of the Theory of Computation, Prentice Hall Inc., 1999

[6] M. Sipser, Introduction to the Theory of Computation, Brooks/Cole Thomson Learning, 1996

[7] Zohar Manna, Mathematical Theory of Computation, McGraw Hill, 1997

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SER5C2
SOFTWARE ENGINEERING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Objective: To familiarize with the process of software development life cycle using the concepts of software engineering.

Prerequisite: Knowledge of a programming language, preferably object oriented and a Mid-size project work.

COURSE CONTENTS

UNIT I

Software Engineering process- Basic concepts of System Design, System :Technical and Socio Technical System, Legacy System, Layered Technology, Software Process Model: Water Fall Model, Prototype Model, Incremental Model, Spiral Model, Agile Model, Role of Software Engineer, Software Qualities and nature requirements and Measurement, Technique; other Software Engineering issues like formality, modality, abstraction, reuse, generality etc.

UNIT II

Critical System, UML, Software Process: Rational Unified Process, Software Requirements, Requirements Analysis and Principles, Requirement Engineering Process, SRS, SDS, End-user requirements, Design Modularity Design, object-orientation

UNIT III

Software Design Process: Design principles, Design Concept: Analysis Model, Design Model, Modularity, Design Methods: Data Design, Architecture Design, Interface Design, Verification goods and Requirement – Testing, Debugging Analysis, Analysis software.

UNIT IV

Software Testing Fundamentals, Black Box Testing, White Box Testing, Other Testing Methods ,Cohesion and Coupling, Verification and Validation ,Case Studies Software Engineering, Management planning control, Organization and Risk Management.

UNIT V

Software Engineering Tools – System programs, Role of Programming languages; CASE Tools; Objected Oriented software Engineering; format Methods; Reengineering process, Client Server Software Engineering.

Learning outcomes:

- How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment
- An ability to work in one or more significant application domains
- Work as an individual and as part of a multidisciplinary team to develop and deliver quality software
- Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle
- Demonstrate an ability to use the techniques and tools necessary for engineering practice

BOOKS RECOMMENDED:

[1] C.Gezzi, M. Jazayeri and D. Mandriohi *Fundament of software Engineering*, PHI 1996.
[2] R.S. Pressman, *software Engineering A Practitioner Approach*, 4/e McGraw-Hill International Edition 1997.
[3] P.Jalote, *An Integrated Approach to Software Engineering*, Naresa Publishing, Latest Edition.
[4]Ian Sommerville, S*oftware Enginering*, Pearson education, 7th edition

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Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Information Technology) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR5C3 COMPUTER NETWORK	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Pre requisites:

Basic knowledge of programming, Data Structures and Object Orient Programming

COURSE CONTENTS

Unit 1 - Introduction:

Definition and goals, Design issues, Network architecture-broadcast & point to point, Models-OSI reference & TCP/IP and their comparative study, Network classification-LAN, WAN & MAN, protocols & services, types of service-connection oriented and connectionless, different protocols.
Transmission Media: Twisted Pair, Coaxial cable, Fiber optic cable, Wireless transmission, telephone system, multiplexing, switching-circuit, packet & message switching, Virtual circuit switch.
Network devices-repeater, bridge, router, gateways, network interface cards, cabling system.

Unit 2 – Data Link Layer:

Framing, Error control-Bit Error, causes of error, control methods, Flow control: Stop & wait, sliding window concept, piggybacking.
Local Area Network Technology: Protocols- Aloha, CSMA, CSMA/CD, Collision free protocols, IEEE 802 protocols, standard- topologies, cabling system, Network management, MAC addressing frame

format. Ethernet.

Unit 3 – Network Layer:

Introduction, features & design issues, Routing- different routing algorithms, congestion control, Internetworking- Concepts and architecture. Addressing-IP Addressing and subnet masking, IP protocols, Network Address Translation, Address resolution protocol (ARP).

Unit 4 – Transport Layer:

Introduction, design issues, Transport layer addressing, buffering, multiplexing, recovery, TCP/IP suit of protocols- TCP & UDP Network applications, Connection establishment, Connection release, TCP Header.

Unit 5 – Application Layer:

Introduction to application layer, Application layer protocols: Electronic mail, File transfer, remote login, WWW, Multimedia etc. Firewalls.

Recommended Books:

- Computer Networks, Andrew. S. Tanenbaum, 4/e, Prentice Hall of India Private Ltd, 2003.
- Data Communications and Networking, Behrouz A Forouzan, 4/e, Tata McGraw Hill Education Private Limited.
- Data Communications & Networks, Achyut S. Godbole, Tata McGraw Hill Education Private Limited, 2002.
- Data and Computer Communication, William Stalling, 7/e, Prentice Hall of India Private Ltd, 2007.

Learning Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

1. Independently understand basic computer network technology.
2. Understand and explain Data Communications System and its components.
3. Identify the different types of network topologies and protocols.
4. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
5. Identify the different types of network devices and their functions within a network
6. Understand and building the skills of subnetting and routing mechanisms.
7. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

List of Assignments:

During learning of course, students need to do assignments:

1. Study of various network devices in detail.
2. Study of basic network commands and network configuration commands.
3. Installation of LAN card.
4. Implementation of Bit Stuffing.
5. Implementation of Byte stuffing.
6. Implementation of error correcting codes.
7. Implementation of error detection codes.
8. Study of network IP.
9. Implementation of various routing protocols.
10. Programming with Sockets.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Computer Engineering)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
CER5G3 **Object Oriented Analysis &Design**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper:3 Hours							

Learning Objectives:

3. To learn object oriented analysis, modeling and design using UML.
4. To learn object oriented approach of software engineering.

Prerequisite:

Knowledge of object oriented programming and basics of software engineering.

COURSE CONTENTS

UNIT-I

Rational Unified Process, Process Notation, Introduction to UML, Business Modeling Workflow, Object Oriented Analysis: Requirements Overview, Problem Statement, Glossary, Supplementary Specifications, Analysis and Design Overview; Architectural Analysis overview,Use Case Analysis: finding classes from use case behavior, describe responsibility, attribute and association; qualify analysis mechanism.

UNIT-II

Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT-III

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.
Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

UNIT-IV

BehavioralModeling: Use cases, Use case Diagrams, Activity Diagrams, Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT-V

Architectural Modeling: Architectural Analysis: Analysis Mechanisms, Key Abstractions, Pattern, Initial Architectural Layers, Component, Deployment, Component diagrams and Deployment diagrams.

Learning Outcomes:

After successfully completing this course you will be able to:

1. Describe Object Oriented Analysis and Design concepts and apply them to solve problems.
2. Prepare Object Oriented Analysis and Design documents for a given problem using Unified Modeling Language

BOOKS RECOMMENDED:

[1] Grady Booch, Object Oriented Analysis & Design with Application, Pearson Education India 2nd Edition.

[2] Scott W. Ambler, The Object Primer, Cambridge University Press, 2nd Edition.

[3] Philippe Kruchten, The rational Unified Processes & Introduction Pearson Education India 2nd Edition.
[4] Grady Booch, Games Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, Addison Wesley
[5] M. Blaha, J. Rambaugh, Object Oriented Modeling and Design with UML, Pearson Education 2nd Edition,2007.

List of Practical Assignment:

1. To develop a problem statement.
2. Develop an IEEE standard SRS document. Also develop risk management and project plan (Gantt chart).
3. Identify Use Cases and develop the Use Case model.
4. Identify the business activities and develop an UML Activity diagram.
5. Identity the conceptual classes and develop a domain model with UML Class diagram.
6. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
7. Draw the State Chart diagram.
8. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
9. Implement the Technical services layer.
10. Implement the Domain objects layer.
11. Implement the User Interface layer.
12. Draw Component and Deployment diagrams.

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">CER5L3
Software Laboratory</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">1</td><td rowspan="2">1</td></tr>
<tr><td>Duration of Practical:
2 Hours</td></tr>
</table>

Objective: To develop the skill set so that the students can develop software application using python on their own

Prerequisite: Programming Concepts.

Unit-1

Features of Python, Setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator, If, If- else, Nested if-else, For, While, Nested loops Break, Continue Accessing Strings, Basic Operations, Function and Methods.

Unit-2

Introduction of Sqlite, Database connectivity, Accessing tuples , Executing queries, Transactions , Operations Working, Handling error Functions and Methods, Printing on screen Reading data from keyboard, Opening and closing file, Reading and writing files

Unit-3

Graphics and GUI programming-Drawing using Tkinter and python. Networking and Multi-threaded programming –Sockets, Thread and Processes, Chat application.

Unit-4

Class and object. Attributes, Inheritance, Overloading, Overriding, Data hiding Regular expressions, Match function, Search function, Matching VS Searching, Modifiers, Patterns, CGI(Introduction, Architecture, CGI environment variable, GET and POST methods, Cookies, File upload.

Unit-5

Web Frameworks - for developing server-side Web applications in Python, Web Browse Programming - interfacing with existing browsers and browser technologies.

Outcome: After the completion of the course the student will be able to develop projects on their own and will try to relate them with the real life problems and this skill will help them for the development of project in next academic session as well as their analytic and research capability will be enhanced.

Reference Books:

- John V Guttag. “Introduction to Computation and Programming Using Python”, Prentice Hall of india
- R. Nageswara Rao, “Core Python Programming”, dreamtech
- Wesley J. Chun. “Core Python Programming - Second Edition”, Prentice Hall
- Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structures and Algorithms in Pyhon”, Wiley
- Kenneth A. Lambert, “Fundamentals of Python – First Programs”, CENGAGE Publication
- Luke Sneeringer, “Professional Python”, Wrox
- Hacking Secret Ciphers with Python”, Al Sweigart, URL- https://inventwithpython.com/hacking/chapters

Programming Assignments:

Students are given programming assignments to learn following.

1. How to take input through file/command line/ network.
2. Concept of Python List, Python String, Python Dictionary, Python Tuples and data type conversion.
3. Techniques of function calling, modules like import, from import etc.
4. Basic I/O functions and exception handling in Python.
5. Concept of object oriented programming, built in class attributes, regular expressions for pattern matching.
6. To work with database interfaces (Sqlite).
7. Concept of networking using Python
8. Web development using web framework flask, bootstrap.
9. Use of XML, CSS, HTML, AJAX to understand the concept behind the web browsing.
10. A project to be developed which uses the above concept.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Computer Engg.)
(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">CER5P1
Server Side Programming</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives: To learn web development using server side programming technologies and to develop skills for building web application with dynamic contents.

Pre requisites: Knowledge of Java Programming language (core), HTML, XML and basics of SQL.

COURSE CONTENTS

UNIT-I

Introduction: Introduction to HTML, HTML tags, HTML forms. HTTP protocol: HTTP request, HTTP response. Introduction to CGI, PHP, ASP and compare these server side technologies with Servlets and JSP. Web Server; web Container, overview of web application.

UNIT-II

Servlets: Basics of Web, MVC in Server side Programming, Servlet API, Servlet Interface, GenericServlet, HttpServlet, Servlet Life Cycle, Working with Apache Tomcat Server, Steps to create a Servlet in Tomcat, Deployment descriptor. ServletRequest: Various Servlet Request methods for form data and HTTP header data.

UNIT-III

Session Tracking: Purpose and need of Session Tracing. Approaches to session tracking: Cookies, Hidden Form Field, URL Rewriting, Session tracking with JAVA Servlet API.

UNIT-IV

Database Connectivity and Servlet Collaboration: Database drivers, JDBC, API for Querying with database, API for updating the database. Servlet collaboration: Methods of Request Dispatcher interface: forward, Include. Sendredirect.

UNIT-V

Java Server Pages: Basic of JSP: Life Cycle of JSP, JSP API. Scripting Elements: - Scriplet Tag, expression tag, declaration tag. 9 Implicit Object: out, request, response, config, application, session, page context, page and Exception. Directives: - page directive, include directive, taglib; Exception Handling, Action Elements, JSTL, Custom tags.

Learning Outcomes: To learn Server Side Programming concepts and its design and implementation issues.

BOOKS RECOMMENDED:

[1] J2EE Tutorial from https://developer.oracle.com/technology/Java
[2] Jason Hunter JAVA servlet programming, , William Crawford, O'Reilly, SPD.
[3] Professional JAVA server programming, J2EE edition, volume I, Wrox, SPD.

<table>
<tr><td colspan="2">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="3">III Year B.E. (Computer Engg.)
(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SER5S5
Engineering Leadership</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

1. The course to develop growth in decision-making, commit to absolute responsibility to deliver on time resourcefulness, ethical actions and integrity, trust and loyalty, work to empower the people, courage face difficult/high-risk actions head-on, vision, realizing the vision design processes and approaches, interpersonal skills, communicating and advocacy.
2. To excel in careers, broaden technical perspectives and acquire new business and leadership skills.
3. To build a quality to achieve vision and mission by working more effectively in teams.
4. To increase awareness of others by interpersonal skills so that contribution would be best in any situation.
5. To turn empathy into impact & uncover the strengths of team members and inspire them to common purpose.

Pre requisites: Basic knowledge about organization & business environment.

COURSE CONTENTS

UNIT-I

Develop Your Leadership Skills

Overview of leadership, essential qualities, generic leadership traits, team maintenance need, towards the functional approach to leadership, role as leader, turning the core leadership functions into skills, developing leader in you, lead at the strategic level, the functions of a strategic leader, the importance of practical wisdom, leadership for desirable change , grow leaders in your organization

UNIT-II

Leadership & Management

Visions, goals and strategies, the creativity thing - change and resistance to change, the proactive – reactive interface, time management, the dynamics of interdependent leadership, delegation

UNIT-III

Corporate Social Responsibility

Corporate governance and society, corporate governance and finance, governance and the board governance, the CEO and leadership

UNIT-IV

Leadership to Entrepreneurship

Meaning, definition of entrepreneurship, role characteristics, IPR

UNIT-V

Leadership Challenges In Business & Personal Financial Planning

Elements of leadership development, personal & corporate financial planning, how financial planning helps leaders.

Case Studies

Learning Outcomes:

After completing the course a student will be able to -

1) Experiential Learning to Enhance Knowledge, Skills and Attitudes
2) Built on this foundation, five pillars represent the core elements of the curriculum:
3) Leadership Capabilities
4) Product Development
5) Scientific Foundations
6) Challenge Project

BOOKS RECOMMENDED:

[1] IMS Proschool, "**Introduction to Financial Planning**", Tata McGraw Hill Education.
[2] Madhu Sinha,"**Financial Planning: A Ready to Reckoner**", Tata McGraw - Hill Education
[3] Colombo plan staff college for Technician Education, Manila , **Entrepreneurship Development**, Tata McGrawHill
[4] N.K. Acharya, **Text book on intellectual Property Rights**, Asha Law House New Delhi,
[5] Raymond Morrison , **Maintaining Effective Engineering Leadership** , IET

Semester-VI

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	CER6C1	Computer Graphics	PC	3-1-0	4
2.	CER6C2	Design and Analysis of Algorithms	PC	3-1-1	4+1(P)
3.	CER6C3	Compiler Techniques	PC	3-1-1	4+1(P)
4.	CER6E1	Data Warehousing & Mining	PE	3-1-1	4+1(P)
5.	CER6G4	Wireless and Mobile Networks	GE	3-1-0	4
6.	CER6L4	Computer Graphics Lab	--	0-0-1	1
7.	SCR6S6	Professional Development Development	--	2-0-0	2
8.	CER6V6	Comprehensive Viva - VI	Virtual	0-0-4	4
				TOTAL CREDITS	**30**
Programme Electives for VI Semester					
1.	CER6E2	Recent Trends in Computer Engineering	PE	3-1-1	4+1(P)
2.	CER6E3	Bioinformatics	PE	3-1-1	4+1(P)
3.	CER6E4	Digital Image Processing	PE	3-1-1	4+1(P)

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE III Year (Computer Engineering) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
CER6C1 **Computer Graphics**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**-**	**3**	**1**	**-**	4

Course Objectives: The goal of this course is to provide an introduction to the theory and practice of computer Graphics.

Prerequisite(s): Programming language: C++/JAVA

COURSE OF CONTENTS

Unit I
Introduction: Application of Computer Graphics, Raster Graphics Fundamentals: Scan conversion, Pixel, Frame Buffer. Graphics Primitives; Line algorithms Circle algorithms, Ellipse, Character generation, Polygon Representation, inside test, Polygon filling algorithms, Antialiasing.

Unit II
Display devices: Random scan and Raster scan monitors, Colors CRT monitor, Plasma Panel; **Hard Copy devices:** Printers and Plotters**; Input devices:** Joysticks, Mouse, Digitizer, Scanner, and Camera; Input Techniques;

Unit III
Windowing and clipping:2D Transformation, Raster method of Transformation, Window, View port, Viewing, Window to View port Transformation, Line clipping algorithms, Polygon clipping algorithms.

Unit IV
Three Dimensions:3D Modeling techniques, 3D Display Techniques, 3D Transformation, Viewing Parameters, Hidden Surface and back face removal algorithms. 3D Curves & Surfaces: Bezier, Bspline.

Unit V
Shading and Color Models: Diffuse illumination, Point source illumination, Reflection, Refraction, Transparency, Shadows, Polygon rendering algorithms, Dithering, Half toning, Color Models and applications.

Learning outcomes:
- To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
- To describe the importance of viewing and projections.
- To define the fundamentals of animation, virtual reality and its related technologies. 5. To understand a typical graphics pipeline 6. To design an application with the principles of virtual reality

BOOKS RECOMMENDED
[1] Hearn Donald and Baker M.Pauling, *Computer Graphics*, 2/e, Prentice Hall of India.
[2] Hearn Donald and Baker M.Pauling, *Computer Graphics with OpenGL*, 3/e, Prentice Hall, 2004.

[3] David F. Rogers, *Procedural Element of computer Graphics*, McGraw Hill International.
[4] William M. Newman Robert F. Sproull, *Principles of Interactive Computer Graphics*, McGraw Hill.
[5] J.D. Foley, A. van Dam, S.K. Feiner, J.F. Hughes, and R.L. Philips, *Introduction to ComputerGraphics*, Addison-Wesley, 1994.
[6] Zhigang Xiang and Roy Plastock, *Computer Graphics*, Tata McGraw Hill Publications.

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<tr><th colspan="4">Devi Ahilya University, Indore, India
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<tr><th>Subject Code & Name</th><th colspan="3">Instructions Hours per Week</th><th colspan="4">Credits</th></tr>
<tr><td>CER6C2</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Design and Analysis of Algorithms</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:3 Hours</td></tr>
</table>

Learning Objectives:

1. Reinforce basic design concepts (e.g., pseudocode, specifications, top-down design)
2. Knowledge of algorithm design strategies
3. Familiarity with an assortment of important algorithms
4. Ability to analyze time and space complexity

Prerequisite:

The students are required to have familiarity with the following data structures: Arrays and linked lists, Stacks and queues, Graphs and trees, binary search trees, height balancing, Heaps and priority queues

COURSE CONTENTS

UNIT-I:Introduction to Algorithms

Notion of algorithms, properties, important areas of research in connection with the study of algorithms, Types of algorithms; Analysis-best case, worst case, and average case. Performance issues - Time and spacecomplexity; Asymptotic analysis. Mathematical preliminaries; functions & their growth rates; Recurrence relations,Methods for solving recurrences.

UNIT-II: Selected Algorithms for Sorting, Searching and matrix multiplication

Elementary sorting techniques: Selection, Bubble, and Insertionsorts; Advanced sorting techniques: Heap, Merge and Quick sorts; Radix & Bucket sorts. Searching techniques: Linearand binary search; Searching minimum and maximum elements.Divide–and-Conquer strategy, Strassen’s matrix multiplication.

UNIT-III:Greedy Method and Dynamic Programming

Algorithms design techniques based on Greedy Method and Dynamic programming. Illustration of these strategies using appropriate examples including Knapsack problem, optimalstorage on tapes, finding shortest path, all pairs shortest path, finding minimum cost spanning trees, and Matrix chain multiplication problem.

UNIT-IV: Backtracking, Branch-and- Bound, and String Matching

Backtracking and Branch-and- Bound algorithm design techniques, Illustration of these techniques using appropriate examples like Queens Problem,subset sum problem,traveling salesperson problem, etc. Introduction to string matching problem, Applications, String matching algorithms: Naive algorithm, Rabin-Karp, Knuth-Morris-Pratt, Boyer-Moore, etc.

UNIT-V: The Theory of NP-Completeness

Non-deterministic Algorithms:Introduction. Nondeterministic Complexity, Decision and optimization problems, Tractable and Intractable Problems,ComputationalClasses: – P, NP, NP-Complete, and NP-Hard; reducibility, Selected NP-Complete and NP-Hard problems:Hamiltonian cycle, Traveling Salesperson (TSP). Satisfiability, Clique problems, etc.

Learning Outcomes:

Students who have completed this course should be able to:

1. Apply design principles and concepts to algorithm design
2. Have the mathematical foundation in analysis of algorithms
3. Understand different algorithmic design strategies
4. Analyze the efficiency of algorithms using time and space complexity theory

Assessment methods of all of the above: quizzes, exams, assignments, practicals

BOOKS RECOMMENDED:

[1] Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, *Introduction to Algorithms*, Second Edition, MIT Press/McGraw-Hill, 2001.

[2] Michael T Goodrich and Roberto Tamassia, *Algorithm Design: Foundations, Analysis, and Internet Examples,* Second Edition, Wiley, 2006.

[3] Jon Kleinberg and ÉvaTardos, *Algorithm Design*, Pearson, 2005.

[4] E. Horowitz, S. Sahni, S Rajasekaran, *Computer Algorithms*, Galgotia Publications.

[5] Saara Base, *Computer Algorithms: Introduction to Design and Analysis*, Addision Wesley, 2/e, 1988.

[6] Knuth, D, *The art of computer programming,* Vols. 1-2-3, Addision Wesley 1968-73.

[7] A V Aho, J E Hopcroft & J D Ullman, *The Design and Analysis of Computer Algorithms*, Addison Wesley, 1974.

[8] Vijay V Vazirani, *Approximation Algorithms*, Springer-Verlag, 2001

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**III Year B.E. (Computer Engineering)(Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
CER6C3 Compiler Techniques	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper:3 Hours							

Learning Objectives:

- Provide a framework for understanding the fundamentals of Compiler. To familiarize students with new Compilation Problems.
- Develop skills to understand how to Design a Compiler.
- Develop ability to understand how to enhance performance of a Compiler for newly evolved Programming Languages.

Prerequisites: Knowledge of Computer Programming, Data Structures, Discrete Mathematics. Knowledge of several different Programming Languages will be useful.

Course Contents

Unit I : Introduction to Compiling

Compilers: The Analysis-Synthesis Model of Compilation, The Context of a Compiler; Analysis of the Source Program: Lexical Analysis, Syntax Analysis, Semantic Analysis; The Phases of a Compiler: Symbol-Table Management, Error Detection and Reporting, The Analysis Phases, Intermediate Code Generation, Code Optimization, Code Generation; Cousins of the Compiler: System Software, Interpreters, Kinds of Language Processors, Preprocessors, Assemblers, Linkers and Loaders, Macros; The Grouping of Phases: Front and Back Ends, Passes, Reducing the Number of Passes; Compiler Construction Tools.

Unit II: Lexical Analysis

The Role of the Lexical Analyzer: Lexical Analysis Versus Parsing, Tokens, Patterns and Lexemes, Attributes for Tokens, Lexical Errors; Specification of Tokens: Strings and Languages, Operations on Languages, Regular Expressions, Regular Definitions; Recognition of Tokens: Transition Diagrams.

Unit III: Syntax Analysis

Introduction: The Role of the Parser, Classification of Grammars, Syntax Error Handling; Context-Free Grammars: Parse Tree and Derivations, Ambiguity, CFG Versus Regular Expressions; Writing a Grammar: Lexical Versus Syntactic Analysis, Eliminating Ambiguity, Elimination of Left Recursion, Left Factoring; Top- Down Parsing: Recursive Descent Parsing, LL(1) Grammars, Nonrecursive Predictive Parsing; Bottom-Up Parsing: Reductions, Shift Reduce Parsing, Conflicts During Shift Reduce Parsing; LR Parsing: Simple LR, Constructing SLR-Parsing Tables, Constructing LALR Parsing Tables; Using Ambiguous Grammars: Precedence and Associativity to Resolve Conflicts, The "Dangling-Else" Ambiguity.

Unit IV: Intermediate-Code Generation and Run-Time Environment

Variants of Syntax Trees: Directed Acyclic Graphs for Expressions, The Value-Number Method for Constructing DAG's; Three Address Code: Addresses and Instructions, Quadruples, Triples; Type Checking: Rules for Type Checking, Type Conversions; Storage Organization: Static Versus Dynamic Storage Allocation; Stack Allocation of Space: Activation Trees, Activation Records; Introduction to Garbage Collection: Design Goals for Garbage Collectors, Reachability.

Unit V: Code Optimization and Planning a Compiler

Basic Blocks and Flow Graphs: Basic Blocks, Flow Graphs, Representation of Flow Graphs; Optimization of Basic Blocks: The DAG Representation of Basic Blocks, Local Common Subexpressions Elimination, Semantic Preserving Transformations, Global Common Subexpressions Eliminations, Dead Code Elimination; Loop Optimization: Loop Invariant Code Motion, Reduction in Strength, Induction Variable Elimination, Loop Unrolling; Planning a Compiler: Source Language Issues, Target Language Issues, Performance Criteria.

Learning Outcomes:

Upon completing the course, students will be able to:

1. Acquire advance knowledge and understanding of Compiler

   Use skills in Compiler Design.

2. Apply acquired knowledge to improve performance of a Compiler.
3. In addition to development in technology computer architectures offers a variety of resources of which students will be able to innovate in the Compiler Design.

Books Recommended:

[1] Compilers: Principles, Techniques, and Tools; Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman; Pearson Education.

[2] Compilers: Principles, Techniques, and Tools; Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman; Pearson Education.

[3] System Programming: D M Dhamdhere; McGraw Hill Education.

[4] System Programming and Operating Systems: D M Dhamdhere; McGraw Hill Education.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">CER6E1
Data Warehousing & Mining</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper:3 Hours</td></tr>
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Learning Objectives:

1. Ability to understand the role of data mining in knowledge discovery process.
2. To familiarize with various data mining functionalities and how it can be applied to various real-world problems.
3. To learn about finding data characteristics and evaluating the outcome of data mining process.
4. To familiarize with various machine learning algorithms used in data mining.

Prerequisite(s):

The students are required to have some basic knowledge about Data structures and Databases.

COURSE CONTENTS

UNIT-I: **Introduction**

Data Mining: Overview, Type of data mined, Functionalities, Technology used, Target applications and challenges; Data Features: Attribute types, basic statistical description, measuring data similarity and dissimilarity.

UNIT-II: Data Preprocessing and Data Warehouse

Data Preprocessing: Overview, Data cleaning, Data integration, Data reduction, Data transformation and discretization; Data Warehouse: Basic concepts, Design and Usage, Implementation.

UNIT-III: Frequent Pattern and Association rule Mining

Basic concepts, Pattern Mining: Apriori algorithm, FP-growth Algorithm; Generating association rules, Pattern evaluation methods, Multi-level and multi-dimensional pattern mining.

UNIT-IV: Classification

Introduction, Decision tree induction, Bayes classification, Rule based classification, Advance classification methods: Bayesian belief networks, backpropogation etc.

UNIT-V: Cluster analysis and Advance Topics

Clustering: Introduction, Types of clustering; Partition-based clustering: K-Means, K-Medoids; Density based clustering: DBSCAN, Clustering evaluation.
Web Data Mining: Introduction, Types of Web mining, and Overview of web usage mining, web content mining and web structure mining.

Learning Outcomes:

Students who have completed this course should be able to:

1. Apply data mining functionalities on real world problems and datasets.
2. Have some knowledge about the couple of data mining tools and how they can be used for large data.
3. They would be able to find the characteristics of given data and may identify presence of outliers, if any.
4. The course would help them to pursue some advance course on data science and may help in subjects like Big Data, AI etc.

Assessment methods of all of the above: quizzes, exams, assignments, practicals

Books Recommended:

[1] Han, Kamber and Pi, Data Mining Concepts & Techniques, Morgan Kaufmann, 3rd Edition, India, 2012.
[2] Mohammed Zaki and Wagner Meira Jr., Data Mining and Analysis: Fundamental Concepts and Algorithms, Cambridge University Press, 2014.
[3] Z. Markov, Daniel T. Larose Data Mining the Web, Jhon wiley & son, USA, 2007.
[4] Bing Liu, Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data, Springer, 2nd Edition, 2011.
[5] Sam Anahory and Dennis Murray, Data Warehousing in the Real World, Pearson Education Asia, 2000.
[6] W. H. Inmon, Building the Data Warehouse, 4th Ed Wiley India, 2005.

List of Experiments :

R-programming and WEKA tools need to be learn in order to complete the lab assignments.

- To know your data, an experiment to visualize summarized data using box-plot, scatter plot and quantile-quantile plot using R-Programming.
- To clean your data, an experiment to find outliers, remove noise and identify correlated data using R-Programming.
- To implement A-priori algorithm to find the frequent patterns in the given dataset. Students can use programming language of their choice to code.
- Use of WEKA tool to use various association mining algorithms on datasets and evaluate them based on pattern evaluation measures.
- Use of WEKA tool to use various classification algorithms on datasets and evaluate them on the basis of accuracy and other parameters.
- Use of WEKA tool to use various clustering algorithms on datasets and evaluate them based on cluster quality and other parameters.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">CER6G4
Wireless and Mobile Networks</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>3</td><td>1</td><td>-</td><td>4</td></tr>
</table>

Learning Objectives: To understand the basic concepts of wireless communication with focus on mobile networking.

- To provide knowledge of different techniques of wireless communication.
- To learn about integration of services and applications from fixed networks into mobile networks.

Prerequisite: Basic knowledge of Computer Networks.

UNIT-I

Introduction:Wireless Networks, Wireless vs Wired Networks, mobile devices, mobile applications, mobile environments and limitations, Wireless transmission-frequencies and regulation, multipath propagation, channel fading, Multiplexing and Modulation techniques, Spread spectrum-DSSS & FHSS,

UNIT-II

Medium Access Control – motivation for specialized MAC, Hidden/Exposed, Near/Far terminal effect, MAC protocols – SDMA,FDMA,TDMA, Reservation Aloha, PRMA, MACA, DSMA etc.

Cellular networks- overview, Cellular Concept and Frequency Reuse, Channel Allocation, Call Setup, Cell Handoffs, Location Management, CDMA, GSM- Architecture, GSM-Air Interface, protocols, HLR/VLR, localization & calling, security, GPRS.

UNIT-III

Wireless LAN : Infra vs Radio transmission, infrastructure vs ad hoc network,IEEE 802.11-system and protocol architecture**,** MAC management**,** IEEE 802.11 flavours**,** Bluetooth – architecture, radio and basband layer, L2CAP, IEEE 802.15, WiMax and Zigbeeoverview

UNIT-IV

Mobile Network Layer : Entities, Packet delivery, Agent Discovery, Tunneling and encapsulation, optimization, reverse tunnelling,
Mobile Transport Layer : Congestion control and implication of mobility, slow start, Mobile TCP – Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/ Fast recovery.
Support for Mobility – File System – CODA, WAP –Architecture,

UNIT-V

Mobile AdhocNetworks- Protocols and Routing,
Advances in Mobile Technologies- 5G and Beyond, Interne of Things (IoT), Internet of Every Thing (IoE), Wireless Sensor Networks, Mobile Opportunistic Networks
Wireless Network Planning and Administration- Wireless Hardware, Wireless Network Design and Deploy, Troubleshooting hardware and connection issues.

Learning Outcomes:

Upon completing the course, students will:

- Be familiar with wireless communication methodologies
- Learn wireless communication protocols and different standards
- Be able to apply these concepts in Wireless Network planning, design and administration to support mobility.

Suggested Books and resources:

1 Jochen Schiller, Mobile Communications, Pearson Education, 2/e, 2003.
2 W. Stalling, Wireless Communications & Networks, Pearson Education, 2/e, 2005.
3 Dharma P. Agrawal and Qing-An Zeng, Introduction to Wireless and Mobile Systems, Cengage Publication, 2012.
4 Wale Soyinka, Wireless Network Administration-A Beginner’s Guide, Tata McGraw-Hill Edu, 2010.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">CER6L4
Computer Graphics Lab</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper:</td></tr>
</table>

List of Practical Assignments :

1. Implement following line drawing algorithm & compare it on the basis (mentioned in table given below) and prepare the table.

	Bresenham	DDA
No. of addition or subtraction		
No. of multiplication		
Execution time		

2. Implement following Circle drawing algorithm & compare it on the basis (mentioned in table given below) and prepare the table.

	Bresenham	Mid point algorithm
No. of addition or subtraction		
No. of multiplication		
Execution time		

3. Implement following Character generation algorithm & compare it on the basis (mentioned in table given below) and prepare the table.

	Stroke	Bit Map
Execution time		
Implementation complexity (advantages/disadvantages)		

4. Implement following Polygon filling algorithm & compare it on the basis (mentioned in table given below) and prepare the table.

	Seed fill	Scan line
Execution time		
Implementation complexity (advantages/disadvantages)		

Implement Cohen Sutherland and Cyrus Back line clipping algorithms and display the clipped portion of line as demonstration.

5. Implement Cohen Hoghman polygon clipping algorithm to clip a polygon against a rectangular boundary and combine Cohen Hoghman polygon clipping algorithm with Cyrus Back line clipping algorithms to clip a polygon against another polygon and display the clipped portion of polygon.

6. Implement the following 2D transformation using matrix multiplication.
   Translation
   Rotation
   Scaling
   Shearing
   Reflection
7. Implement parallel (oblique and axonometric) and perspective projection and display following objects using projections.
   Pyramid
   Rectangles

8. Implement the following 3D transformation using matrix multiplication. And display using perspective projection.
   Translation
   Rotation
   Scaling
   Shearing
   Reflection

9. Implement rotation of an object about any arbitrary axis.

10. Implement reflection of an object about any arbitrary plane.

11. Implement the L-system for generation of symmetric objects(Fractals)

12. Generate 2D curve and surfaces using implementation of Bezier curve.

13. Implement the following visible surface detection algorithm and compare them on the basis of complexities and execution time.
    Z-buffer
    Scan-line
    Depth sorting
    Octree
    RayCasting

14. Implement the following rendering algorithm and compare them on the basis of complexities and execution time.
    Flat Shading
    Gouraud shading
    Phong shading
    Ray tracing

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Computer Engineering)(Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
SCR6S6 **Professional Development**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**0**	**2**	**0**	**0**	**2**
Duration of Theory Paper:3 Hours							

LEARNING OBJECTIVES:
Students who successfully complete this course will:

- Become aware of local business practices world wide
- Understand and evaluate the issues that impact their learning communities
- Gain new perspectives on their aspired professional areas
- Become aware of culturally-specific business practices, perspectives on work ethic, constructive interactions, and related issues
- Become aware about the job Market and their growth

PRE REQUISITES: Basic Knowledge about organization, business environment & computer, Internet or smart phone (for social networking sites).

COURSE CONTENTS

Unit 1 Time Management

- Time Management perception
- Time Management & your life
- Set Priorities
- Magic of 168
- S.M.A.R.T.
- Time Management Tools
- Time Management Behavior

Unit 2 Strengthen different Skills - I

- critical thinking skills
- creative problem-solving skills
- critical reflection skills
- Make cognitive connections between learning & other learning experiences
- Strengthen collaborative learning and teamwork skills

Unit 3 Strengthen different Skills- II

- Strengthen academic writing skills
- Strengthen oral presentation skills
- Strengthen critical reflection skills
- Become familiar with resources available for further research on business practices and issues, as well as culturally-specific business behavior

Unit 4 Personality

- Defining Personality,
- Personality Determinants,
- Personality Development,
- Personality Change
- Various types of Personality.
- Motivation and its Process,
- Increase intercultural skills through guided consideration of varied perspectives

Unit 5 Communication Skills

- Strengthen academic writing skills Resume Writing
- Strengthen oral presentation skills Interview , Discuss speech and short memo assignments
- Strengthen critical reflection skills GD
- Listening skills

Unit 6 Leadership

- Types of Leaders and Styles of Leadership,
- Characteristics and Functions of Leadership,
- Values and Ethics of Leadership.
- Theories Of Leadership
- Leader Member Exchange Theory,
- Contingency Theory,
- Path- Goal Leadership Theory
- Transformational Leadership Theory,
- Charismatic Theory.
-

CASE STUDIES

Industry Visit and Training after completion of the course by students with the help of placement cell.

Using social networking sites students have to develop their professional network.
LEARNING OUTCOMES:

The Professional Development course is comprised of two essential elements: a methodological and contextual seminar and a practical industry survey. The methodological and contextual seminar is delivered by faculty that includes readings, lectures, and discussion of local business practices, key issues for organizations associated with the learning communities.

It also includes discussion of the students' areas of professional interests, and culturally-specific training for students' constructive interaction with local industry. Students will visit local organizations as a group and will gain first-hand knowledge of operations and issues. Discussion with industry leaders will complement these visits. Preparatory group discussions prior to field visits and reflective group exercises following visits will enable students to compare and contrast their observations, challenge and confirm their prior thinking, and sharpen their understanding of the issues that impact their learning communities. Other professional events, such as networking events, will augment the course.

B.E. (Computer Engineering)
New Scheme on Choice Based Credit System w.e.f. 2016-17

Semester-VII

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	CER7PR	Project Phase -I	--	0-0-7	7
2.	CER7C1	Distributed Computing	PC	3-1-0	4
3.	CER7C2	Cloud Computing	PC	3-1-1	4+1(P)
4.	CER7C3	Artificial Intelligence	PC	3-1-1	4+1(P)
5.	CER7E1	Machine Learning	PE	3-1-1	4+1(P)
6.	CER7V7	Comprehensive Viva - VII	Virtual	0-0-4	4
			TOTAL CREDITS		**30**
Programme Electives for VII Semester					
4.	CER7E2	Optimization Algorithms & Techniques	PE	3-1-1	4+1(P)
4.	CER7E3	Robotics and Numerical Control	PE	3-1-1	4+1(P)
4.	CER7E4	Computer Vision	PE	3-1-1	4+1(P)
5.	CER7E5	VLSI Design	PE	3-1-1	4+1(P)

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">CER7C1
Distributed Computing</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

The field of machine learning is concerned with the question of how to build computer programs able to construct new knowledge or to improve already possessed knowledge by using input information. The goal of this course is to introduce the theoretical foundations of machine learning, to provide practical experience of applying machine learning techniques and to investigate new problems where machine learning techniques can do better.

Pre requisites: Basic knowledge of a programming language and Basic knowledge of probabilities and statistics is required.

COURSE OF CONTENTS

Unit-I

Introduction: Basic Concept-Concepts of Distributed Systems: Introduction, Distributed computing models, Software concepts, Design issues in distributed systems, Client-server model, WWW 1.0 and 2.0.Network Communication: LAN and WAN technologies, OSI Model and Internet protocols, ATM, Protocols for Distributed systems

Unit-II

Distributed Computing System DCS design goals, Transparencies, Fundamental issues, Distributed Coordination, Inter-process Communication: Message Passing and its features, IPC message format, IPC synchronization, Buffering, multi datagram messaging, process addressing techniques, failure handling, Formal Models for message passing systems, Broadcast and converge cast on a spanning tree, Flooding and building a spanning tree, Constructing a DFS spanning tree with and without a specified root

Unit-III

Remote Communication: Introduction, RPC basics, RPC implementation, RPC Communication, Other issues, Sun RPC, RMI basics, RMI Implementation, Java RMI

Unit-IV

Synchronization: Clock synchronization, Logical clocks, Global state, Mutual exclusion, Election algorithms: Bully algorithm, Ring algorithm, Leader election in rings, anonymous rings, Asynchronous rings, synchronous rings, election in wireless networks

Unit-V

Deadlock: Deadlocks in distributed systems, Deadlock in Massage communication, Distributed Shared Memory: Concepts, Hardware DSM, Design issues in DSM systems, Implementation issues, Heterogeneous and other DSM systems, Naming: Overview, Features, Basic concepts, System oriented names, Object locating mechanisms, Issues in designing human oriented names, Name caches, Naming and security, DNS

Distributed database system: A Case study

RECOMMENDED BOOKS

1. Distributed Computing, Sunita Mahajan and Seema Shah, Oxford University Press
2. Distributed Systems: Principles and Paradigms, Taunenbaum
3. Distributed Systems: Concepts and Design, G. Coulouris, J. Dollimore, and T. Kindberg, Pearson Education
4. Distributed Computing, Fundamentals, Simulations and Advanced topics, 2nd Edition, Hagit Attiya and Jennifer Welch, Wiley India

Learning Outcomes:

After learning the course the students should be able to

1. Understand distributed systems
2. Know various types of transparencies which Distributed OS should provide
3. Understand and analyze Message passing models
4. Understand RPC and implement it using manual or automatic stub generation
5. Know various synchronization issues
6. Know, analyze various election algorithms
7. Implement threads Understand distributed systems
8. Know various types of transparencies which Distributed OS should provide
9. Understand and analysis Message passing models
10. Understand RPC and implement it using manual or automatic stub generation
11. Know various synchronization issues
12. Know, analyze various election algorithms
13. Implement threads
14. Know File systems
15. Compare various Distributed OS

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE IV Year Computer Engineering (Semester – A)			
Subject Code : CER7C2	**Instructions Hours per Week**			**Credits**			
Subject Name: Cloud Computing	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**1**	**3**	**1**	**1**	**4**

Course Objective:

To study the latest Computing Technologies of Computer Engineering.

Unit-I: Introduction to Cloud Computing

Cloud computing introduction and overview, history, characteristics of cloud, service and deployment models, Role of virtualization in enabling the cloud, Applications, providers of IaaS, PaaS and SaaS; challenges, advantages and disadvantages, Issues, SOA Programming model, Cloud based OS, deployment tools, cloud as green computing model.

Unit –II: Virtualization

Introduction to virtualization, characteristics, virtualization at infrastructure level, CPU virtualization, storage virtualization, network virtualization, Hypervisors, SAN, VLAN, Server virtualization, data center challenges and solutions, scaling a cloud infrastructure.

Unit-III : Service management in cloud

Service monitoring, load balancing, database recovery, backup management, virtual machine management, SLA. Migration of virtual Machines and techniques, different types of management issues.

Unit-IV: Issues and challenges in cloud

Various issues in cloud, cloud security services, secure cloud software requirements, cloud security challenges, network security, virtual machine security, threads.

Unit-V: Using mobile cloud

Working with mobile devices, cloud services applied in smartphone, mobile web services, performance synchronization, Defining WAP & other protocols, Fog computing.

Case study: google app engine, amazon open stack, Aneka, Microsoft Azure.

Recommended Books:

1) Rajkumar Buyya; Cloud Computing Principles and Paradigms; John Wiley & Sons 2011.
2) Rajkumar Buyya; Mastering Cloud Computing; Elsevier Inc 2013.
3) Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
4) Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach" McGraw-Hill Osborne Media; 1 edition [ISBN: 0071626948], 2009.

IIT NPTEL links:

- https://www.youtube.com/watch?v=ZHCtVZ6cjdg&list=PLmmuEIIZy1cbwIMvGF1EsV4ZtAe8vA_7I (Prof S K Ghosh)
- https://www.youtube.com/watch?v=NzZXz3fJf6o&list=PLShJJCRzJWxhz7SfG4hpaBD5bKOloWx9J

Learning outcomes

Introduce the broad perceptive of cloud architecture and model

• Apply different cloud programming model as per need.

• Explore some important cloud computing driven commercial systems such as Google Apps, Microsoft Azure and Amazon Web Services and other businesses cloud applications

List of practicals:

1. Implementation of virtualization using VMware or Virtual Box.
2. Configuration of virtual machine for Storage unit, NIC, Processors and Memory.
3. Configuration of Hardware and software services of virtual machine
4. Configure Iaas, PaaS and SaaS for users.
5. Add new cloud services for local machine.
6. Design and deploy new web services for cloud users.
7. Manage user account and services in cloud.
8. Manage cloud database for remote users.
9. For the cloud users: Create, Update, delete, and modify the database for services.
10. Develop new services for cloud automation like: service update, upload data, backup.
11. Configure and manage the cloud for automatic data recovery and backup.
12. Working With Goggles APP engine and Amazon AWS services.
13. Identify and analyze the principal issues in troubleshooting virtual environments.
14. Performance evaluations and critical evaluations of a small scale virtual environment.
15. Case Study: PaaS (Face book, Google App Engine), SaaS (Desktop Apps) .
16. Case Study: NoSQL databases, MapReduce.

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<tr><td rowspan="2">CER7C3

Artificial Intelligence</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:3 Hours</td></tr>
</table>

Learning Objectives:

- Study the concepts of Artificial Intelligence.
- Learn the methods of solving problems using Artificial Intelligence.
- Learn the knowledge representation techniques, reasoning techniques and planning
- Introduce the concepts of Expert Systems and machine learning.

Pre requisites: **Data Structures and Algorithms**

COURSE CONTENTS

UNIT-I

Introduction: Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics Problem solving methods – Defining the problem as state space search, Problem graphs, Matching, Indexing and Heuristic functions.

UNIT-II

Search Techniques: Hill Climbing-Depth first and Breath first, heuristic search strategies- Best-first search, A*, AO* search, Constraints satisfaction, Means end analysis, simulated annealing, etc. Measure of performance and analysis of search algorithms. Adversarial search –Minimax search procedure, alpha-beta pruning, iterative deepening, genetic algorithms - Related algorithms, etc.

UNIT-III

Representation of Knowledge : Game playing - Knowledge representation, Knowledge representation using Predicate logic,Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representationusing other logic-Structured representation of knowledge. Knowledge representation -Production based system, Frame based system, Scripts, CD, Ontologies, Semantics web and RDF.

UNIT-IV

Knowledge Inference and Planning: Inference – Backward chaining, forward chaining, Rule value approach, uncertain knowledge and reasoning: Probabilistic reasoning, Bayesian networks, Fuzzy logic and reasoning, Theory-Bayesian Network-Dempster - Shafer theory.
Planning overview, components of planning system, Goal stack planning, Hierarchal planning, and other planning techniques.

UNIT-V

Machine Learning and Expert Systems: Overview of different forms of learning, Statistical methods, Learning Decision Trees, Neural Networks, Clustering- basic agglomerative, divisive algorithm based on similarity/dissimilarity measures.Introduction to Natural Language Processing.
Architecture of expert systems, Roles of expert systems - Knowledge Acquisition –Meta knowledge. Typical expert systems - MYCIN, DART, XOON, Expert systems shells. Basic knowledge of Prolog programming language.

Learning Outcomes:

Upon completing the course, students will be able to:

- Familiar with Artificial Intelligence, its foundation and principles.
- Identify appropriate AI methods to solve a given problem.
- Examine the useful search techniques, knowledge representation techniques, Inference methods; learn their advantages, disadvantages and comparison.
- Understand important concepts like Expert Systems, AI applications.
- Learn PrologProgramming to program intelligent systems.

BOOKS RECOMMENDED:

1. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill- 2008.
2. Stuart Russel and Peter Norvig "AI – A Modern Approach", 2nd Edition, Pearson Education 2007Peter Jackson, "Introduction to Expert Systems", 3 rd Edition, Pearson Education, 2007.
3. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007. (Unit-III).
4. http://nptel.ac.in.
5. Carl Townsend, "Introduction to Turbo PROLOG", BPB Publication.
6. Ivan Bratko,"Prolog Programming for Artificial Intelligence", 3rd Edition, Pearson Education.

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<tr><td rowspan="2">CER7E1
Machine Learning</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
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Learning Objectives:

The field of machine learning is concerned with the question of how to build computer programs able to construct new knowledge or to improve already possessed knowledge by using input information. The goal of this course is to introduce the theoretical foundations of machine learning, to provide practical experience of applying machine learning techniques and to investigate new problems where machine learning techniques can do better.

Pre requisites: Basic knowledge of a programming language and Basic knowledge of probabilities and statistics is required.

COURSE OF CONTENTS

Unit-I

Introduction: Definition, Applications of machine learning, Importance of machine learning, Aspects of developing a learning system: training data and test data, Issues in machine learning, Types of learning: supervised, unsupervised and Reinforcement learning, Concept learning, General-to-specific ordering of hypotheses. Version spaces and the candidate elimination algorithm.

Unit-II

Supervised Learning: Classification and Regression learning methods**,** Decision Tree Learning**:** Representing concepts as decision trees, ID3 algorithm. Picking the best splitting attribute, searching for simple trees and computational complexity. Regression and function approximation, linear regression and best fit, Order of polynomial, Polynomial regression, Cross validation.

Unit-III

Unsupervised Learning: Introduction to unsupervised learning -Clustering -Classification of clustering algorithms, Computational Learning theory, PAC Learning, VC dimension.

Artificial Neural Networks Learning: Neural Network Representation, Perception, Back propagation algorithm.

Unit-IV

Language Learning: Classification problems in language: word-sense disambiguation, Formal Language learning, introduction to Hidden Markov models (HMM's).

Support Vector Machines: Maximum margin linear separators. Quadratic programming solution to finding maximum margin separators..

Unit-V

Genetic Algorithms (GAs): Motivation, Representing Hypotheses, Genetic operators, fitness Function and Selection, Working of Genetic Algorithm, Evolutionary Programming and Genetic Programming, Case studies of Machine Learning data sets .

RECOMMENDED BOOKS

15. Tom Mitchell, *Machine Learning*, McGraw-Hill, 1997.
16. Richard O. Duda, Peter E. Hart & David G. Stork, *Pattern Classification,* Wiley & Sons, 2001.
17. Ethem Alpaydin, *Introduction to Machine Learning*, MIT Press, 2004.
18. David E. Goldberg, *Genetic Algorithms in Search, Optimization and Machine Learning,* Kluwer Academic Publishers, Boston, MA, 1989.
19. Zbigniew Michalewicz, *Genetic Algorithms + Data Structures = Evolution Programs*, Springer, 1999.

Learning Outcomes:

Upon Completing the Course, students will have knowledge of various machine learning techniques useful for solving the real world problems.

List of Assignment in Machine Learning Lab:

- **Problem based on different machine Learning algorithm**
- **Works on different machine learning Tools**
- **Case Study on different data sets**

Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**IV Year B.E. (Computer Engineering)** **(Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
CER8C1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Information Retrieval & Extraction	**3**	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper:3 Hours							

Learning Objectives:

- To understand challanges, scale and approaches for Information Retrieval system.
- To study structure and components of Information Retrieval systems.
- To understand design of Information Retrieval system by study of diffrent data structures and algorithms used in design..
- To study means of measuring performance and effectiveness of Information Retrieval system and techniques for improvement.
- To understand Information Extraction and inherent challanges.

Pre requisites: Understanding of Data Structures and Algorithms.

COURSE CONTENTS

UNIT-I

Introduction:Goals and history of IR. The impact of the web on IR., Boolean retrieval: Processing Boolean queries, The extended Boolean model versus ranked retrieval, The term vocabulary & postings lists: Document delineation and character sequence decoding, Determining the vocabulary of terms, Positional postings and phrase queries.

UNIT-II

Dictionaries and tolerant retrieval: Search structures for dictionaries, Wildcard queries, Spelling correction, Phonetic correction, Index Construction: Hardware basics, Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing, Index compression**:** Statistical properties of terms in information retrieval, Dictionary compression, Postings file compression.

UNIT-III

Scoring, term weighting & the vector space model: Parametric and zone indexes, Term frequency and weighting, The vector space model for scoring, Variant tf-idf functions. Computing scores in a complete search system: Efficient scoring and ranking, Components of an information retrieval system, Vector space scoring and query operator interaction.

UNIT-IV

Evaluation in information retrieval: Information retrieval system evaluation, Standard test collections, Evaluation of unranked retrieval sets, Evaluation of ranked retrieval results, Assessing relevance, Results snippets**,** Relevance feedback and query expansion, XML retrieval.

UNIT-V

Informaton Extraction and Other Issues: Language models for information retrieval, Flat clustering, Hierarchical clustering, Web search basics, Web crawling, Information extraction: Task and evaluation.

Learning Outcomes:

Upon completing the course, students will be able to:

- have clear understanding of design of Information Retrieval system.
- Design and code components of Information Retrieval system.
- Understand evaluation of performanve and effectiveness of Information Retrieval System.
- Have understanding of working of Web Search system.
- Understand Information Extraction task.

BOOKS RECOMMENDED:

[1] Christopher D. Manning, Prabhakar Raghavan and Hinrich Schutze, I*ntroduction to Information Retrieval*, Cambridge University Press Cambridge, 2014.
[2] Bruce Croft, Donald Metzler and Trevor Strohman, *Search Engines: Information Retrieval in Practice*. Addison Wesley, 2009.

<table>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4" rowspan="2">IV Year B.E. (Computer Engineering (Full Time) Credits</td></tr>
<tr><td>CER8C2</td><td colspan="3"></td></tr>
<tr><td rowspan="2">NETWORK & INFORMATION SECURITY
Duration of Theory Paper: 3 Hours</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
</table>

Learning Objectives:

1. To impart the knowledge and in-depth reference to current information and network security standards and procedures.
2. This course provides you with an overview of data and computer security and concentrates in technical and continuity management issues.
3. Allow the student to gain expertise in some specific areas of information security such as the design and providing security to individual networks.

Prerequisites :

Basic knowledge of programming and Computer Networks

COURSE CONTENTS

Unit I
Introduction: The need for security, security approaches, principles of security services, mechanisms and attacks, a model for network security. substitution & transposition techniques, steganography, key range & key size.

Unit II
Symmetric Cipher: An general idea of symmetric key cryptography, classical symmetric ciphers, Algorithm types & modes, possible types of attacks, Symmetric & asymmetric cipher model, Data Encryption Standard (DES), Advanced Encryption Standard (AES).

Unit III
Asymmetric Cipher: RSA algorithm, asymmetric & symmetric key cryptography together, digital envelopes, digital signatures & digital certificates & Public key infrastructure (PKI).

Unit IV
Information Security Protocols: Secure Socket Layer, Secure Hyper Text Transfer Protocol (SHTTP), Time Stamping Protocol (TSP), 3- D Secure Protocol, Email Security, and Kerberos.

Unit V
Network Security: Deffie-Hellman key exchange, Firewalls, IP Security, Virtual Private Networks, Intrusion detection system, IP spoofing, DNS spoofing. Introduction to blockchain technology and cryptocurrency.

Learning Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

1. Acquire a practical overview of the issues involved in the field of information security.
2. Demonstrate a basic understanding of the practice of IS, especially in the evaluation of information security risks across diverse settings including the Internet and WWW-based commerce systems, high bandwidth digital communications and funds transfer services.
3. The learning outcome is students shall be able to understand what are the common threats faced today, what are the foundational theory behind information security, what are the basic principles and techniques when designing a secure system, how to think adversarial, how today's attacks and defenses work in practice, how to assess threats for their significance, and how to gauge the protections and limitations provided by today's technology.
4. Familiarity with the basic protocols of Information Security, and how they can be used to assist in network security design and implementation.

Books Recommended:

1. Douglas R. Stinson; Cryptography Theory and Practice; 2nd Edition, Chapman & Hall/CRC
2. Williams Stallings; Cryptography & Network Security; 3rd Edition, Pearson Education
3. Bernard Menezes; Network Security and Cryptography; Cengage Learning India Pvt
   i. Ltd.
4. Neal Krawetz; Introduction to Network Security; 2nd Edition, Thomson Learning Inc.

List of Practical Assignments:

During learning, of course, students need to do assignments:

1. Implementation of various symmetric key algorithms.
2. Implementation of various asymmetric key algorithms.
3. Implementation of Algorithm types and modes (Electronic Code Book (ECB), Cipher Block Chaining (CBC), Cipher Feedback (CFB), Output Feedback (OFB)).
4. Study of Pretty Good Privacy open source security tool for email security.
5. Implementation of digital certificates.
6. Study of IP Tables.
7. Implementation of various open source security tools (Wireshark, Nmap, tables, pretty good privacy, Snort, LC5, OpenVPN, TrueCrypt, THC Hydra).

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**IVYear B.E. (Computer Engg.) (Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
CER8C3 Data Sciences	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- This course will introduce students to data science basic principles and tools as well as its general mindset.
- Students will learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration, exploratory data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and e ective communication.

Prerequisites: Basic knowledge of algorithms and sufficient programming experience and familiarity with basic linear algebra, probability and statistics.

COURSE OF CONTENTS

Unit 1 :Introduction to Data Management
What is Data Science?, Data Science Languagues, Data Warehousing & OLAP, Data Preparation, Data Wrangling etc.

Unit 2 :Statistics and EDA
Descriptive Statistics, Inferential Statistics, Exploratory Data Analysis, Hypothesis Testing etc.

Unit 3 :Machine Learning
Linear Regression, Supervised Classification – K-Nearest Neighbors, Clustering – K-Means etc., Decision Trees, Support Vector Machine and Neural Networks etc.

Unit 4 :Big Data Analytics
Introduction to Big Data and Hadoop, Managing Big Data, Introduction to SPARK, Big Data Analysis etc.

Unit 5 :Advance Topics
Mining Social Nework graphs; Privacy, Security and Ethical Issues in Data Science; Data Visualization; Recommended Systems etc.

RECOMMENDED BOOKS

[1] Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.
[2] Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.
[3] Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009.
[4] Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
[5] Allen Downey. Think Python. Oreilly. First Edition. ISBN 144933072X. 2012.
[6] Joel Grus. Data Science from Scratch. Shroff. ISBN 9352130960. 2015.

Learning Outcomes:

At the conclusion of the course, students should be able to:

- Describe what Data Science is and the skill sets needed to be a data scientist.
- Use Python to carry out basic statistical modeling and analysis.
- Apply EDA and the Data Science process in a case study.
- Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN),K-Means) for predictive modeling.
- Create e ffective visualization of given data, reason around ethical and privacy issues in data science conduct and apply ethical practices.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">CER8E1
Soft Computing</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

20. To familiarize with neural networks and learning methods for neuralnetworks.
21. To introduce basics of genetic algorithms and their applications in optimization andplanning.
22. To introduce the ideas of fuzzy sets, fuzzy logic and fuzzy inferencesystem.
23. To develop skills thorough understanding of the theoretical and practical aspects of Soft Computing.

Pre requisites: Analysis of Algorithm, Artificial Intelligence.

COURSE CONTENTS

UNIT-I

INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS
Evolution of Computing ,Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing, Machine Learning Basics and Fundamentals of Neural Networks and Application.

UNIT-II

NEURAL NETWORKS

Backpropagation Networks, Architecture: perceptron model, single layer artificial neural network, multilayer perception model; backpropagation learning methods, effect of learning rule coefficient, backpropagation algorithm, factors affecting backpropagation training, Associative memory, Adaptive ResonanceTheory.

UNIT-III

GENETIC ALGORITHMS

Genetic Algorithm(GA) Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, probability of crossover and probability of mutation, convergence. The Scheme Theorem – Classification of Genetic Algorithm – Holland Classifier Systems. Simulated annealing and stochastic models, Boltzmann Machine, Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm, Image processing and pattern Recognition.

UNIT-IV

FUZZYLOGIC

Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzyfications&Defuzzificataions, Fuzzy Controller, Industrial applications Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT-V

NEURO, FUZZY MODELING

Adaptive Neuro, Fuzzy Inference Systems Coactive Neuro, Fuzzy Modeling, Classification and Regression Trees Data Clustering Algorithms, Rulebase Structure, Identification , Neuro Fu zzy Control , Case studies.

Learning Outcomes:

Upon Completing the Course, Student will able to:

- Identify and describe soft computing techniques and their roles in building intelligent machines.
- Apply neural networks to pattern classification and regressionproblems
- Recognize the feasibility of applying a soft computing methodology for a particularproblem
- Apply fuzzy logic and reasoning to handle uncertainty and solve engineeringproblems.
- Apply genetic algorithms to combinatorial optimizationproblems.

BOOKS RECOMMENDED:

[1] S. Rajasekaran and G.A.VijaylakshmiPai.. Neural Networks Fuzzy Logic, andGenetic Algorithms, Prentice Hall ofIndia.

[2] Timothy J. Ross, “Fuzzy Logic with Engineering Applications” WileyIndia.

[3] Neural Networks and Fuzzy Systems: Dynamical Systems Application to Machine Intelligence-Bart Kosko, Prentice Hall,1992.

[4] Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998.

[5] David E. Goldberg, “Genetic Algorithms in search, Optimization & Machine Learning” ,Addison-Wesley,1997.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">CER8G1
Machine Learning</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

The Syllabus for the CER8G1 is as per the MOOC/SWAYAM Course-1 .

They will be offered in self study/ MOOCS mode for students who have opted for internship and went at other institutions/organization.

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>CER8G2</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Introduction to Soft computing</td><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

The Syllabus for the CER8G2 is as per the MOOC/SWAYAM Course-II .

They will be offered in self study/ MOOCS mode for students who have opted for internship and went at other institutions/organization.

DEVI AHILYA VISHWAVIDYALAYA, INDORE

FACULTY OF ENGINEERING

SCHEME OF EXAMINATION (CBCS)
&
COURSE OF CONTENTS

BE I Year Programme
(Common to All Branches)
Effective from July 2015

INSTITUTE OF ENGINEERING & TECHNOLOGY
(www.iet.dauniv.ac.in)

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

CBCS SCHEMES OF EXAMINATION FOR BE I PROGRAMME
(Subject to Revision)

B. E. I YEAR (Common to all branches)

(Computer Engineering, Information Technology and Civil Engineering*)

SEM - 1				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR1C1	Applied Mathematics-I	3-1-0	PC1
2.	ACR1C2	Chemistry & Environment Science	3-1-1	PC2
3.	MER1C3	Elements of Mechanical Engineering	3-1-1	PC3
4.	ETR1C4	Basic Electronics	3-1-1	PC4
5.	MER1C5	Workshop Practice	0-1-2	PC5
6.	SSR1S1	Technical English	3-1-0	SS1
7.	BER1V1	Comprehensive Viva I	0-0-4	Viva1
Total Credit for SEM I			**26 actual + 4 Virtual credits**	

SEM – 2				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR2C1	Applied Mathematics-II	3-1-0	PC1
2.	APR2C2	Applied Physics	3-1-1	PC2
3.	MER2C3	Engineering Drawing	2-1-2	PC3
4.	EIR2C4	Electrical Engineering	3-1-1	PC4
5.	COR2C5	Computer Programming in C++	3-1-1	PC5
6.	SSR2S2	Humanities	2-0-0	SS2
7.	BER2V2	Comprehensive Viva II	0-0-4	Viva2
Total Credit for SEM II			**26 actual + 4 Virtual credits**	

* Semester 1 for three branches and Semester 2 for other three branches for the teaching load balancing.

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

CBCS SCHEMES OF EXAMINATION FOR BE I PROGRAMME
(Subject to Revision)

B. E. I YEAR (Common to all branches)

(Mechanical Engineering, Electronics & Telecommunication Engineering and Electronics & Instrumentation Engineering*)

SEM - 2				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR2C1	Applied Mathematics-II	3-1-0	PC1
2.	APR2C2	Applied Physics	3-1-1	PC2
3.	MER2C3	Engineering Drawing	2-1-2	PC3
4.	EIR2C4	Electrical Engineering	3-1-1	PC4
5.	COR2C5	Computer Programming in C++	3-1-1	PC5
6.	SSR2S2	Humanities	2-0-0	SS2
7.	BER2V2	Comprehensive Viva II	0-0-4	Viva2
Total Credit for SEM II			**26 actual + 4 Virtual credits**	

SEM – 1				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR1C1	Applied Mathematics-I	3-1-0	PC1
2.	ACR1C2	Chemistry & Environment Science	3-1-1	PC2
3.	MER1C3	Elements of Mechanical Engineering	3-1-1	PC3
4.	ETR1C4	Basic Electronics	3-1-1	PC4
5.	MER1C5	Workshop Practice	0-1-2	PC5
6.	SSR1S1	Technical English	3-1-0	SS1
7.	BER1V1	Comprehensive Viva I	0-0-4	Viva1
Total Credit for SEM I			**26 actual + 4 Virtual credits**	

*Semester 1 for three branches and Semester 2 for other three branches for the teaching load balancing.

Semester 1

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE-I Year (Common to all branches)
Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AMR1C1:
Applied Mathematics-I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To develop the concepts of calculus, useful to create mathematical models in order to arrive into an optimal solution in various disciplines like physics, engineering, economics, and statistics.
- Provide the fundamentals of formal techniques like differentiation to find the slope of a curve, find approximation to the original function by Taylor's series, determine the stationary points of functions in order to sketch their graphs, optimization of functions and so on; Integration to find areas, volumes, central points and many useful things; Vector fields to represent many physical quantities like velocities, forces (useful in fluid mechanics), particle displacements (useful in solid mechanics), and electric and magnetic fields (electromagnetism).

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT-I

Differential Calculus: Review of Successive differentiation, Leibnitz theorem and problems; Expansion of functions by Taylor's and Maclaurin's Theorem; Asymptotes; Curvature in Cartesian and Polar Coordinates; Envelopes; Evolutes and Involutes.

UNIT-II

Advanced Differential Calculus: Function of Several Variables; Partial Differentiation; Approximations and errors; Jacobians; Taylor's Series of Two Variables; Maxima and Minima of Function of Two and More Variables; Lagrange's Method of Undetermined Multipliers.

UNIT-III

Integral Calculus: Beta and Gamma functions; detailed study of tracing of curves-Cartesian, polar and parametric curves; Area; Length of Curve; Volume; Surface of Revolution; Theorems of Pappus and Guldin and problems.

UNIT-IV

Advanced Integral Calculus: Multiple integrals: Double and Triple Integration; Change of Order of Integration; Area; Volume; Centre of Gravity; Moment of Inertia.

UNIT-V

Vector Calculus: Differentiation of a Vector; Gradient; Divergence; Curl; Integration of a Vector Function; Gauss's, Green's and Stoke's Theorems.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply the concept of function derivatives to study the behaviour and rate of how different quantities change, how the graph of a function can actually be computed, analysed, and predicted and use integrals to find the summation of infinitely many small factors to determine whole.
- Learn the applicability of calculus in various fields like, in physics, it is used in the study of motion, electricity, heat, light, harmonics, acoustics, astronomy, dynamics and advanced physics concepts including electromagnetism and Einstein's theory of relativity use calculus. In the field of chemistry, calculus can be used to predict functions such as reaction rates and radioactive decay. In addition, it is used to check answers for different mathematical disciplines such as statistics, analytical geometry, and algebra.
- Find a way to construct relatively simple quantitative models of change, and deduce their consequences.

BOOKS RECOMMENDED

[1] B.S.Grewal, Engineering Mathematics, 39/e, Khanna Publishers, 2006.
[2] Erwin. Kreyszig, Advanced Engineering Mathematics, 8^{th} edition, John Willy and sons Publications, 1999.
[3] Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.
[4] C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co. Ltd., 6/e, 2003.
[5] H.K.Das, Higher Engineering Mathematics, S.Chand New Delhi.
[6] E Mendelson, G J Hademenos, F Ayres, Schaum's Easy Outline: Calculus, McGraw-Hill, 2000.
[7] R C Wrede, M Spiegel, Schaum's Outline of Advanced Calculus, 2/e, McGraw-Hill, 2002.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>ACR1C2:</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Applied Chemistry &
Environmental Science</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:
- To learn chemistry of various engineering materials and processes, their importance, properties, testing, structure-property relationship, tailoring and their applications in various technologies.
- To understand and aware with various environmental issues and pollution and control studies in modern society for sustainable development.

.
Prerequisite: Nil

COURSE OF CONTENTS

UNIT-I WATER AND ITS APPLICATIONS
Sources, impurities, applications, Hardness- its expression and determination; Boiler troubles and their causes; Industrial water requirement, Treatment of water for industrial purpose; De-ionization of water; Analysis of water; Water quality parameters, Numerical problems on water analysis and water treatment processes.

UNIT-II ENGINEERING MATERIALS AND TESTING
Introduction, classification and requirement of engineering materials. Material testings.

Polymers: Chemistry of polymer materials and their diversification; Types of polymerization and their brief account; Examples of polymers.

Cement, Glass and Refractories: Different types, composition, properties and uses.

UNIT-III LUBRICANTS
Introduction, Principle and functions of lubrication, Types of lubricants, Properties, tests and applications of solid, semi-solid and liquid lubricants; Synthetic lubricants and lubricating emulsions.

UNIT-IV INSTRUMENTAL TECHNIQUES IN MATERIAL CHARACTERIZATION
Classification, Lamberts and Beers Law; Introduction, Principle and applications of Colorimetry, IR, UV-Vis, NMR and Mass spectroscopy; Chromatographic Techniques and applications, Numerical Problems on spectroscopic techniques.

UNIT-V ENVIRONMENTAL SCIENCE
Components of Environment and their interactions, Natural resources, Ecosystem, Impacts of development of environment, Environment protection act, EIA, Sustainable development.

Pollution and its types, Description, effects and control measures of Air, Water, Land and Noise pollution, Chemical toxicology, Global warming, Depletion of ozone layer, Acid rains, Eutrophication, Rain water harvesting, Pollution case studies.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply applications of various engineering materials in different technologies.
- Relate structure-property-uses relationship of engineering materials and tailoring of materials for technology development.
- Use of material testing and material characterization required in different engineering applications.
- Understand the components of Environment and their interactions with modern world. Also to analyse factors affecting, causes of Environmental Pollution and to apply possible control measures for Sustainable development.

BOOKS RECOMMENDED:

[1] Jain & Jain, Engineering Chemistry, Dhanpat Rai Publications, 2007.

[2] S. S. Dara, A Text Book of Engineering Chemistry, S. Chand & Company, 2007.

[3] B.Joseph, Environmental Studies, Tata McGraw Hill.

[4] A.K. De, Environmental Chemistry, New Age International, 1996.

[5] Shashi Chawala, A Text Book of Engineering Chemistry, Dhanpat Rai Publications, 2006.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>MER1C3:</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Elements of Mechanical Engineering</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:
- To understand the basic fundamentals of Mechanical Engineering in light of thermal engineering and production engineering.
- To provide an insight about the basic thermal and production processes, materials, components and applications.

Prerequisites: Nil.

COURSE OF CONTENTS

UNIT I

Thermodynamics and energy, Temperature and Zeroth law of thermodynamics, Systems and control volume, Properties of a system, Energy transfer by heat and work, First law of thermodynamics, Energy analysis of closed systems, Internal energy and enthalpy of ideal gases, Energy analysis of steady flow systems, Analysis of some steady flow engineering devices, Relevant review problems.

UNIT II

Properties of pure substance, p-v and T-s diagram for a pure substance, Mollier diagram for a pure substance, Quality or dryness fraction, Steam tables, Methods for measurement of steam quality, Relevant review problems.

UNIT III

Basic considerations in the analysis of power cycles, Air standard assumptions, Overview of reciprocating engines, Thermodynamic analysis of Otto cycle: Ideal cycle for spark ignition engines, Thermodynamic analysis of Diesel cycle: Ideal cycle for compression ignition engines, Comparison of Otto and Diesel cycles, Effect of Specific Heat and Dissociation on the performance of the cycles, Relevant review problems.

UNIT IV

Metal Casting: Classification and overview of metal casting processes: sand casting, expandable mould casting and permanent mould casting; Patterns, cores and moulding; Elements of gating systems; Heating, pouring and solidification; Casting quality: cleaning, finishing and defects.

UNIT V

Welding and Machining: Fundamentals of welding and overview of welding processes: Oxy-Acetylene gas welding, Arc welding: TIG, MIG, SAW etc., Resistance welding; Soldering & Brazing; weld quality and defects; Fundamentals of metal machining and introduction to turning and related operations; Constructional features of lathe, Geometry of single point cutting tool and cutting tool materials.

Learning Outcomes:

- Upon Completing the Course, Student will able to:
- Understand basics of thermodynamics and components of steam.
- Identify engineering materials, their properties, manufacturing methods encountered in engineering practice.
- Understand basics of internal combustion engines.
- Understand functions and operations of welding, casting and machine tools including milling, shaping, grinding and lathe machines.

BOOKS RECOMMENDED:

[1] Nag P K, Engineering Thermodynamics, The McGraw-Hill Companies, Fourth Edition.
[2] P N Rao, Manufacturing Technology, Vol. I and Vol.2 Tata McGraw-Hill, 4th Edition, 2014.
[3] Hajra & Chaudhary, Work Shop Technology, Vol. 1 & 2, 12th Edition, Media Promoters & Pub, 2007.
[4] Cengel Y A, Boles M A, Thermodynamics-An Engineering Approach, The McGraw-Hill Companies, Fifth Edition.
[5] Mikell P. Groover, Fundamentals of Modern manufacturing, 3rd Edition, John Wiley and Sons.

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Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ETR1C4:
Basic Electronics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
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</table>

Learning Objectives:

- To introduce the basic concepts of electronics along with the understanding of working fundamental circuit devises such as diode, transistors and op-amp. To apply the basics of diode to describe the working of rectifier circuits such as Full and half wave rectifiers and zener diode as a voltage regulator in line and load regulation.Describe the application of transistors for Current and voltage amplification, the characteristics of different configurations of the transistor, DC load line and bias point. List, explain, and design and analyse the different biasing circuits, to give basic knowledge of working of op-amp, its characteristics and applications
- **Prerequisite(s):** nil

COURSE OF CONTENTS

UNIT I

Discrete electronic devices: Diode, zener diode, BJT (Bipolar junction transistor), LED, photodiode phototransistor, varactor; characteristic and operation (qualitative description and quantitative behaviour with black box approach)

UNIT II

Diode circuits; clipper, clamper circuits, DC power supply: rectifier-half wave, full wave (center tapped, bridge), zener regulated power supply, regulation (with regulator IC-LM317)

UNIT III

BJT characteristics; BJT biasing; CE-biasing circuits: operating point; h-parameter model of transistor; large/small signal models (concept);large/small signal models of CE-BJT amplifier, Design of amplifier; Differential amplifier (using BJT).

UNIT IV

Operational amplifier: basic model; virtual ground concept; inverting amplifier; non-inverting amplifier; integrator; differentiator; Schmitt trigger; astable multivibrator, Simple active filters: low pass, high pass, bandpass, notch filter

UNIT V

Basic feedback theory; +ve and -ve feedback; concept of stability; oscillator, Waveform generator using op-amp schimitt trigger for Square wave, triangular wave Wien bridge oscillator for sinuisoidal waveform.

Learning outcomes:

- Students will be able to get the knowledge of Q point and can calculate it using different biasing circuits. They will easily compare different biasing circuits on the basis of stability factor.
- Students will be able to solve clipper and clamper circuits. They get the knowledge og op-amp

and its various applications as integrator, differentiator and as an oscillator.

BOOKS RECOMMENDED:

[1] Ralph J.Smith, R.C.Dorf circuits, devices and systems, john Wiley, 1992.
[2] R.L.Boylestad, L. Nashelsky, Electronic devices, and circuit theory, Prentice Hall, 2002.
[3] A. S. Sedra, K.C. Smith, Microelectrinic circuits, Oxfort University Press, 1998
[4] R.A. Gayakwad, OP-amps and linear integrated circuits, Prentice Hall of India.
[5] Millman, Grabel, Microelectronics, Mc-Graw-Hill.
[6] De Carlo, and Lin, Linear circuit analysis, Oxford Univesity Press, 2001 (second edition).
[7] Hayt, Kammerly and Durbin, Engineering Circuit Analysis, Tata McGraw Hill, sixth edition.

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<tr><td colspan="4">Devi Ahilya University, Indore, India
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Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SSR1S1:
Technical English</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
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</table>

. **Learning Objectives:**

- To develop the English communication skills in terms of reading, writing and understanding of Engineering terms.
- To develop the technical ideas in English and to be able to express the technical ideas.

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT I

Basic of technical communication: Meaning of technical communication; process of communication; Forms of communication: Verbal and Non-verbal; technology-enabled communication; Barriers to communication; Essentials of effective communication; Types of communication; Defining audiences for technical communication; Aspects of communication: Global, Ethical and Legal.

UNIT II

Professional correspondence: Qualities of professional correspondence: Goodwill techniques; Types of correspondence: Letters, Memos, E-mails; Business Letters: Elements of a Letters, Basic Letter Formats; Types of Business Letters: Positive Letters, Negative Letters, Inquiry Letters, Sales Letters, Complain and Adjustment Letters. Memos: Meaning and Format of Memos. Writing job application letters & Designing Resumes; Meeting and Minutes.

UNIT III

Technical Writing: Meaning & Concept of Technical Writing: Process of Technical Writing: Forms of Technical Writing: Technical Description, Summaries, Instructions & User Manuals: Technical Reports: Meaning and Essentials of Good Report Writing: Classification of Reports; Report Formats: Formal and Informal; Common Informal Technical Reports: Progress Reports, Lab Reports, Feasibility reports, Problem Solving Reports.

UNIT IV

Reading Comprehension; Precis Writing; Expansion of an idea; Dialogue Writing; Paragraph Writing (Related to Technical Communication).

UNIT V

Foreign Words & Phrases; Antonyms and Synonyms; Transitional Words and Phrases; Articles, Use of Prepositions, Modal Verbs, Connectives, Relative Clauses, Noun/Nominal Compounds: Correction of Sentences and Homophones; Punctuation, Abbreviations, Capitalization and Number Usage; Use of Technical Words and Jargons.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply various technical terms and terminologies practically
- The course aims at developing the fundamentals of Technical English and mastery in the professional writing like Business letters, Business correspondence .designing Business Memorandum, Resume and E-mail writing.
- Will be able to write formal and informal reports in work place.
- Will have complete knowledge of comprehending different passages and Precis writing.
- Apply various grammatical skills practically.

BOOKS RECOMMENDED:

[1] A. Esenberg, A Beginner's Guide to Technical Communication, McGraw-Hills.
[2] A. J. Rutherford, Basic Communication Skills for Technology, Pearson Education Asia.
[3] C. L. Bovee, J. V. Thill & B Schatzman, Business Communication Today, 7/e, Pearson Education, 2002.
[4] R. V. Lesikar, J. D. Perrit, Jr., & ME Flately, Lesikar's Basic Business Communication.
[5] R. C. Sharma and K. Mohan, Business Correspondence and Report Writing, Tata McGraw-Hill, 2002.

Semester 2

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AMR2C1:
Applied Mathematics-II</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce the mathematical concepts of Matrix Algebra, Differential Equation Probability and Statistics and Fuzzy sets for solving engineering problems that shall be used in various branches of engineering.
- Provide the basics of Matrix mathematics useful in providing a more compact way to deal with groups of equations in linear algebra; Differential equations, a mathematical equation that relates some function (usually represent physical quantities) with its derivatives (represent their rates of change), and the equation defines a relationship between the two; Probability distributions describe the dispersion of the values of a random variable; Curve fitting and regression analysis, to find the "best fit" line or curve for a series of data points; Theory of equations, which tells when an algebraic equation has an algebraic solution; Fuzzy sets generalize classical sets (Crisp sets), as the characteristic functions of classical sets are special cases of the membership functions of fuzzy sets.

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT-I

Matrix Algebra: Review of Matrices; Elementary Operations on Rows and Columns; Normal Form; Linear Dependence; Rank; Application of Rank Theory in Solving System of Linear Equations; Linear Transformation; Orthogonal, Unitary and Hermitian Matrices; Characteristic Equation; Eigen- Values and Eigen-Vectors; Caley-Hamilton Theorem; Quadratic and Linear forms.

UNIT-II

First Order Ordinary Differential Equation: Exact Differential Equation; Equations Solvable for x, y and p; Clairaut’s Form; Application to Simple Problems.

Higher Order Ordinary Differential Equation: Linear Differential Equations with Constant & Variable Coefficients; Method of Variation of Parameters, Simultaneous Differential Equations; Application to Simple Problems.

UNIT-III

First Order Partial Differential Equations: Formation of Partial Differential Equations; Partial Differential Equations of First Order and First Degree i.e. $Pp + Qq = R$.

Higher Order Partial Differential Equations: Linear Homogenous Partial Differential equations of n^{th} order with constant coefficients; method of Separation of variables; their Simple applications.

UNIT-IV

Probability and Statistics: Conditional Probability, Baye’s Theorem; Binomial, Poisson and Normal distributions and their Mean and Variance, Methods of least squares and curve fitting, Correlation and Regression Analysis.

UNIT-V

Theory of Equations: Polynomial equations, relation between root and coefficients, symmetric functions of roots, cube roots of unity, Cardon’s method for solution of cubic equations.

Fuzzy sets: Membership function, definition, Operations on Fuzzy sets, Properties of Fuzzy sets.

Learning Outcomes:

Upon completing the course, students will be able to:

- Express a linear map between finite-dimensional vector spaces with a matrix, calculate the electrical properties of a circuit, with voltage, amperage, resistance, etc. with matrix arithmetic, use them in 3D geometry (e.g. computer graphics), can try to improve linear solvers efficiency. Matrices can also represent quadratic forms (for example, in analysis to study hessian matrices, which help us to study the behaviour of critical points) and also computers run Markov simulations based on stochastic matrices in order to model events ranging from gambling through weather forecasting to quantum mechanics.
- Use differential equations to model natural phenomena, engineering systems and many other situations like exponential growth and decay, the population growth of species or the change in investment return over time, describing the movement of electricity, in modelling chemical reactions, in finding optimum investment strategies, describing the motion of waves, pendulums or chaotic systems.
- Handle probability distributions, to indicate the likelihood of an event or outcome, which are used for making forecasts and risk assessments. Pdf's are quite important and widely used in insurance, engineering, physics, evolutionary biology, computer science and even social sciences such as psychiatry, economics and even medical trials.
- Use fitted curves as an aid for data visualization, to infer values of a function where no data are available, and to summarize the relationships among two or more variables.
- Apply Fuzzy sets and logic to reason like a human in terms of linguistic variables, design Traffic monitoring systems, AC and heating ventilation, Gene Expression data analysis, Facial pattern recognition, Weather forecasting systems and many more.

BOOKS RECOMMENDED:

[1] B.S.Grewal, Engineering Mathematics, 39/e, Khanna Publishers, 2006.
[2] Erwin. Kreyszig, Advanced Engineering Mathematics, 8^{th} edition, John Willy and sons Publications, 1999.
[3] Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.
[4] C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co. Ltd., 6/e, 2003.
[5] H.K.Das, Higher Engineering Mathematics, S.Chand New Delhi.
[6] Zafar Ahsan, Differential Equation and their Applications, Prentice Hall of India Pvt. Ltd., New Delhi, 2004.
[7] S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical statistics, Sultan Chand & Sons., 2000.
[8] Freund John E, Mathematical Statistics, PHI, N.D., 7^{th} Ed., 2010.
[9] G. J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PHI, New Delhi, 2005.
[10] H. J. Zimmerman, Fuzzy Set Theory and its Applications, Allied Publishers, 1996.
[11] Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd Edition, John Wiley & Sons, Inc., 2010.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE - I Year (Common to all branches) Semester- 2			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
APR2C2: Applied Physics	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To introduce the basics concepts of physics and make a bridge between basics and their application.
- To introduce the concept of the modern science like Laser, Optical fire, X-rays and quantum physics.
- To introduce fundamental physics like wave optics, interference, diffraction polarization, and semiconductor physics.

Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I

Optics-I: Interference of Light Waves: Thin film, Newton's Ring experiment, Michelson interferometer; Diffraction of Light Waves: Fresnel's & Fraunhoffer diffraction, Zone plate, Single slit experiment, diffraction by double slit, Diffraction at Circular aperture, Plane transmission Grating.

UNIT-II

Optics-II: Polarization of Light Waves, Double refraction, Nicol Prism, Half Wave & Quarter Wave plates, Circularly & elliptically polarized light, Polarimeter; LASER: Stimulated & spontaneous emission, Population Inversion, Optical Resonator, Einstein's coefficients, He-Ne Laser, Co_2 Laser, Semiconductor Laser; Optical Fiber: types of Fibers (material, refractive index, mode), Acceptance angle, Numerical aperture, V-Number, Propagation of Light through Fibers, Applications.

UNIT-III

Crystal Structure and Semiconductors: Symmetry & properties of Simple crystal structure, Miller's Indices, Interplanar spacing, production and properties of x-ray, Bragg's law; Semiconductors: Band theory of Semiconductors, Intrinsic & extrinsic semiconductors, Fermi level , pn junction diode, LED, Zener diode, npn & pnp Transistors.

UNIT-IV

Electromagnetism: Continuity equation for Charge & Current, Inconsistency of Ampere's law for time varying field, Concept of Displacement current, Maxwell's equations; Wave equations for E & H, Propagation of one dimensional electromagnetic waves in dielectric medium, Energy density in electromagnetic field: Poynting Vector.

UNIT-V

Quantum Physics: Plank's law, Compton's effect, Concept of Matter Waves, Devison & Germer's experiment, Phase velocity & Group velocity, Heisenberg's Uncertainty Principle; Schrodinger 's Wave Equation, Interpretation of Wave function Ψ, Time dependent & Time Independent equations, Schrodinger's Wave equation for a free particle in a box.

Learning Outcomes:

- The student will demonstrate the ability to use concepts of Morden physics to their engineering applications.

- The course aims at developing the fundamentals of wave optics, crystal structure, structure of atoms and their applicable to obtain quantitative solutions of problems in physics.

BOOKS RECOMMENDED:

[1] R K Gaur & S L Gupta, Engineering Physics, Dhanpat Rai & Sons, 2006
[2] H.K. Malik & A.K.Singh, Engineering Physics, Tata McGraw Hill, 2011
[3] N. Gupta & S.K. Tiwary , A Text Book of Engineering Physics, Dhanpat Rai & Co. 2009.
[4] W. T. Silfast, Laser Fundamentals Cambr. Un. Press, 1996,
[5] D Halliday & R Resnick, Physics Vol-II, Wiley Eastern, 1993
[6] H White, Modern Physics: Van Nostrand; 15/e.
[7] D P Khandelwal, Optics and Atomic Physics.
[8] R Feyaman,Feyaman Lectures on Physics, /e, Narosa Publication, 1998.
[9] S.O. Pillai, Solid State Physics, New Age International Publication, 2010.
[10] R.S. Sedha, A Text Book of Applied Electronic, S. Chand & company Lmt. 2005.
[11] R.P. Goyal, Unified Physics-II,,and III Shivlal Agrawal & Co. ,1994.

<table>
<tr><td colspan="3">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER2C3:
Engineering Drawing</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">1</td><td rowspan="2">4</td><td rowspan="2">2</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To understand the concepts of imagining, envisioning and visualizing the objects & machine parts and drawing them with the instruments & tools.
- To introduce the students to the “universal language of Engineers” for effective communication through drafting exercises of geometrical solids
- **Prerequisite(s):** Nil

COURSE OF CONTENTS

UNIT-I

Introduction, need & Classification of Engineering Drawings, Drawing Instruments and their uses, Indian Standards for Drawing, Drawing Sheet Layout, Various conventions used in drawing, Technical Lettering, Dimensioning, Basic Geometrical Constructions. Engineering Scales & Engineering Curves

UNIT - II

Orthographic Projections, Isometric Projections, Oblique Projections, Perspective Projections & Missing Views.

UNIT - III

Projection of Points, Straight Lines and Plane Surfaces.

UNIT - IV

Projection of Solids, Section of Solids and Development of Surfaces.

UNIT - V

Interpenetration of Solids / Intersection of Surfaces, Introduction to Computer Aided Drawings, Drawing of Machine elements like Riveted Joints, Screw fasteners and Welded Joints.

Learning Outcomes:

- Upon Completing the Course, Student will able to:
- Understand the importance of BIS and ISO Standards in Engineering Drafting.
- Graphically construct and understand the importance of mathematical curves in engineering applications.
- Visualize geometrical solids in 3D space through exercises in Orthographic Projections.
- Interpret Orthographic, Isometric and Perspective views of objects.
- Develop the surfaces of geometrical solids.

BOOKS RECOMMENDED:

[1] Bhatt N D, Engineering Drawing, Charoter Publishing House, Anand, Gujrat Agrawal B, and Agrawal C M, Engineering Drawing, Tata McGraw-Hill Publishing Company Limited.
[2] French T E, Vierck C J, Foster R J, Engineering. Drawing and Graphic Technology Mc Graw-Hill International, Singapore, Low Price Edition.
[3] Luzadder W J, Duff J M, Fundamentals of Engineering Drawing, Prentice- Hall India, New Delhi.

[4] Dhananjay A Jolhe, Engineering drawing, Tata McGraw Hill.
[5] Shah M B and Rana B C, Engineering Drawing, Pearson Education, New Delhi.

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<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE - I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR2C4:
Electrical Engineering</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To understand the concepts and practical ideas of AC/DC circuits along with basic 3 phase power management, Properties of different magnetic material used in Electromagnetic Circuits to create an idea among students that how different magnetic materials were choose for different practical machines.
- Practical concepts of Transformers and different Electric Machines to make students easy understanding of electrical machines surrounded by us and also they are basic to all the engineering streams.

COURSE OF CONTENTS

UNIT-I

AC circuits: Generation of EMF, Phasor Quantities, RMS, Average, Form Factor, Peak Factor Etc, Phasor Diagrams; Single Phase AC Circuits: R, L, C And Combinations, Resonance, Q-Factor, Bandwidth; Three Phase AC Circuits: Generation, EMF, Phase Sequence, Analysis of Star and Delta Connections, and Power Measurement In Single Phase& Three Phase Circuit.

UNIT-II

Circuit analysis tools: Kirchoff's laws, Analysis of DC and AC circuits, Thevenin's theorem, Norton's theorem, Max power transfer theorem, Superposition theorem, and Source transformation.

UNIT-III

Magnetic Circuits: Electromagnetism, Magnetic flux, Magnetic flux density, Intensity of magnetization, B-H curves, hysteresis and eddy current losses, Magnetic circuit calculations, laws of Electro-magnetic induction, Magnetic induction, Lifting power of an electromagnet.

UNIT-IV

Transformer: Construction, principle, ideal transformer, EMF equations, Analysis of transformer on no load and load conditions, Equivalent resistance and reactance, voltage regulations, transformer losses Transformer testing, transformer efficiency, Types of transformer, Cooling methods, Auto transformer.

UNIT-V

Rotating electric Machines: Construction, working principles, EMF equations, Characteristics, Torque equations of DC machines (generators & motors), 3-phase synchronous and induction motor, single phase induction motor.

Learning Outcomes:

Upon completing the course, students will be able :

- To solve circuit problems based on KVL,KCL laws and different network theorems which helps them to solve practical circuits for future industries exposure .
- The course also covers basic knowledge of alternating circuits and their practical applications, which helps students to understand their domestic home load in bettr way.
- Students were also able to understand uses of different magnetic materials available in market for constructing different electrical machines and they also able to solve their circuit parameters which helps in designing a electrical machine at initial level.
- After this course, students were able to understand different properties, characteristics and functioning of different parts of transformer and different rotating electrical machines at basic level.

BOOKS RECOMMENDED:

[1] V Del Toro, Electrical Engineering Fundamentals, 2/e, PHI, 2000.
[2] D P Kothari, I J Nagrath, Basic Electrical Engineering, 2/e, Tata McGraw Hill, 2002 (Fifth Reprint 2003).
[3] A Sudhakar, Network Theory, 2/e, Tata McGraw Hill, 2004
[4] P S Bimbhara, Electrical Machinery, 7/e, Khanna Publishers, New Delhi, 2006.

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<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">COR2C5:
Computer Programming in C++</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To learn to analyse a problem and construct a C++ program that solves it using C++ basic constructs and advanced constructs.
- To learn the syntax and semantics of the C++ programming language.
- To learn how to design C++ classes with constructors and class member functions.
- To understand the concept of data abstraction and encapsulation.
- To learn how to overload and override functions and operators in C++.
- To learn how containment and inheritance promote code reuse in C++.
- To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
- To learn how to use exception handling in C++ programs.

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Prerequisites: Nil.

COURSE OF CONTENTS

UNIT-I

Introduction to flowcharts and problem solving. Types of programming languages, Programming with C++:- C++ Data Types:-auto, bool, int, char, float, double, void. Variables and Constants, Operators, Arithmetic and Logical Expressions, Assignment Statements and Type Casting. Control structures- Iteration statements, Jump Statements and Selective statements. Common C++ Header files, Generation of Random numbers in C++.

UNIT-II

Functions: Introduction - Call by Value and Call by Reference – return values – recursion – Arrays - Introduction to Arrays - Initialization of Array - Multi dimensional Arrays - passing arrays to functions – Strings - Arrays of Strings - Standard Library String Functions.

Structures: Structure elements, Nested Structures, Array of Structures, Array within structures and passing structures to functions.

Unit- III

Pointers:-Declaration and Initialization of Pointers, Dynamic Memory allocation/deallocation operators:-new and delete. Pointers and Arrays:-Array of Pointers, Pointer to an array, Function returning a pointer, Reference variables and use of alias. Invoking functions by passing pointers. Files – Introduction – File Structure - File handling functions - File Types - Error Handling.

UNIT-IV

Object Oriented Programming Paradigm - Basic Concepts of OOP - Benefits of OOP. Class and object fundamentals and various visibility modes in class, Object as function arguments-pass by value and pass by reference. Constructor:-Special Characteristics, Declaration and Definition of a Constructor, Default Constructor, Overloaded Constructor, Copy Constructor and Constructor with default arguments.

Function Overloading:-Need and restrictions of overloaded functions, Steps involved in finding the best match, Default arguments versus overloading.

Destructor:- Special Characteristics, Declaration and Definition of a Destructor. Friend function and its characteristics and friend class.

UNIT-V

Introduction to Operator overloading - Rules for Operator overloading – overloading of binary and unary operators - Introduction to inheritance – Types of inheritance - Abstract Classes - new Operator and delete Operator - Pointers to Objects – this Pointer - Virtual Functions - Pure Virtual Functions - Introduction to Class Templates - Function Templates - Member Function Templates - Basics of Exception Handling - Types of exceptions - Exception Handling Mechanism - Throwing and Catching Mechanism - Rethrowing an Exception - Specifying Exceptions.

Learning Outcomes:-

Upon completing the course, students will be able to:

- To develop C++ programs using basic and advanced constructs that will solve real life problems.
- The course aims to understand the features of C++ supporting object-oriented programming.
- Apply the major object-oriented concepts to implement object-oriented programs in C++ i.e. encapsulation, inheritance and polymorphism.
- Understand advanced features of C++ specifically friends, pointers, virtual functions and operator overloading.

BOOKS RECOMMENDED:

[1] Coohoon and Davidson, C++ Program Design: An introduction to Programming and Object-Oriented Design (3rd edition), Tata McGraw Hill, New Delhi, 2003.
[2] Herbert Schildt, the Complete Reference, Tata McGraw Hill.
[3] E Balagurusamy, Object Oriented Programming with C++, McGraw Hill Education.
[4] Ravichandran, Programming With C++, Tata McGraw Hill.
[5] Dromey G, How to solve it by Computer, Prentice Halll – 1978.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE-I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SSR2S2:
Humanities</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce students to understand and interpret the human experience from individual to entire culture.
- It also helps to understand how human beings across time and cultures understand happiness & suffering, understand good from bad, debate political questions.
- To understand that their actions have a Social, economic and environmental impact. To inspire ethical & moral course of thinking.

Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I

Man and society- Theories of man and society, Methodological individualism, structuralism, Society and its features- Social Institutions; Social Stratification and Change; Contemporary Indian Philosophy-its characteristics andCross-cultural Issues.

UNIT-II

Human Behavior: Biological Bases of Behavior, Methods for understanding human psychophysiology, Working of brain, Psychobiology of learning, memory, emotions and personality, Temperament and personality: trait structure and persistence, Extraversion/sociability, Aggression-hostility/agreeableness, Philosophy of Mind & Cognition.Concepts of good life – quality of life and subjective well-being; happiness, life satisfaction, and positive affect.

UNIT-III

Perspectives on Knowledge, Science and Technology, Technological Shaping of Society and Social Shaping of Technology and its Human roots, Role of Humanities in Engineering: Professionalism in Engineering; Professional Engineering Bodies.

UNIT-IV

Governance and Engineers: Political parties; Types & Forms of Governance; Utilitarianism; capitalism, socialism and communism; Marxist and neo-Marxist thoughts; democracy in public and private spheres.

UNIT-V

Engineering and Corporate Social responsibility- Ecology and Natural Resources, Role of corporations in the society, Morals, Values, Consciousness, Experience: Basic codes of Ethics; Engineering Ethics, Evolution of CSR, Strategic CSR, Role of stakeholders in CSR, Consumer awareness towards CSR,CSR as competitive advantage, the Global Competitiveness Index (GCI) & Sustainability , Issues in CSR- organizational, economic & social.

Learning Outcomes:
On successful completion of course we will have

- Aspire students to be world citizens of broad perspective who can make educated and ethical decisions.
- Students who articulate their own values & beliefs and can apply them in their personal & professional life.
- To become a model human being.

BOOKS RECOMMENDED:

[1] D J Kemper, Introduction to Engineering Profession, 2/e, Suanders Publication, 1998.
[2] A S Chauhan, A Text Book of Social Science Jain Brothers 9/e, 2008.
[3] R C Agrawal, Principle of Political Science.
[4] NPTEL
[5] W.B. Werther & D. Chandler, Strategic Corporate Social Responsibility, Thousand Oaks, 2011.

B.E. (Information Technology)

New Scheme on Choice Based Credit System w.e.f. 2016-17

Semester - III

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	AIR3C1	Discrete Mathematics	PC	3-1-0	4
2.	ITR3C2	Object Oriented Programming	PC	3-1-1	4+1(P)
3.	ITR3C3	Data Structures	PC	3-1-1	4+1(P)
4.	ITR3C4	Digital Electronics	PC	3-1-1	4+1(P)
5.	ITR3G1	Computer Organization & Architecture	GE	3-1-0	4
6.	ITR3L1	Computer Hardware Lab	--	0-0-1	1
7.	SIR3S3	Life Management Skills	--	2-0-0	2
8.	ITR3V3	Comprehensive Viva - III	Virtual	0-0-4	4
				Total Credits	**30**

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**II Year B.E. (INFORMATION TECHNOLOGY)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
AIR3C1 Discrete Mathematics	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

1. To introduce students to ideas and techniques from discrete mathematics that are widely used in Computer Science.
2. Provide the fundamentals of formal techniques for solving the problems in mathematical reasoning, combinatorial analysis, discrete structures, algorithmic thinking, and applications and modelling.

Prerequisites: Nil.

Course Contents

Unit-I

Sets: Algebra of sets, laws of sets, computer representation, cardinality of a set, principle of inclusion-exclusion.

Functions: Characteristic function of a set, floor and ceiling functions**,** mod function, hashing function.

Relations: Binary Relation, properties, closure of a relation, equivalence and partial order relations, partially ordered set, Hasse Diagram, totally ordered set, maximal and minimal elements, upper bound, lower bound, greatest lower bound and least upper bound, lattice, sub lattice, properties of lattices, distributive lattices, complemented lattices, modular lattices, topological sorting.

Unit-II

Propositional Logic: Proposition, logical connectives, bit operations, conditional and bi-conditional propositions, logical equivalence, algebra of propositions, tautology, contradiction and contingency, normal forms, logic in proof, predicates and quantifiers, rules of inferences, Applications of propositional logic to logic puzzles, Boolean searches, logic circuits and system specifications.

Unit-III

Mathematical Induction: Strong induction, well-ordering, Recursive definitions.

Advanced Counting techniques: Pigeon-hole principle, sequences and summations, generating functions.

Recurrence relations:-Formation, methods of solution and application.

Unit-IV

Graph Theory: Terminology, graph representation-incidence and adjacency matrices, walk, path, cycle, graph isomorphism, connectedness, Euler & Hamiltonian graphs, planar graph, graph coloring, shortest paths algorithms.

Trees: Terminology, spanning trees, minimum spanning trees, tree traversals; prefix codes.

Unit-V

Binary operation, groupoid, semi group, monoid, group, subgroup, cyclic group, permutation group, definition and examples of Rings, Integral domain and Fields; Application to coding theory.

Boolean Algebra-Definition, laws of Boolean algebra, Boolean functions, sum of products and product of sum form, normal form, simplification of Boolean function by algebraic method, Boolean expression for logic and switching network, Karnaugh Map Method for simplification of Boolean expressions.

Learning Outcomes:

Upon completing the course, students will be able to:

1. Learn a particular set of mathematical facts and know how to apply them.
2. Think logically and mathematically.
3. Use and analyze recursive definitions.
4. How to count some different types of discrete structures.
5. Techniques for constructing mathematical proofs and to reason about the efficiency of an algorithm.

Books Recommended:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th ed., Tata McGraw-Hill Edition 2007.
2. Kolman, Busby & Ross, Discrete Mathematical Structures, 6th edition, Pearson Education, 2008.
3. C.L.Liu, Introduction to Discrete Mathematics, McGraw Hill, 1986.
4. Trembley and Manohar, Discrete Mathematical structures for Computer Science, McGraw Hill, 1986.
5. Edgar G. Goodaire, Michael M. Parmenter, Discrete Mathematics with Graph Theory, 3rd edition Prentice Hall, 2005.

<table>
<tr><td colspan="3">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="5">II Year B.E. (INFORMATION TECHNOLOGY)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>ITR3C2</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>OBJECT ORIENTED PROGRAMMING</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

3. To provide the knowledge of Object Oriented Programming Paradigm.
4. To learn basic constructs of programming language that are implementing tools for object oriented program development.
5. To develop skill to analyze and code for problem solution in object oriented approach.

Pre-requisites : Computer Programming

COURSE CONTENTS

UNIT-I

Introduction to Object Oriented Programming: Object Oriented Concepts, Merits of Object Oriented Technology. Abstraction, Encapsulation, Information Hiding. Object Model: definition, State, behavior, Identity and messages. Concept of object initialization, constructors, constructor overloading. Access modifiers: Class attributes and methods. Introduction to object model of software development.

UNIT-II

Introduction to Java classes and objects: Java features: Java syntax, data types, data type conversions, control statements, operators and their precedence. Introduction to Class: Instance members and member functions. String Handling, Wrapper classes: Arrays and Vectors.

UNIT-III

Inheritance and Polymorphism : Class relationships: Inheritance and its types, Merits and Demerits. Association. Association inheritance, Polymorphism: Dynamic method dispatch, Runtime polymorphism, Abstract classes, Interfaces and Packages.

UNIT-IV

Exception Handling and Multithreading: Exceptions: Need for exceptions, Checked Vs Unchecked exceptions, creating custom exceptions. Multithreading: Introduction, Priorities and scheduling, Inter-thread communication, Thread Synchronization and its life cycle.

UNIT-V

Java I/O, Applets and Event Handling: Basic concept of streams I/O stream & reader-writer classes. File handling. Applet and its Life Cycle, Basic GUI elements, Event Delegation Model and event handling

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Analyze and code the solution to problem using object oriented paradigm.
2. Understand Java language constructs.
3. Apply object model for software development

BOOKS RECOMMENDED:

[1] Cay S.Horstmann, *Core JAVA Vol-1*, 9/e, Pearson Education 2012.

[2] Herbert Schildt, *The complete Reference*, 9/e, Tata McGraw Hill 2014.

[3] Scott W Amber, *The Object Primer*, 3/e, Cambridge 2004.

[4] Timothy Budd, *Object Oriented Programming*, 3/e, Pearson Education 2002.

[5] Kathy Sierra, Bert Bates, *Head First Java*, 2/e , Oreilly Publications 2005.

List of Practical Assignment:

6. Experiments to understand program development environment for Java language.
7. Writing program to learn basic language constructs like identifier, variables, data types and console input/output..
8. Writing program to learn control statements.
9. Writing program to use class and objects to model problem domain entity in program domain.
10. Writing program to use inheritance and polymorphism features.
11. Programs to use exception and understanding modeling errant condition in execution as class and objects.
12. Experiments to learn Multi-Thread execution.
13. Writing program to code applications needing concurrency and exploring inter-thread communication mechanism.
14. Experiments to understand stream concept and study various stream abstractions and implementation available in the language
15. Exploring GUI components and understanding Event Delegation Model. Understanding (GUI) objects and their communication based program to realize object oriented programming in action.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**II Year B.E. (Information Technology)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR3C3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
DATA STRUCTURES	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

1. To provide the knowledge of basic data structures and their implementations.
2. To understand importance of data structures in context of writing efficient programs.
3. To develop skills to apply appropriate data structures in problem solving.

Prerequisites : Computer Programming knowledge

COURSE CONTENTS

UNIT-I

Arrays and List: Array: Definition, Representation, Address Calculation; Searching: Linear search, Binary search; Sorting: Bubble sort, Insertion sort, Selection sort, Radix sort, Shell sort; List: Introduction, Implementation as Linked list, Circular linked List, Doubly linked list, Applications of linked list.

Unit-II

Stacks: Definition, Representations : static and dynamic, Implementation of stack, Applications of stack: Polish notation representation and conversion, Tower of Honoi problem, Implementation of recursion, Quick sort and Merge sort.

Unit-III

Queues and Hashing: Definition, Representations, Static and dynamic, Circular Queue, Double ended Queue, Priority Queue, Implementation of Priority Queue using Heap data structure, Heap Sort, applications of queues. Hash Structures: Representation, Search and Implementation and other issues.

Unit-IV

Trees: Definition, Basic terminology, Binary tree, Complete Binary Tree, representations: Static and dynamic, Traversal techniques in binary tree, Heap tree, Binary Search tree, AVL tree, M-way search trees, B-tree & its variations.

Unit-V

Graphs: Definition, Basic terminology, Graph Types, Representations: static, dynamic; Implementations, Searching in graphs, Shortest path in graphs, Applications.

Learning Outcomes :

Upon Completing the Course, Student will able to:

1. Learn the basic types for data structure, implementation and application.
2. Know the strength and weakness of different data structures.
3. Use the appropriate data structure in context of solution of given problem..
4. Develop programming skills which require to solve given problem.

BOOKS RECOMMENDED:

[1] E. Horowitz & Sahni,Fundamental Data Structure, Galgotia Book Source, 1983.

[2] A. Tannenbaum, Data Structure Using C, Pearson Education, 2003.

[3] Kruz, Data Structure and Programming Design, 1987.

[4] N. Wirth, Algorithms +Data Structure = Program, Prentice Hall of India, 1979.

[5] Goodrich & Tamassia, Data Structures and Algorithms in C++, 2nd Edition, John Wiley & Sons, 2011.

List of Practical Assignments:

1. Implementation of searching and sorting techniques.
2. Implementation of list using array and linked list.
3. Implementation of push and pop operation on stack
4. Implementation of polish notation and its conversion
5. Write a program to solve the problems using iteration/recursion
6. Program for recursion removal using stack
7. Program for insertion /deletion operation on various queue & Implementation of priority queue for process scheduling
8. Program for storing data as tree structure and implementation of various traversal techniques
9. Program for storing data as graph structure and implementation of various traversal techniques
10. Program for finding shortest path in graph.
11. Learn use of suitable data structures for solving problems: Maze, Polynomial Arithmetic, Tower of Hanoi etc.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Information Technology)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR3C4	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Digital Electronics	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper:3 Hours							

Learning Objectives:

4. To provide knowledge of different data representation systems for digital computers.
5. Familiarize students with different hardware implementation techniques of different logic functions.
6. Develop skills to design and implement various combinational and sequential circuits
7. Develop ability to implement digital circuits in various practical applications.
8. Provide knowledge of data converters and basic understanding of Microprocessors

Pre requisites: Nil

COURSE CONTENTS

UNIT-I

Foundation: Number system, Arithmetic operations using 1's,2's complement, various codes, Review of basic gates, universal gate application, Logic Families: - RTL, DTL, TTL &MOS, CMOS families for NOR/NAND gate, characteristics of Digital IC's-speed of operation, power dissipation, Fan-in, Fan-out, Noise margin, Current and Voltage parameters

UNIT-II

Combinational Circuits: Boolean laws & algebra , Sum Of Product & Product Of Sum expression, K-Map and Tabular method of minimization, Combinational devices like Multiplexer, Demultiplexer, Decoders, Encoders,Tri -state Devices, Combinational circuit design for Adder, Subtractor, Comparator, Code converters

UNIT-III

Sequential Circuits: Latches and Flip-Flops SR, D, T, JK, Master-slave , Flip- Flop conversions, Synchronous counter, Asynchronous counter, Up-Down Counter

UNIT-IV

Registers: Shift Registers, serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out, Universal Shift Register, Sequence Generators, Designing of Synchronous & Asynchronous sequential circuits.

UNIT-V

Digital to Analog Conversion Technique as Binary Weighted DAC, R-2R Ladder, Conversions as Flash type, Counter type , Successive Approximations type A/D converter, Clock generation through IC555, Memory- Types ROM, RAM, Introduction to Microprocessor, Microprocessor Evaluation, Programming and hardware model of Microprocessor, 8/16/32/64 bit Series of Microprocessors.

Learning Outcomes :

Upon completing the course, students will be able to:

Understand how to represent data in digital form.
Understand driving capacity of a gate and voltage-current parameters
Design and Analyse any combinational and sequential digital circuit
Using analog to digital and digital to analog IC's for data conversion.
Understand basics of microprocessors

BOOKS RECOMMENDED:

1. Mano M. Morris, "Digital Design", 3rd edition, Pearson Education 2006.
2. William H.Gothmann,*Digital Electronics: An Introduction to Theory and Practice*, Eastern Economy Edition , Prentice-Hall of India Private Limited,NewDelhi.,2001
3. William I. Fletcher, *An Engineering Approach to Digital Design*, Pearson Education
4. S Salivahan,S Arivazhagan "Digital Circuit and Design" Vikas Publication
5. Ramesh S. Gaonkar, Microprocessor, Architecture, Programming, and Applications with the 8085, Penram International Publication.

List of Practical Assignment:

During the learning of course, students need to do assignments:

a. To Implement various gates using universal NAND/NOR IC's.
b. To Design and Implement various combinational circuits using gate IC's.
c. To Design and Implement various combinational circuits using Mux,D Mux, Encoder, Decoder IC's. To learn and analyze different Flip-Flops.
d. To Design and Implement various sequential circuits using Flip-Flop.
e. To learn and analyse Counter IC's.
f. To Design and Implement various sequential circuits.
g. To Design and Implement circuit to generate clock waveform of desired frequency using IC555.
h. Learn to use ADC and DAC IC's for data conversion.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">II Year B.E. (Information Technology)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ITR3G1

Computer Organization & Architecture</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

Provide a framework for understanding the fundamentals of computing.

To familiarize students with relationship between hardware and software to focus on the concepts that are the basis for current computers.

Develop skills to understand how to design a computer.

Develop ability to understand how to enhance performance of a computer system. **Prerequisites:** Knowledge of Digital Electronics and Computer Programming.

COURSE CONTENTS

Unit-I

Introduction: Difference Between Computer Organization and Computer Architecture, Computer Types, Flynn's Classification, Functional Units, Basic Operational Concepts: Bus Structures, Software; Performance: Processor Clock, Basic Performance Equation, Clock Rate, Compiler, Performance Measurement; Multiprocessors and Multicomputers, Historical Perspective: Generation of computer, Evolution of Performance; Arithmetic for Computers: Addition and Subtraction of Signed Numbers, Multiplication of Positive Numbers, Booth Algorithm, Floating Point Arithmetic: Addition and Multiplication.

Unit-II

Memory System: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories: ROM, PROM, EPROM, EEPROM, Flash Memory; Memory Speed, Size and Cost Considerations; Cache Memories: Mapping Functions, Replacement Algorithms, Performance Considerations, Hit Rate and Miss Penalty, Caches on the Processor Chip; Virtual Memories: Address Translation; Memory Management Requirements.

Unit-III

Processing Unit: Addressing Modes, Connections between the Processor and the Memory, Processor Activity, Instruction cycle, John Von Neumann Architecture, State Machine Concept, Processor as a State Machine, Data Path Architecture, Data Path Controller: Microprogrammed; Hardwired Design, Firmware Design, Microcontroller Design, Design of Flip-Flop to understand the Design of CPU.

Unit-IV

Input Output Organization: I/O Devices: Introduction**,** Typical Collection, Diversity; Dependability, Reliability, Availability, Disk Storage, Flash Storage, Connecting Processor Memory and I/O Devices, Connection Basics, Interfacing I/O Devices to the Processor Memory and Operating System: Giving Commands to I/O Devices, Communicating with the Processor, Interrupt Priority Levels, Transferring the Data between a Device and Memory, Direct Memory Access and the Memory System; I/O Performance Measures, Impact of I/O on System Performance.

Unit-V

Pipelining & Multiprocessors: Principles of Pipelining, Principles of Linear Pipelining, Clock Period, Speedup, Efficiency, Throughput, Classification of Pipeline Processor, General Pipelines and Reservation Tables, Collision Vector, State Diagram for a Pipeline, Pipeline Hazards, Shared Memory Multiprocessors, Clusters and Other Message-Passing Multiprocessors, Introduction to Graphics Processing Units, Introduction to Multiprocessor Network Topologies.

Learning Outcomes:

1. Upon completing the course, students will be able to:
2. Acquire advance knowledge and understanding of computing.
3. Use skills in computer design.
4. Apply acquired knowledge to improve performance of a computer.
5. In addition to development in technology student will be able to innovate in the architecture of computers, such as the use of caches and pipelining.

Books Recommended:

1. Computer Organization, 5th Ed., C. Hamacher, Z. Vranesic, S. Zaky, McGraw Hill International Edition 2002.
2. Computer Organization and Design, 5th Ed. ,David A. Patterson, John L. Hennessy, The hardware/software interface, Morgan Kaufmann Publisher, 2014.
3. Patterson & Hennessy, Computer Organization and Design, Morgan Kaufmann Publisher, 2007.
4. Computer Architecture and Parallel Processing, Kai Hwang, Faye A. Briggs, McGraw Hill Education, 2012.

List of Assignments (Theory): During the learning of course, students need to do assignments:

1. Performance measurement of a Computer.
2. Arithmatic for Computers.
3. Cache Hit Rate/Miss Penalty issues.
4. Virtual Memory : Address Translation.
5. Use of Addressing Modes.
6. Study on designs of CPU.
7. Secondary storage performance.
8. Impact of I/O on system performance.
9. Pipelining performance.
10. Multi-core, GPU Processor and Multiprocessor : A Comparison.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E.(Information Technology) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR3L1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Computer Hardware Lab	**0**	**0**	**2**	**0**	**0**	**1**	**1**

Learning Objectives:

1. To provide the knowledge of computer Hardware parts and latest technology.
2. To give basic Knowledge of working internal part of system.
3. To develop skill to analyze and find the fault in System.
4. To know how to assembling the hardware parts.

Pre requisites : Not Required.

COURSE CONTENTS

UNIT-I

CPC Processor

Basics of Processor and Computer Generation, Study of Different Processor, Pentium, Dual Core , Quad Core , I3, I5, I7 Processor, Motherboards, Chipset and Controllers, BIOS and the Boot Process.

UNIT-II

Internal Components

IDE and SATA Devices: Hard Disk Drive and CD/DVDs Drives,SCSI Devices, Floppy Disk, Zip Drive, Backup Drive, Expansion Cards- LAN Card, IDE Card , VGA and SVGA Cards, Sound Card, Interface Cards, I/O cards, Video Cards, USB Card, Internal Ports, Cables and Connector Types, SMPS.

UNIT-III

Computer Peripherals

Monitors:- CRT, LCD and LED Displays, Printers:- Dot-Matrix Printer, Inkjet Printer, Laser Printer Scanner:- Photo Scanner, Documents Scanner, Bar Cord Scanner, Keyboards, Mouse, External Modem, Ports and Connectors, Batteries, Pen Drives, SCSI interface devices, Laptop Computers, Digital Advance storage technology.

UNIT-IV

Memory and Networking Devices

Computer memory: Primary Memory- RAM, ROM, Secondary memory, Switches, Routers, Modems.

UNIT-V

Assembling and Operating System Installation

Assembled the Hardware Parts, Different types of Operating systems, System files FAT and NTFS,Dos , Windows XP, Windows Vista, Windows 7 and Windows 8 and Red Hat Linux and Multi Boot Operating System and latest OS.

Learning Outcomes:

Upon Completing the Course, Student will able to: learn the knowledge of hardware parts and Assemble a computer System and Installation & Uninstallation of Software.

BOOKS RECOMMENDED:

[1] PC AND CLONES Hardware, Troubleshooting and Maintenance B. Govinda rajalu, Tata Mc-graw-Hill Publication

(2) PC Troubleshooting and Repair Stephen J. Bigelow Dream tech Press, New Delhi.

[3] Windows XP Professional and Windows 7 Edition By BPB Publication.

(4) Red Hat Linux By BPB & SYBEX publication.

List of Practical Assignment:

1. To study motherboard.
2. Study of Processor.
3. To study SMPS and UPS.
4. To study the CD-ROM and DVD-ROM.
5. To study working of keyboard and mouse.
6. To study different ports and slots.
7. To study various types of Cables &Connectors.
8. Study of monitor.
9. To study different types of printers.
10. To Run All Dos Command (Internal and External Dos Command)
11. To study Floppy Disk Drive.
12. Installation of different Operating Systems
13. Installation of different device drivers
14. Installation of different Application Software
15. Assembling and Dissembling of a Computer System.

<table>
<tr><th colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</th><th colspan="4">II Year B.E. (Information Technology)</th></tr>
<tr><th>Subject Code & Name</th><th colspan="3">Instructions Hours per Week</th><th colspan="4">Credits</th></tr>
<tr><td rowspan="2">SIR3S3 Life Management Skills</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper:3 Hours</td></tr>
</table>

Learning Objectives:

To provide an overview on Life Skills Management

To make students able to understand themselves and their Role in Society

To develop Healthy Personality

To align them as complete self: Mind, Body and Soul

Pre requisites: Nil

COURSE CONTENTS

UNIT-I

Basics of Life Skills Management: Understanding Self and Psychological Problems

Life Skills Management: Concepts and Applications, Basics of Brain-Structure, Hormones: Role of Hormones in changing mood and emotions, Role of genes, Understanding Memory.

Normal Self: Concept of Normality. Characteristics of Healthy Personality, Levels of Personality Dysfunctions, Ways to offset depression. Anxiety: Symptoms and Dealing with anxiety. Managing Anger, and Right attitude towards competition. Understanding the reasons behind OCD and.

Unit-II

Managing Habits: Neurology of Habits, Developing Discipline in creating new habits, will-power, Causes of Addictions, Changing destructive habits, Habits of highly effective people.

Relaxation Techniques: Meditation, Effects of Meditation. Positive Attitude towards oneself, Equanimity in oneself, Happiness – a state of mind and related techniques.

Unit-III

Relationship Management: Emotional Intelligence: Core Domain: Self Awareness, Self Regulation, Social Awareness and Relationship Management. Relationship Management: Four Criteria for Effective Relationship Management, Competencies in the Relationship Management.

Ability to size-up situations, Role of Empathy Basics of Interpersonal Communication: Understanding and Observing Non-Verbal Behavior, Listening skills. Profiling Personal Environments. Understanding the types of Personality & their Motivating-Factors. Concepts of healthy relationships.

Unit-IV

Stress Management : Understanding the Physiology of Stress, Symptoms of Stress. Stress and Performance, effects of Stress on Learning, Oversensitivity, Focus and Concentration, Techniques of Stress Management. Concepts of Crisis Management, Dealing with Peer Pressure and Complexes, Assertiveness Training, Avoiding Groupthink, Dealing with distractions.

Unit-V

Mental Health and Wellness : Concept of Wellness: Measures to improve Wellness. Sleeping and Mind, Yoga and Exercise, Concepts of Balanced Diet, Importance of Recreational Practice, Role of art in wellness, How imagination shapes our Mind-Set. Wellness Programs for Professionals.

Learning Outcomes :

Upon completing the course, students will be able to:

- Handle Stressful Situations
- Understand their priorities
- Cope with different Psychological Problems
- Find Real Happiness

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B.E. (Information Technology)

New Scheme on Choice Based Credit System w.e.f. 2016-17

Semester - IV

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	AIR4C1	Numerical & Optimization Techniques	PC	3-1-0	4
2.	ITR4C2	Operating Systems	PC	3-1-1	4+1(P)
3.	ITR4C3	Software Engineering	PC	3-1-1	4+1(P)
4.	ITR4C4	Database Management System	PC	3-1-1	4+1(P)
5.	ITR4G2	Digital Communication Engineering	GE	3-1-0	4
6.	ITR4L2	Smart Systems Lab	--	0-0-1	1
7.	SIR4S4	Communication Skills	--	2-0-0	2
8.	ITR4V4	Comprehensive Viva - IV	Virtual	0-0-4	4
			Total Credits		**30**

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Information Technology) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
AIR4C1: Numerical and Optimization Techniques	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**-**	**3**	**1**	**-**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- Numerical approach enables solution of a complex problem with a great number of very simple operations. It is useful to find the solution with use of computers making calculation easy and fast.
- The optimization techniques makes the students aware of the various techniques, which provides an analytical and objective basis for decisions.

Prerequisites: Basic knowledge of determinants, matrices, differentiation and integration of functions, vector algebra, and probability theory.

UNIT-I

Numerical solutions of algebraic and transcendental equations: Bisection method, Regula-falsi method, Newton-Raphson method.

Solution of system of linear algebraic equation: Gauss-Seidel, Gauss Jacobi's and relaxation methods. Numerical solution of I order ordinary differential equation: solution by Euler's and Runge's methods.

UNIT-II

Interpolation: Finite difference operators, Newton's and central difference interpolation formulae, divided differences, Lagrange's interpolation.

Numerical differentiation using newton's formulae, maxima and minima.

Numerical integration- General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule.

UNIT-III

Linear Programming: Formulation of LP problem, solution by graphical, simplex, big M and two phase methods, duality and dual simplex method, degeneracy and sensitivity analysis.

UNIT-IV

Assignment models: Definition, mathematical formulation, balanced and unbalanced assignment problems, Hungarian method of solution.

Transportation Problems: Definition, mathematical formulation, balanced and unbalanced transportation problems, degeneracy and its resolution.

UNIT-V

Game Theory: Definitions and terminologies of Matrix game theory, Fundamental theorem of matrix games theory, game with mixed strategies and principle of Dominance.

Dynamic programming- Characteristics, dynamic programming approach of solving LPP, optimal subdivision problem, dynamic programming under certainty.

Learning Outcomes:

Upon completing the course, students will be able to:

- Learn that many problems were analytical methods seems to fail, like solving highly nonlinear equation, numerical methods works very well.
- Use the optimization techniques to provide a mathematical model to represent complex functional relationships.

Books Recommended:

1. B.S.Grewal, Engineering Mathematics, Khanna Publishers, 42/e, 2015.
2. Erwin. Kreyszig, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.
3. Hillier, F. S., Lieberman, G. J. – Introduction to Operation Research, 8^{th} Ed., New York, McGraw- Hill, 2005.
4. Taha, H. A. – Operations Research: An Introduction, 7^{th} ed., Macmillan Publication Co.,2003.
5. P K Gupta, D S Hira, Operations Research, S. Chand., 2008.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**II Year B.E. (Information Tech.) (Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR4C2 Operating System	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- Students will learn how Operating System is Important for Computer System.
- To make aware of different types of Operating System and their services.
- To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- To know virtual memory concepts.
- To learn secondary memory management.

Pre requisites: Basic knowledge of Data Structures and Computer Organization.

COURSE CONTENTS

UNIT-I

Introduction: Role of OS: Types of OS, Batch Systems; Multiprogramming; Time Sharing; Distributed & Real time OS. Computer structure and OS: System Architecture – I/O, Storage, Processors; System components- OS Services, System Calls , System Programs; System Design, Implementation and Generation.

UNIT-II

Process Management: Concepts of process: Process status, Process description, Process model.

Process Scheduling: Concepts, Scheduler organization, preemptive and non- preemptive scheduler strategies, scheduling algorithms: FCFS, SJN, Priority Scheduling, Round Robin Scheduling, Multiple Processor scheduling, Thread Concepts and Multiple threaded OS. **UNIT-III**

Process Synchronization and Deadlock: Process Co-operation, Concepts of Inter-process communication, Process Synchronization, Synchronization Issues, Critical Section problem, Mutual exclusion Primitives and Algorithms, Process Synchronization with semaphores. Concepts of Deadlock, Conditions for Deadlocks, Resource Concepts & Abstractions, Deadlock Prevention, Avoidance and Recovery, Banker Algorithms for Deadlock Avoidance

UNIT-IV

Memory Management and File system: Paging, Segmentation and Contiguous memory allocation.

Virtual Memory: Demand Paging, Page replacement and Frame Allocation policies, Thrashing. File System: Concepts, Access Method, Directory Structure, and File System Management.

UNIT-V

Disk management and other issues: Disk management: Disk Structure and Scheduling. File systems, and operating system support for distributed systems. Protection and Security related issues. Case studies of contemporary operating systems.

Learning Outcomes:

- Understands the different services provided by Operating System at different level.
- They learn real life applications of Operating System in every field.
- Understands the use of different process scheduling algorithm and synchronization techniques to avoid deadlock.
- They will learn different memory management techniques like paging, segmentation and demand paging etc.

BOOKS RECOMMENDED:

[1]. Silberschatz, Galvin and Gagne, Operating System Principles, 7th Ed. Addison Wesley. [2]. Gary Nutt, Operating Systems, 3rd Ed. Pearson Education, India [3]. Tanenbaum, Modern Operating Systems, PHI.

[4]. W. Stalling, Operating Systems, Macmillan.

[5]. H. M. Dietel, Operating Systems, Addison Wesley Longman.

[6]. Maurice J. Bach, The design of Unix Operating system, Pearson Education, India.

[7]. Sumitabha Das, Unix Concepts & Applications: includes SCO UNIX & Linux, Tata McGraw Hill.

List of Practical:

- Experiments to understand operating system (Ubuntu) installation process, file system portioning and dual boot setup.
- Experiment to learn command line interface (shell) and exploring various commands of UNIX.
- Writing programs to create and execute shell script.
- Program to implement various algorithms for process scheduling.
- Program to implement various algorithms for page replacement activity in memory management.
- Writing programs to use inter process communication constructs (File sockets/ Shared memory).

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Information Technology) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR4C3 Software Engineering	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper:3 Hours							

Learning Objectives:

- To Understand the Software Engineering Practice & Process Models.
- Familiarize students with different software life cycle models.
- Understand the importance of the software development process.
- Understand the importance of modelling and modelling languages.
- Design and develop correct and robust software products.

Pre requisites: Nil

COURSE CONTENTS

UNIT-I

Software Engineering process: Basic concepts of System Design, Software life cycle, Software process models: Linear Sequential model, Prototyping Model, RAD Model, Evolutionary Process Models like Incremental Model, Spiral Model, Component Assembly Model, RUP and Agile processes, CMM.

UNIT-II

Requirement Analysis and Specification: Function and Non-functional requirements. Requirement Sources and Elicitation Techniques, Initiating the Requirements Engineering Process, Eliciting Requirements, Developing Use Cases building the Analysis Model, Negotiating Requirements, Validating Requirements.

UNIT-III

Software Design: Overview of System Design, Decomposing the system, System Design

Concepts, System Design Activities, Addressing Design Goals, Managing System Design, Design for Web Apps, Design Issues for Web Engineering, Web E Design Pyramid, Interface Design, Architecture Design – Navigation Design – Component Level Design

UNIT-IV

Testing: Testing Strategies, Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Object Oriented Software, Validation Testing, System Testing, The Art of Debugging, Software quality Assurance, Software Reliability, safety critical software development process.

UNIT-V

Software Maintenance: Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering, Economics of Reengineering, Project Metrics

Learning Outcomes:
Upon completing the course, students will be able to:

- A clear understanding of Software Engineering concepts.
- Knowledge gained of Analysis and System Design concepts.
- Ability to manage change during development.
- Basic idea of the SOA and AOP concepts

BOOKS RECOMMENDED:

1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, McGraw – Hill, Sixth Edition
2. Ian sommerville "Software Engineering", Pearson Edu,9th edition, 2010.
3. Hans Van Vliet, "Software Engineering: Principles and Practices", 2008.
4. Richard Fairley, "Software Engineering Concepts",2008

List of Practical Assignments:

During the learning of course, students need to do assignments:

1 Prepare SRS for email or window explorer domain problem.

2. Using COCOMO model estimate effort for email or window explorer domain problem.

3. Draw E-R diagram, DFD for the project problem of your choice.

4. Draw Use Case diagram for facebook.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Information Technology) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR4C4 Database Management System	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper:3 Hours							

Learning Objectives:

- To understand the need of databases, its architecture and schemas.
- To familiarize students with representing domains using entity-relationship modelling.
- How to design a normalized schema in the relational data model.
- Develop skills in students to implement schema and query using SQL.
- Develop ability to develop database applications based on the requirements.

Prerequisites: Knowledge of Data Structures and Computer Programming and some topics of operating systems.

COURSE CONTENTS

Unit-I

Introduction: Database Environment: Basic Concepts, Advantages of Database approach, Comparison with Traditional file systems, DBMS Architecture, Database Users, Data Models and Schemas, Database languages and Interfaces; Database development process: Development Lifecycle, Types of Application.

Unit-II

Database Analysis & Modeling: Introduction to Data Analysis and Modeling, Modeling the rules, Entity Relationship Model, ER Model Constructs- Attributes, Relationship etc., Enhanced ER Model and Business Rules, Modeling Enhanced relationships – Specialization and Generalization, Union Types. Binary and Ternary relationship Issues.

Unit-III

Database Design: Introduction to Logical Database Design, Relational Data Model – Codd's Rules, Relational Algebra etc.; Integrity Constraints, Transforming ER diagrams into relations, Functional Dependencies, Normalization – 1NF, 2NF, 3NF, BCNF and 4NF etc..

Unit-IV

System Implementation & Transaction Processing: Introduction to SQL – Inserting , Updating, and Deleting data, Processing Single Tables, Processing Multiple Tables, PL/SQL Constructs Views, Triggers, Cursors etc; Transaction Processing – Properties, Schedules and Serializability Issues. Concurrency Control – Introduction, Locking etc.

Unit-V

Advance Topics: File Organization and Indexes, Hashing Techniques, B-trees, B+ Trees etc; Database Recovery, Database Security, Introduction to Data Warehousing and Data Mining, Emerging Database Technologies and Applications etc., Overview of MySQL.

Learning Outcomes:

Upon completing the course, students will be able to:

- Understand the fundamentals of relational database system including: data models, database architectures and database manipulations.
- Understand the theories and techniques in developing database applications and be able to demonstrate the ability to build databases using DBMS such as MySQL.
- Be familiar with managing database systems.
- Understand new developments and trends in databases.

Books Recommended:

1. Fundamentals of Database Systems, By R. Elmasri and S. Navathe, 6th Ed. Pearson Education, 2010.
2. Database System Concepts, By A. Silberschatz, H. Korth and S. Sudarshan, 6th Ed. McGraw Hill Education, 2013.
3. A First Course in Database Systems, By J. Ullman, J. Widom, 3rd Edition, Pearson Education, 2014.
4. Database Systems, By T. Connolly and C. Begg, 4th Edition, Pearson Education, 2008.
5. Database Management Systems, R. Ramkrishnan and J. Gehrke, 3rd Edition, McGraw Hill Education, 2014.
6. MySQL : The Complete Reference, 1st Edition, McGraw Hill Education, 2004.

List of Assignments:

During the learning of course, students need to do assignments:

1. Designing an E-R model.
2. Solving basic SQL assignments.
3. Solving intermediate SQL assignments involving Nested and Join queries.
4. Using PL/SQL constructs involving procedures, triggers, views etc.
5. Exploring how transaction processing is handled by MySQL.
6. Minor Project on developing a database application.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Information Technology) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR4G2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Digital Communication Engineering	**3**	**1**	**-**	**3**	**1**	**-**	**4**
Duration of Theory Paper:3 Hours							

Learning Objectives:

- To review the basic Fourier techniques and its application in these processes.
- To provide knowledge of basic principles of analog and digital communication.
- To introduce the various processes like sampling, digital coding techniques, modulation and channel coding techniques that are used in modern telecommunication system.
- To give exposure to quantitative method of measuring information and determining the capacity of communication system.
- To provide knowledge of spread spectrum techniques.

Pre requisites: Basic exposure to signals and systems.

COURSE CONTENTS

UNIT-I

Review of Fourier techniques, Fourier techniques for linear system analysis, Fourier transform properties convolution, Error Function and complimentary error function, Introduction to analog modulation techniques like AM, FM, PM.

UNIT-II

Line coding**:** NRZ, RZ, Biphase, Duo binary etc. their comparison and spectrum associated with their wave forms, bandwidth of digital data. Signal and Spectra: classification of signals, Parseval's theorem, energy spectral density, power spectral density, auto-correlation, crosscorrelation, random variables.

UNIT-III

Sampling and quantization, Digital coding techniques, PCM, DPCM, ADPCM, DM, ADM, vocoders, matched filter. Digital modulation techniques, BPSK, QPSK, MSK, performance analysis and comparison of digital modulation techniques in presence of noise.

UNIT-IV

Information theory: concept of amount of information, entropy, information rate, coding to increase average information per bit, Huffman coding, channel capacity, Shannon's theorem of channel capacity. Channel coding: Linear block codes, systematic Linear blocks codes, parity check matrix, syndrome testing, cyclic codes, hamming codes.

UNIT-V

Introduction to spread spectrum techniques – spread spectrum overview, spreading sequences, properties of spreading sequences, spreading gain, direct sequence spread spectrum system, jamming margin, frequency hopping system, spread spectrum applications.

Learning Outcomes:

Upon completing the course, students will be able to:

- Understand frequency domain analysis and its importance.
- Understand about the digital data transmission using line coding.
- Understand the working of transmitter and receiver in digital communication system.
- Understand how to detect and correct the errors introduced during the transmission.
- Understand basics of secured communication using spread spectrum techniques.

BOOKS RECOMMENDED:

1. Lathi B.P., "Modern Analog and Digital Communication Systems", Oxford Univ. Press, Third edition.
2. Taub & Schilling, "Principal of Communication System", Tata McGraw Hill publication, Fourth edition, 2007.
3. J.G. Proakis, "Digital Communication", McGraw Hill publication, Fourth edition, 2001.
4. Haykins Simon, "Digital Communication", Wiley Publication, Third edition, 2007.
5. Haykins Simon, "Analog and Digital Communication", Wiley Publication, Third edition, 2007.
6. Bernard Sklar, "Digital communication", Pearson Education, Second edition, 2007.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Information Technology) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
	L	**T**	**P**	**L**	**T**	**P**	**Total**
Smart System (ITR4L2)	**0**	**0**	**1**	**0**	**0**	**1**	**1**
Duration of Practical: 2 Hours							

Learning Objectives:

- To provide knowledge of different Smart System applications.
- To familiarize students with Arduino as IDE, programming language & platform.
- To provide knowledge of Arduino boards and basic components.
- Develop skills to design and implement various smart system application.

List of Experiments:

Following is the list of experiments to be carried out using Arduino boards and other peripheral devices:

- Digital Input & Digital Output
- Experiments on digital input and digital output on Arduino Mega board and using LED and Buzzer.
- Analog Input & Analog Input
- Experiments on analog input and analog output on Arduino Mega board using PWM. Different outputs on LED.
- LCD Display
- Experiment on LCD display:-Print numbers, Name, Time etc.
- Serial Port
- Serial Communication between Arduino board and PC:-character send and received, Read and display voltage
- DC Motor Control
- Experiments on DC Motor to control motor speed and direction of rotation. Servo Motor Control
- Experiments on servo Motor to rotate servo motor.
- Stepper Motor Control
- Experiments on Stepper Motor to rotate bidirectional.
- TV Remote
- Experiments on TV Remote with LCD.

- Timer
- Experiments with Timer:-play tones, time interval measurement etc.

- Ethernet
- Experiment on Ethernet with web page static IP
- Bluetooth & Wi-Fi
- Experiments on Blue tooth and Wi-Fi

Learning Outcomes:

Upon completing the course, students will be:

- Familiar with Arduino environment and its applications.
- Able to understand Arduino programming with C++.
- Able to Design Smart systems applications.
- Learn and understand about any new IDE, compiler, and MCU chip in Arduino compatible boards or similar types.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Information Technology)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
SIR4S4 Communication Skills	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	2	**-**	**-**	**2**	**-**	**-**	**2**
Duration of Theory Paper: 2 Hours							

Learning Objectives: introduced to skills involved in making a presentation at a conference.

To help students acquire the basics of interpersonal skills and public speaking. To improve their communication skills and ability to understand others

To provide the knowledge of Professional Speaking.

To develop skills involved in making a presentation at a conference.

To develop understanding about Dressing Sense, Telephone and Mobile Etiquettes.

COURSE CONTENTS

UNIT-I

Introduction to Communication: Purpose of Communication; Process of Communication; Importance of Communication in Business; Differences between Technical and General Communication; Barriers to Communication; Measures to Overcome the Barriers to Communication. Objectives and Principles of Communication.

UNIT-II

Types of Communication & Listening Skills: Types of Communication; Verbal Communication-Importance of verbal communication- Advantages of verbal communication, Significance of Non-verbal Communication. Listening Process: Classification of Listening, Purpose of Listening, Common Barriers to the Listening Process, Measures to Improve Listening. Listening as an Important Skill in Work Place.

UNIT-III

Communication Network: Scope and Types of Communication Network; Formal and Informal Communication Network; Upward Communication; Downward Communication; Horizontal Communication; Diagonal Communication.

UNIT-IV

Oral Communication Skills Attire and Etiquettes: Oral Business Presentation and Pubic Speaking: Self-Monitoring as tool for Public Speaking; Purpose, Analysis of Audience, Steps in Making a Presentation, Delivering a Presentation. Dressing Sense and Telephone/Mobile Etiquettes.

UNIT-V

Employment Communication – Job Interview: Importance and Factors Involving Job Interview; Characteristics of Job Interview; Job Interview Process; Job Interview Techniques- Manners and etiquettes to be maintained during an interview. **Group Discussion;** Purpose, Methods and Importance

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Analyze different Communication Pattern.
2. Understand Audience while speaking publically.
3. Implement Interview Technique and Group Discussion.
4. Develop understanding toward making own Style of Communication.

Suggested Readings:

1. Pal, R. & Korlahalli, J.S. Essentials of Business Communication, Sultan Chand & Sons, New Delhi.
2. Sethi, J & et al. A Practice Course in English Pronunciation, Prentice Hall of India, New Delhi.
3. Sen, Leena. Communication Skills, Prentice Hall of India, New Delhi.
4. Prasad, P. Communication Skills, S.K. Kataria& Sons.
5. A.S. Hornby's. Oxford Advanced Learners Dictionary of Current English, 7th Edition.
6. Bill Scott, The Skills of Communication, Bombay, Jaico
7. Ronald E. Dulek & John S. Fielden, Principles of Communicatin, New York, McMillan.

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SCHEME

III Year B.E. (IT)

Semester – V

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1	ITR5C1	Theory of Computation	PC	3-1-0	4
2	ITR5C2	Object Oriented Analysis & Design	PC	3-1-1	4+1(P)
3	ITR5C3	Computer Networks	PC	3-1-1	4+1(P)
4	ITR5E1	Web Technologies	PE	3-1-1	4+1(P)
5	ITR5G3	Applied Statistics	GE	3-1-0	4
6	ITR5L3	Scripting Language Laboratory	--	0-0-1	1
7	SIR5S5	Principles of Management	--	2-0-0	2
8	ITR5V5	Comprehensive Viva - V	Virtual	0-0-4	4
				Total Credits	**30**

Programme Electives for V Semester					
2.	ITR5E2	Unix & Shell Programming	PE	3-1-1	4+1(P)
3.	ITR5E3	Embedded Systems	PE	3-1-1	4+1(P)
4.	ITR5E4	Distributed Operating System	PE	3-1-1	4+1(P)

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**III Year B.E. (Information Technology (Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR5C1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Theory of Computation	**3**	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

To provide a formal connection between algorithmic problem solving and the theory of languages and automata and develop them into a mathematical (abstract) view towards algorithmic design and in general computation itself.

The course should in addition clarify the practical view towards the applications of these ideas in the engineering part as well.

Prerequisite:

Students should have a background in discrete mathematics, data structures, and programming languages.

COURSE CONTENTS

UNIT-I

Finite Automata and Regular Languages: Motivation for studying theory of computation, Notion of formal languages and grammars, Kleene's Closure, Regular Expressions and Regular languages, closure properties of regular languages, Finite Automata. Finite Automata with output: Mealy and Moore machines, applications.

UNIT-II

Nondeterminism and Minimization: Nondeterministic Finite Automata, Acceptance condition. Kleene's Theorem, Myhill-Nerode relations, Minimization Algorithm, Non-Regular languages, Pumping Lemma for regular languages.

UNIT-III

Grammars and Context-Free Languages: Grammars and Chomsky Hierarchy, Context-Free Grammars, Context-Free Languages (CFLs), Inherent Ambiguity of CFLs, closure properties of CFLs, Eliminating useless symbols; null-productions; and unit productions, Chomsky Normal Form, Greibach Normal Form, Cock-Younger-Kasami (CYK) Algorithm, Applications to Parsing.

UNIT-IV

Pushdown Automata: Pushdown Automata (PDAs), PDAs vs CFLs. Deterministic PDAs and CFLs, applications, notion of acceptance for PDAs: acceptance by final states, and by empty stack; the equivalence of the two notions, Proof that CFGs generate the same class of languages that PDAs accept, Pumping Lemma for CFLs.

UNIT-V

Turing Machines and Computability: Introduction to Turing Machines, Configurations, Halting vs Looping, Turing computability, Nondeterministic, multitape and other versions of Turing machines. Church`s thesis, Universal Turing Machines, Linear Bounded Automata (LBAs) and context-sensitive languages, Recursive and Recursively enumerable languages, Undecidability of Halting Problem and unsolvable problems about Turing Machines, the diagonalization language and proof that it is not Recursively enumerable.

Learning Outcomes:

After completing the course, the student will be able to:

1. Model, compare and analyse different computational models.
2. Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata.
3. Identify limitations of some computational models and possible methods of proving them.
4. Have an overview of how the theoretical study in this course is applicable to and engineering application like designing the compilers.
5. Have an understanding of the solvable and unsolvable problems and their computational behaviors.

Books Recommended:

1 Daniel I.A. Cohen, Introduction to Computer Theory, John Wiley, 1990
2 John C. Martin, Introduction to Languages and the Theory of Computation, 3/e Tata McGraw Hill, 2005
3 J.E. Hopcroft and J.D.Ullman, Introduction to Automata, Languages and Computation, Narosa Publishing House, 1995
4 J.E. Hopcroft, Rajeev Motwani and J.D.Ullman, Introduction to Automata, Languages and Computation, Pearson Education, Asia, 2002
5 H.R. Lewis and C.H. Papadimitrou, Elements of the Theory of Computation, Prentice Hall Inc., 1999
6 M. Sipser, Introduction to the Theory of Computation, Brooks/Cole Thomson Learning, 1996
7 Zohar Manna, Mathematical Theory of Computation, McGraw Hill, 1997

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**III Year B.E. (Information Technology (Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR5C2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Object Oriented Analysis & Design	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

To learn object oriented analysis, modeling and design using UML.

To learn object oriented approach of software engineering.

Prerequisite:

Knowledge of object oriented programming and basics of software engineering.

COURSE CONTENTS

UNIT-I

Rational Unified Process, Process Notation, Introduction to UML, Business Modeling Workflow, Object Oriented Analysis: Requirements Overview, Problem Statement, Glossary, Supplementary Specifications, Analysis and Design Overview; Architectural Analysis overview, Use Case Analysis: finding classes from use case behavior, describe responsibility, attribute and association; qualify analysis mechanism.

UNIT-II

Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT-III

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.
Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

UNIT-IV

Behavioral Modeling: Use cases, Use case Diagrams, Activity Diagrams, Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT-V

Architectural Modeling: Architectural Analysis: Analysis Mechanisms, Key Abstractions, Pattern, Initial Architectural Layers, Component, Deployment, Component diagrams and Deployment diagrams.

Learning Outcomes:

After successfully completing this course you will be able to:

1. Describe Object Oriented Analysis and Design concepts and apply them to solve problems.
2. Prepare Object Oriented Analysis and Design documents for a given problem using Unified Modeling Language

Books Recommended:

1. Grady Booch, Object Oriented Analysis & Design with Application, Pearson Education India 2nd Edition.

2. Scott W. Ambler, The Object Primer, Cambridge University Press, 2nd Edition.

3. Philippe Kruchten, The rational Unified Processes & Introduction Pearson Education India 2nd Edition.

4. Grady Booch, Games Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, Addison Wesley

5. M. Blaha, J. Rambaugh, Object Oriented Modeling and Design with UML, Pearson Education 2nd Edition,2007.

List of Practical Assignment:

1. To develop a problem statement.
2. Develop an IEEE standard SRS document. Also develop risk management and project plan (Gantt chart).
3. Identify Use Cases and develop the Use Case model.
4. Identify the business activities and develop an UML Activity diagram.
5. Identity the conceptual classes and develop a domain model with UML Class diagram.
6. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
7. Draw the State Chart diagram.
8. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
9. Implement the Technical services layer.
10. Implement the Domain objects layer.
11. Implement the User Interface layer.
12. Draw Component and Deployment diagrams.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Information Technology) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR5C3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
COMPUTER NETWORK	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

Build an understanding of the fundamental concepts of computer networking.

Familiarize the student with the basic taxonomy and terminology of the computer networking area.

Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Prerequisite:

Basic knowledge of programming and Data Structures.

COURSE CONTENTS

UNIT-I

Introduction: Definition and goals, Design issues, Network architecture-broadcast & point to point, Models-OSI reference & TCP/IP and their comparative study, Network classification-LAN, WAN & MAN, protocols & services, types of service-connection oriented and connectionless, different protocols. Transmission Media: Twisted Pair, Coaxial cable, Fiber optic cable, Wireless transmission, telephone system, multiplexing, switching-circuit, packet & message switching, Virtual circuit switch.

Network devices-repeater, bridge, router, gateways, network interface cards, cabling system.

UNIT-II

Data Link Layer: Framing, Error control-Bit Error, causes of error, control methods, Flow control: Stop & wait, sliding window concept, piggybacking.

Local Area Network Technology: Protocols- Aloha, CSMA, CSMA/CD, Collision free protocols, IEEE 802 protocols, standard- topologies, cabling system, Network management, MAC addressing frame format. Ethernet.

UNIT-III

Network Layer: Introduction, features & design issues, Routing- different routing algorithms, congestion control, Internetworking- Concepts and architecture. Addressing-IP Addressing and subnet masking, IP protocols, Network Address Translation, Address resolution protocol (ARP).

UNIT-IV

Transport Layer: Introduction, design issues, Transport layer addressing, buffering, multiplexing, recovery, TCP/IP suit of protocols- TCP & UDP Network applications, Connection establishment, Connection release, TCP Header.

UNIT-IV

Application Layer: Introduction to application layer, Application layer protocols: Electronic mail, File transfer, remot login, WWW, Multimedia etc. Firewalls.

Learning Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

Independently understand basic computer network technology.

1. Understand and explain Data Communications System and its components.
2. Identify the different types of network topologies and protocols.
3. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
4. Identify the different types of network devices and their functions within a network
5. Understand and building the skills of subnetting and routing mechanisms.
6. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Books Recommended :

Comuter Networks, Andrew. S. Tanenbaum, 4/e, Prentice Hall of India Private Ltd, 2003.

Data Communications and Networking, Behrouz A Forouzan, 4/e, Tata McGraw Hill Education Private Limited.

Data Communications & Networks, Achyut S. Godbole, Tata McGraw Hill Education Private Limited, 2002.

Data and Computer Communication, William Stalling, 7/e, Prentice Hall of India Private Ltd, 2007.

List of Practical Assignments:

During learning of course, students need to do assignments:

1. Study of various network devices in detail.
2. Study of basic network commands and network configuration commands.
3. Installation of LAN card.

4. Implementation of Bit Stuffing.
5. Implementation of Byte stuffing.
6. Implementation of error correcting codes.
7. Implementation of error detection codes.
8. Study of network IP.
9. Implementation of various routing protocols.
10. Programming with Sockets.

<table>
<tr><th colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</th><th colspan="4">III Year B.E. (Information Technology (Full Time)</th></tr>
<tr><th>Subject Code & Name</th><th colspan="3">Instructions Hours per Week</th><th colspan="4">Credits</th></tr>
<tr><td rowspan="2">ITR5G3
Applied Statistics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

To enable the students to use statistics in computer science for a number of things, including data mining, data compression, speech recognition, vision & image analysis, artificial intelligence and network & traffic modeling.

Prerequisite:

Elementary statistics, matrices and determinants, probability.

COURSE CONTENTS

UNIT-I

Correlation and regression analysis – linear correlation and regression, regression plane, multiple and partial correlation.

Random variables-discrete and continuous random variables, cumulative distribution function. normal distribution.

UNIT-II

Elements of Hypothesis Testing : Null and Alternative hypotheses, Simple and Composite hypotheses, Critical Region, type I and type II Errors, Level of significance and size, p-value.

Test of significance of large and small samples.

Test of goodness of fit and independence of attributes.

UNIT-III

Design of experiments: Principle of experimental design, complete randomized block design, randomised block design, ANOVA: one-factor and two factor classifications.

UNIT-IV

Stochastic processes; classification, special stochastic processes-Poisson process, Markov process, discrete-time Markov chains (MCs): Chapman-Kolmogorov equations, n-step transition probabilities, classification of states and limiting probabilities, continuous-time Markov chains (MCs): birth-death processes.

UNIT-V

Queuing Theory: Objectives and characteristics of a Queuing System, classification of Queuing models, probability distribution of arrival and service times, Models (M/M/1, M/M/C, $M/E_K/1$, M/D/1, D/D/1).

Reliability: Basic Concepts, Evaluation of system reliability.

Learning Outcomes:

Upon completing the course, students will be able to:

use statistics for a specialist study of applications areas like developing speech recognition software, quality management, software engineering, storage and retrieval processes and software and hardware engineering and manufacturing.

Books Recommended:

1. S.C.Gupta, Fundamentals of Statistics, Himalaya Publishing House, Mumbai, 6th Ed., 2009.
2. Freund John E, Mathematical Statistics, PHI, N.D., 7th Ed., 2010.
3. T. Veerarajan, Probability, Statistics and Random Processes, Tata McGraw - Hill Education, 2002.
4. K. S. Trivedi, Probability and Statistics with Reliability, Queuing, and Computer Science Applications, John Wiley & Sons, 2006.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ITR5E1
Web Technology</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
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Learning Objectives:

- Introduce the students to emerging web technologies
- Introduce the students with XML concepts and its application
- Motivate the students to develop 3 tier web applications
- Understanding of server side programming using Java Servlets
- To create awareness about the MVC

Prerequisite: NIL

COURSE CONTENTS

UNIT-I

Introduction to Web Technology: WWW and Protocols: TCP/IP , HTTP, DNS, SMTP etc. Web Servers (IIS, Apache etc)- Web Browsers, Uniform Resource Locator, HTTP Request and Response Types , n -Tier Architecture, Common Gateway Interface,

Introduction to HTML5 (Elements, Attributes, Hyperlinks, Forms, div, Tables, links, images), Designing effective navigation.

Cascading Style Sheets- using CSS, background images, colors and properties, using fonts, borders and boxes, margins, positioning, animation and transition effects with CSS3.

UNIT-II

JavaScript and DHTML: JavaScript and variables, functions, conditions, loops and repetition, Pop up boxes,, Event Handing, forms and validations, JavaScript standard objects, DOM, AJAX, Regular Expression

XML Technologies: Introduction of XML, Validation of XML documents, DTD, XML for data files, HTML vs XML, Embedding XML into HTML documents, Displaying XML using CSS and XSL, Introduction to JQuery.

UNIT-III

Java Servlets: Difference between CGI & Servlets, Servlet API, HttpServletRequest, HttpServletResponse, ServletConfig, ServletContext Session Management, RequestDispatcher , Filters

UNIT-IV

Working with JDBC: Database concepts, Connection to server, creating database, creating a table, inserting data, altering tables, queries, JDBC Overview & Architecture, JDBC Driver Types, Connecting servlets with databases

UNIT-V

Introduction to JSP: JSP API, JSP Life Cycle, JSP Elements, JSP Directives, JSP Implicit Objects, Configuring Error Pages in JSP, JSP Scopes(request, session, application, page), JSP Standard Actions, MVC architecture, Introduction to Expression Language and JSTL

Learning Outcomes:

After completion of the course students will be able to -

1. Describe the concepts of WWW including browser and HTTP protocol.
2. Develop the modern web pages using the HTML5 and CSS3 features with different layouts as per the need of applications.
5. Use JavaScript to develop the dynamic web pages and validate data entered by users through forms
6. Use Servlets to generate the web pages dynamically using the database connectivity.
7. Develop modern Web Applications using the client and server side technologies and the web design fundamentals.

Books Recommended:

1. Complete Reference JAVA - Naughton Schildt
2. Steven M. Schafer, "HTML, XHTML and CSS", Fourth Edition by, Wiley India Edition.
3. HTML 5, Black Book, Dreamtech Press
4. JDBC, Servlets and JSP Black Book, by Kogent Solutions Inc. Santosh Kumar K.
5. Web Technologies, Black Book, Dreamtech Press
6. Head First – Servlet and JSP - Bryan Basham, SPD O'REILLY, 2nd Edition.
7. Java Server Pages – Hans Bergsten, SPD O'REILLY, 3rd Edition
8. Web Design, Joel Sklar, Cengage Learning
9. Web Technologies – Achyut S Godbole and Atul Kahate
10. Jason Hunter, "Java Servlet Programming", 2nd Edition, O'reilly Publications.

List of Practical Assignments:

During the learining of course, students need to do assignments:

1. Design web pages using HTML5
2. Style web pages using CSS3 features
3. Accepting and validating user entered data using JavaScript
4. Creating html pages to submit data to server
5. Write a program to demonstrate the use of Servlet request and response as well as doGet ( ) and doPost( ) methods.
6. Collecting submitted data in a Servlet

7. Using redirection and request forwarding in Servlets
8. Write a Servlet to store form data to database – using Type 4 JDBC driver and Database connectivity support from server.
9. Experiment with scriplets, declaration and expression tags
10. Writing java server pages to use JSP actions
11. Writing error pages in JSP
12. Develop sample application for session management using Servlet and JSP.
13. Develop sample application with database connectivity using Servlet/JSP

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Computer engineering /Information Technology) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR5L3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Scripting Language Programming Laboratory	**0**	**0**	**2**	**0**	**0**	**1**	**1**
Duration of Practical: 2 Hours							

Learning Objectives: To learn basics and advance scripting language programming for modern computing requirements.

Prerequisite: Programming Concepts.

UNIT-I

Features of Python ,Setting up path ,Working with Python ,Basic Syntax ,Variable and Data Types ,Operator, If ,If- else ,Nested if-else, For ,While ,Nested loops Break ,Continue Accessing Strings ,Basic Operations ,Function and Methods.

UNIT-II

Introduction of Sqlite, Database connectivity, Accessing tuples, Executing queries, Transactions ,Operations Working, Handling error Functions and Methods, Printing on screen Reading data from keyboard ,Opening and closing file ,Reading and writing files

UNIT-III

Graphics and GUI programming-Drawing using Tkinter and python. Networking and Multithreaded programming –Sockets, Thread and Processes, Chat application.

UNIT-IV

Class and object. Attributes, Inheritance ,Overloading ,Overriding ,Data hiding Regular expressions ,Match function ,Search function ,Matching VS Searching ,Modifiers ,Patterns, CGI(Introduction, Architecture ,CGI environment variable, GET and POST methods ,Cookies ,File upload.

UNIT-V

Web Frameworks - for developing server-side Web applications in Python, Web Browse Programming - interfacing with existing browsers and browser technologies

Learning Outcomes:

After completion of the course students will be able to –

Apply scripting language programming skills for modern computing requirements.

Reference Books:

1 John V Guttag. “Introduction to Computation and Programming Using Python”, Prentice Hall of india
2 R. Nageswara Rao, “Core Python Programming”, dreamtech
3 Wesley J. Chun. “Core Python Programming - Second Edition”, Prentice Hall
4 Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structures and Algorithms in Pyhon”, Wiley
5 Kenneth A. Lambert, “Fundamentals of Python – First Programs”, CENGAGE Publication
6 Luke Sneeringer, “Professional Python”, Wrox
7 Hacking Secret Ciphers with Python”, Al Sweigart, URL-https://inventwithpython.com/hacking/chapters

Learning Outcomes:

List of Practical Assignments:

Students are given programming assignments to learn following .

1. How to take input through file/command line/ network.
2. Concept of Python List, Python String, Python Dictionary, Python Tuples and data type conversion.
3. Techniques of function calling, modules like import, from import etc.
4. Basic I/O functions and exception handling in Python.
5. Concept of object oriented programming, built in class attributes, regular expressions for pattern matching.
6. To work with database interfaces (Sqlite).
7. Concept of networking using Python
8. Web development using web framework flask,bootstrap.
9. Use of XML, CSS, HTML, AJAX to understand the concept behind the web browsing.
10. A project to be developed which uses the above concept.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Information Technology (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
SIR5S5	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Principles of Management	**2**	**-**	**-**	**2**	**-**	**-**	**2**
Duration of Theory Paper:3 Hours							

Learning Objectives:

Understanding Management Concepts.

Acquire the knowledge of business environment.

Managing behavior of human at organizations with modern management concepts.

Understanding business ethics and social responsibility as Engineers.To develop the capacity to lead in a variety of circumstances.

Pre requisite: Nil

COURSE CONTENTS

UNIT- I

Introduction to Management: Basic concepts of management: Definition, Essence, Principles, Roles, Level; Functions of management: Planning, Organizing, Staffing, Directing, Coordinating and controlling; Organizational efficiency & effectiveness; Roles of manager, Skills required in a manager.

UNIT- II

Management and Society: Organization: Types and Structure; Business environments: Political, Economic, Legal, Social, Technological and International environment; Designing effective organization: Span of management, Delegation, Centralization and Decentralization; Formal and Informal organization.

UNIT- III

Management of Human at Work: Human Resource Development: Interrelationship of managerial function; significance of staffing, Personnel management: Recruitment, Training, Performance appraisal, Employee retention; Managerial communication; Motivating individuals and work groups, Leadership for managerial effectiveness.

UNIT- IV

Management Ethics for Engineers: Business ethics, Social responsibility of Business: Economical, Legal, Ethical and Philanthropic; Ethical responsibilities of Engineers toward society; Business and environment protection; Impact of engineering on society.

UNIT -V

Modern Management Concepts: MBO: Principles, steps, advantages and disadvantages; Strategic management-SWOT analysis; Team Building: Definition of Team, Team Formation, Approaches, Goal Setting and Communication among Team Members. Models of relationship between professional and client.

Case Study

Learning Outcomes:

At the end of the course, students should be able to do the following:

1. Identify the key management processes and the relevance of management in organisations.
2. Understand the key management skills required in organisations and how these might be applied.
3. Evaluate their own managerial skills and the ways in which these might be developed.
4. Understand Team members while working with people from different background.

Books Recommended:

1. R.D Agrawal, Organization & Management.1/E PHI 1997.
2. Tripathy PC And Reddy PN, Principles of Management, Tata McGraw-Hill, 5th Edition, 2012.
3. Dinkar Pagare, Principles of Management, Sultan Chand & Sons, 2000.
4. G.K.Vijayaraghavan and M.Sivakumar, Principles of Management, Lakshmi Publications, 5th Edition, 2009.
5. Harold Koontz & Heinz Weihrich, Essentials of Management – An International perspective, 8th edition. Tata McGraw-Hill, 2009.
6. Charles W.L. Hill and Steven L McShane, Principles of Management, Tata Mc Graw-Hill, 2009.
7. Fleddermann, C.B., "Engineering Ethics," Pearson Prentice Hall, Upper Saddle River, NJ, 2004.
8. Stephen P. Robbins, Timothy A Judge, Sanghi Seema Organizational Behavior, Pearson Education 13th Ed 2009.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Information Technology)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>ITR5E2</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Unix and Shell Programming</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:
The student will have ability to:

Understand the UNIX operating system and its memory management, input/output processing, internal and external commands.
Learn the File Systems and Process Management of UNIX.
Learn and explore the use of operating system utilities such as text editors.
Understand Shell Scripting and Shell Programming.

Prerequisites: Basic knowledge of Operating System concepts along with DOS (Disk Operating System) is essential. Fundamentals of Programming language is helpful.

COURSE CONTENTS

UNIT–I
Overview of UNIX: What is UNIX Operating System? Architecture, Kernel & Shell, Installation Process, Features, Internal And External Commands, Basic Commands: cal, date, echo, bc, script, passwd, PATH, who, uname, pwd, cd, mkdir, rmdir etc. Command Structure, Shell Script & Shell Programming, UNIX Server.

UNIT–II
File System: Definition of File System, Boot Block, Super Block, Inode. File creations and its related commands cat, cp, rm, mv, more, file, ls, wc, pg, cmp, comm, diff. Zipping & unzipping files, gzip, tar, zip, df, du, mount, umount, etc. The vi editor. File Permissions with chgrp & chmod. **Process Control:** Viewing a Process, Command to display Process, Process Attributes, Process States, Process Fields, ps Commands options, Handling Jobs, Foreground & Background Jobs.

UNIT–III
Redirection & Pipes: Standard I/O Streams, Redirection & Pipes, Command Execution, Command-Line Editing, Quotes. **Filters:** Filters, Concatenating, Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Ordering a File. **Regular Expressions:** Atoms, operators, grep, sed, awk etc.

UNIT–IV
System Security: Physical Security, Boot level security (GRUB), Controlling System Access, Restricted Shells, File Access Commands, Access Control List(ACLs), Restricting Root Access, Monitoring & Securing Super User Access.

UNIT–V

Shell Scripting: Introduction to Shell, Types of Shell, C shell features, **writing first script writing script, Executing & Debugging script. Shell Programming:** Shell variables, Output, Input, exit Status of a Command, Branching Control Structures, Loop-Control Structure, and Continue and break Statements, Expressions, Command Substitution, Command Line Arguments and Functions.

Learning Outcomes:

Upon completion of the subject, students will be able to:

1. Identify and use UNIX utilities to create and manage simple file processing operations,
2. Organize directory structures with appropriate security.
3. Effectively use the UNIX system.
4. Monitor system performance and lean the shell scripts.
5. Use the shell scripts in designing a programs for engineering problems.

Books Recommended:

1. Yashavant P. Kanetkar "**Unix Shell Programming",** BPB Publications.
2. Venkatesh Murthy, "Introduction to Unix &Shell", Pearson Edu.
3. Forouzan, "Unix & Shell Programming", Cengage Learning.
4. Sumitab Das,"Unix Concept & Application", TMH.
5. Venkateshwavle,"Linux Programming Tools Unveil`ed", BS Publication.
6. Richard Peterson,"Unix Complete Reference",TMH.

List of Practical Assignments:

1. Execution of various file/directory handling commands.
2. Simple shell script for basic arithmetic and logical calculations.
3. Shell scripts to check various attributes of files and directories.
4. Shell scripts to perform various operations on given strings.
5. Shell scripts to explore system variables such as PATH, HOME etc.
6. Shell scripts to check and list attributes of processes.
7. Execution of various system administrative commands.
8. Use seed instruction to process /etc/password file.
9. Write a shell script to display list of users currently logged in.
10. Write a shell script to delete all the temporary files.
11. Write a shell script to search an element from an array using binary searching.
12. Write script to print the message "Hello" on the Console.
13. Write script to perform following basic math operation as :
    i) Take input from keyboard
    ii) Take input as command line parameter
14. Write script to display current date, time, username and current directory.
15. Write shell script to show various system configurations like:
    a) Currently logged user and his long name
    b) Current shell
    c) Your home directory
    d) Your operating system type

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**III Year B.E. (Information Technology)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR5E4	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Distributed Operating Systems	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper:3 Hours							

Objectives:

Provide an understanding of the principles of distributed operating systems. Questions concerning distributed system architecture, concepts and design, functioning; and how these meet the demands of contemporary distributed applications will be addressed.

Undertake problem identification, formulation and solution. Capacity for independent critical thought, rational inquiry and self-directed learning.

Realizing the challenges encountered during the design and analysis of a distributed system.

Identifying efficient methods for facing these challenges and designing efficient distributed algorithms and systems.

Pre requisites: Basic knowledge of Operating System concepts.

COURSE CONTENTS

UNIT-I

Introduction to Distributed Systems: Distributed Computing Systems, Evolution of Distributed Computing System, Distributed Computing System Models, Distributed Operating System, Examples of Distributed Systems, Design Approaches & Issues, Computer Network and Layered protocols, Network Operating System and Distributed Operating System, Introduction to Distributed Computing Environment (DCE), Operating System Structures.

UNIT-II

Message Passing & Remote Procedure Calls(RPC): Overview of Computer Networks, Communication Inter-process communication(IPC), The Critical Section Problem, Features of a Good Message Passing System, Issues in IPC by Message Passing, Synchronization, Group Communication, Case Study: 4.3 BSD UNIX IPC Mechanism. The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Case Studies: Sun RPC.

UNIT-III

Synchronization in Distributed Systems: Logical clocks, Physical clocks, Vector Clock, Clock synchronization and related algorithms, Mutual Exclusion, Non-Token Based Algorithms – Lamport’s Algorithm, Token-Based Algorithms, Suzuki-Kasami’s Broadcast Algorithm, Election Algorithms, Dead locks in Distributed Systems, Thrashing.

UNIT-IV

Distributed Shared Memory: Introduction, General Architecture of DSM Systems, Algorithm, Protocols, Design and Implementation Issues of DSM, Page based Distributed Shared Memory, Shared variable Distributed shared Memory, and Object based Distributed shared Memory, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy, Thrashing, Other approaches to DSM, Heterogeneous DSM, Advantages of DSM. **Resource Management:** Introduction, Desirable Features of a Good Global Scheduling Algorithm, Task Assignment Approach, Load – Balancing Approach, Load – Sharing Approach, **Process Management:** Introduction, Process Migration, Threads, Case studies.

UNIT-V

Distributed File Systems: Introduction, Desirable Features & Goals og Distributed File System, File models, File–Accessing Models, File – Sharing Semantics, File – Caching Schemes, File Replication, Fault Tolerance, Atomic Transactions, Design Principles, Security in Distributed File system. Trends in distributed file system, case study Case study: Amoeba, Mach, Chorus and their comparison.

Learning Outcomes:

Upon completing the course, students will be able to:

Distinguish the theoretical and conceptual foundations of distributed computing.

Recognize the feasibility and the impossibilities in managing resources.

Identify the core concepts of distributed systems and also identify the problems in developing distributed applications.

Apply existing solutions to the core problems and develop appropriate variations of existing solutions to meet the development contexts.

Examine how existing systems have applied the concepts of distributed operating systems in designing large systems, and will additionally apply the concepts to develop sample systems.

Books Recommended:

1. P K Sinha, “Distributed operating systems; Concepts and design”, PHI Learning.
2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design”, Pearson Ed.
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design”, Pearson Ed.
4. Sunita Mahajan & Shah, Distributed Computing, Oxford Press
5. Tanenbaum and steen, “Distributed systems: Principles and paradigms”, 2nd edition, PHI Learning.
6. Asilberschatz P.B Garvin Operating System Concept, John Wiley & Sons (Asia) Pte 2000.

List of Practical Assignment:

1. Implementation of Deadlock using JAVA programs.
2. Implementation of Bankers algorithms to avoid deadlocks.

3. Implementation Ring Election algorithm.
4. Implementation of Bully Election algorithm.
5. Prepare a multi-cast program using JAVA APIs.
6. Simulate Sequential file allocation strategy.
7. Simulate Indexed file allocation strategy.
8. Simulate Linked file allocation strategy.
9. Implement file organization strategies single level, Two level and Hierarchical.
10. Case Study on:
    a) CORBA, RMI and RPC
    b) Reservation System
    c) Online Chain management
    d) Inventory management

III BE (Information Technology)

CBCS SCHEME

Semester-VI

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	ITR6C1	Wireless Protocols and Mobile Networks	PC	3-1-0	4
2.	ITR6C2	Design and Analysis of Algorithms	PC	3-1-1	4+1(P)
3.	ITR6C3	Network and Information Security	PC	3-1-1	4+1(P)
4.	ITR6E1	Software Testing and Quality Assurance	PE	3-1-1	4+1(P)
5.	ITR6G4	Compiler Design	GE	3-1-0	4
6.	ITR6L4	Mobile Technology Lab	--	0-0-1	1
7.	SIR6S6	Entrepreneurship Development & IPR	--	2-0-0	2
8.	ITR6V6	Comprehensive Viva - VI	Virtual	0-0-4	4
			TOTAL CREDITS		**30**
Programme Electives for VI Semester					
4.	ITR6E2	Bioinformatics	PE	3-1-1	4+1(P)
4.	ITR6E3	Information Retrieval & Extraction	PE	3-1-1	4+1(P)
4.	ITR6E4	High Performance Computing	PE	3-1-1	4+1(P)

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ITR6C1
Wireless Protocols and
Mobile Networks</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
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Learning Objectives: To understand the basic concepts of wireless communication with focus on mobile networking.

To provide knowledge of different techniques of wireless communication.

To learn about integration of services and applications from fixed networks into mobile networks.

Prerequisite:

Basic knowledge of Computer Networks.

COURSE CONTENTS

UNIT-I

Introduction: Wireless Networks, Wireless vs Wired Networks, mobile devices, mobile applications, mobile environments and limitations, Wireless transmission-frequencies and regulation, multipath propagation, channel fading, Multiplexing and Modulation techniques, Spread spectrum-DSSS & FHSS,

UNIT-II

Medium Access Control: motivation for specialized MAC, Hidden/Exposed, Near/Far terminal effect, MAC protocols –SDMA,FDMA,TDMA, Reservation Aloha, PRMA, MACA, DSMA etc.

Cellular networks : overview, Cellular Concept and Frequency Reuse, Channel Allocation, Call Setup, Cell Handoffs, Location Management, CDMA, GSM- Architecture, GSM-Air Interface, protocols, HLR/VLR, localization & calling, security, GPRS.

UNIT-III

Wireless LAN : Infra vs Radio transmission, infrastructure vs ad hoc network,IEEE 802.11-system and protocol architecture**,** MAC management**,** IEEE 802.11 flavours**,** Bluetooth – architecture, radio and basband layer, L2CAP, IEEE 802.15, WiMax and Zigbee overview

UNIT-IV

Mobile Network Layer: Entities, Packet delivery, Agent Discovery, Tunneling and encapsulation, optimization, reverse tunnelling,
Mobile Transport Layer: Congestion control and implication of mobility, slow start, Mobile TCP – Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/ Fast recovery. **Support for Mobility** – File System – CODA, WAP –Architecture,

UNIT-V

Mobile Adhoc Networks: Protocols and Routing,
Advances in Mobile Technologies: 5G and Beyond, Interne of Things (IoT), Internet of Every Thing (IoE), Wireless Sensor Networks, Mobile Opportunistic Networks
Wireless Network Planning and Administration: Wireless Hardware, Wireless Network Design and Deploy, Troubleshooting hardware and connection issues.

Learning Outcomes:

Upon completing the course, students will:
Be familiar with wireless communication methodologies
Learn wireless communication protocols and different standards
Be able to apply these concepts in Wireless Network planning, design and administration to support mobility.

Books Recommended:

1. Jochen Schiller, Mobile Communications, Pearson Education, 2/e, 2003.
2. W. Stalling, Wireless Communications & Networks, Pearson Education, 2/e, 2005.
3. Dharma P. Agrawal and Qing-An Zeng, Introduction to Wireless and Mobile Systems, Cengage Publication, 2012.
4. Wale Soyinka, Wireless Network Administration- A Beginner's Guide, Tata McGraw-Hill Edu, 2010.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**III Year B.E. (Information Technology (Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR6C2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Design and Analysis of Algorithms	**3**	**1**	**1**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

1. Reinforce basic design concepts (e.g., pseudocode, specifications, top-down design)
2. Knowledge of algorithm design strategies
3. Familiarity with an assortment of important algorithms
4. Ability to analyze time and space complexity

Prerequisite:

The students are required to have familiarity with the following data structures: Arrays and linked lists, Stacks and queues, Graphs and trees, binary search trees, height balancing, Heaps and priority queues

COURSE CONTENTS

UNIT-I

Introduction to Algorithms: Notion of algorithms, properties, important areas of research in connection with the study of algorithms, Types of algorithms; Analysis- best case, worst case, and average case. Performance issues - Time and space complexity; Asymptotic analysis. Mathematical preliminaries; functions & their growth rates; Recurrence relations, Methods for solving recurrences.

UNIT-II

Selected Algorithms for Sorting, Searching and matrix multiplication: Elementary sorting techniques: Selection, Bubble, and Insertion sorts; Advanced sorting techniques: Heap, Merge and Quick sorts; Radix & Bucket sorts. Searching techniques: Linear and binary search; Searching minimum and maximum elements. Divide–and-Conquer strategy, Strassen's matrix multiplication.

UNIT-III

Greedy Method and Dynamic Programming: Algorithms design techniques based on Greedy Method and Dynamic programming. Illustration of these strategies using appropriate examples including Knapsack problem, optimal storage on tapes, finding shortest path, all pairs shortest path, finding minimum cost spanning trees, and Matrix chain multiplication problem.

UNIT-IV

Backtracking, Branch-and- Bound, and String Matching: Backtracking and Branch-and-Bound algorithm design techniques, Illustration of these techniques using appropriate examples like Queens Problem, subset sum problem, traveling salesperson problem, etc.

Introduction to string matching problem, Applications, String matching algorithms: Naive algorithm, Rabin-Karp, Knuth-Morris-Pratt, Boyer-Moore, etc.

UNIT-V

TheTheory of NP-Completeness:

Non-deterministic Algorithms:Introduction. Nondeterministic Complexity, Decision and optimization problems, Tractable and Intractable Problems, Computational Classes: – P, NP, NP-Complete, and NP-Hard; reducibility, Selected NP-Complete and NP-Hard problems: Hamiltonian cycle, Traveling Salesperson (TSP). Satisfiability, Clique problems, etc.

Learning Outcomes:

Students who have completed this course should be able to:

1. Apply design principles and concepts to algorithm design
2. Have the mathematical foundation in analysis of algorithms
3. Understand different algorithmic design strategies
4. Analyze the efficiency of algorithms using time and space complexity theory

Assessment methods of all of the above: quizzes, exams, assignments, practicals

Books Recommended:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, MIT Press/McGraw-Hill, 2001.
2. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.
3. Jon Kleinberg and ÉvaTardos, Algorithm Design, Pearson, 2005.
4. E. Horowitz, S. Sahni, S Rajasekaran, Computer Algorithms, Galgotia Publications.
5. Saara Base, Computer Algorithms: Introduction to Design and Analysis, Addision Wesley, 2/e, 1988.
6. Knuth, D, The art of computer programming, Vols. 1-2-3, Addision Wesley 1968-73.
7. A V Aho, J E Hopcroft& J D Ullman, The Design and Analysis of Computer Algorithms, Addison Wesley, 1974.
8. Vijay V Vazirani, Approximation Algorithms, Springer-Verlag, 2001

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ITR6C3
NETWORK & INFORMATION SECURITY</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

1. To impart the knowledge and in-depth reference to current information and network security standards and procedures.
2. This course provides you with an overview of data and computer security and concentrates in technical and continuity management issues.
3. Allow the student to gain expertise in some specific areas of information security such as the design and providing security to individual networks.

Pre requisites :

Basic knowledge of programming and computer Networks

COURSE CONTENTS

Unit I

Introduction: The need for security, security approaches, principles of security, services, mechanisms & attacks, model for network security. Plain & Cipher text, substitution & transposition techniques play fair cipher, hill cipher, stenography, key range & key size.

Unit II

Symmetric Key Algorithms: Deffie-Hellman key exchange, An general idea of symmetric key cryptography, Algorithm types & modes, possible types of attacks, Symmetric & asymmetric cipher model, Data Encryption Standard (DES), Advanced Encryption Standard (AES).

Unit III

Asymmetric Key Algorithms: Brief account and general idea of asymmetric key cryptography, RSA algorithm, asymmetric & symmetric key cryptography together, digital envelopes, digital signatures & digital certificates & Public key infrastructure (PKI).

Unit IV

Information Security Protocols: Secure Socket Layer, Secure Hyper Text Transfer Protocol (SHTTP), Time Stamping Protocol (TSP), 3- D Secure Protocol, Email Security, and Kerberos.

Unit V

Network Security: Introduction, brief introduction to TCP/IP, Firewalls, IP Security, Virtual Private Networks, Intrusion detection system, IP spoofing, DNS spoofing. Introduction to block chain technology and crypto currency.

Learning Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

1. Acquire a practical overview of the issues involved in the field of information security.
2. Demonstrate a basic understanding of the practice of IS, especially in evaluation of information security risks across diverse settings including the Internet and WWW based commerce systems, high bandwidth digital communications and funds transfer services.
3. The learning outcome is students shall be able to understand what are the common threats faced today, what are the foundational theory behind information security, what are the basic principles and techniques when designing a secure system, how to think adversarial, how today's attacks and defences work in practice, how to assess threats for their significance, and how to gauge the protections and limitations provided by today's technology.
4. Familiarity with the basic protocols of Information Security, and how they can be used to assist in network security design and implementation.

Books Recommended:

Douglas R. Stinson; Cryptography Theory and Practice; 2nd Edition, Chapman & Hall/CRC

Williams Stallings; Cryptography & Network Security; 3rd Edition, Pearson Education

Bernard Menezes; Network Security and Cryptography; Cengage Learning India Pvt Ltd.

Neal Krawetz; Introduction to Network Security; 2nd Edition, Thomson Learning Inc.

List of Practical Assignments:

During learning of course, students need to do assignments:

1. Implementation of various symmetric key algorithms.
2. Implementation of various asymmetric key algorithms.
3. Implementation of Algorithm types and modes (Electronic Code Book (ECB), Cipher Block Chaining (CBC), Cipher Feedback (CFB), Output Feedback (OFB)).
4. Study of Pretty Good Privacy open source security tool for e mail security.
5. Implementation of digital certificates.
6. Study of IP Tables.
7. Implementation of various open source security tools (Wireshark, nmap, iptables, pretty good privacy, Snaort, LC5, OpenVPN, TrueCrypt, THC Hydra).

Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**III Year B.E.** **Information Technology** **(Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR6E1 **Software Testing & Quality Assurance**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

To develop software testing skills and create awareness about software quality assurance processes.

Prerequisite:

Good knowledge of software Engineering and programming.

COURSE CONTENTS

UNIT-I

Software Testing Principles: Fundamental of software testing: History, Prerequisite for testing, Testing Principles and Concepts, Scope of testing, testing constraint, software development Life cycles (SDLC), Agile software development, software testing life cycle (STLC), 'V' concept of testing, challenges in testing, Testingprocess: fundamental test process, role and responsibility.

UNIT-II

Verification and Validation: Levels of testing: Unit, Integration and System Testing, Acceptance testing, Test case Planning, Test case Design, Test case template, Test case execution, Test case misconception, Test case management.

UNIT-III

Static and Dynamic Testing: White Box Testing techniques and methodology, statement coverage, branch coverage, single /multiple condition coverage, data flow coverage. Black Box Testing: boundary value analysis, Equivalence partitioning, System testing: functional and non-functional testing, Acceptance testing, Integration testing, database testing.

UNIT-IV

Testing Strategies: Bug, bug life cycle, defect management life cycle, defect severity and priority, test matrices, fuzz testing, special testing: UI testing, load testing, stress testing, performance testing, configuration testing, compatibility testing, security and recovery testing. Factors and Methodology for Performance testing, Regression testing: Methodology for Regression testing.

Mobile apps testing: Mobile app testing (popular apps), game testing, mobile testing tools: Appium, Calabash, Monkey Talk, Robotium, EggPlant.

Case study: Social Media, compiler, project under ISRO, NASA, DRDO, System Driver, kernel. Hard real time applications testing.

UNIT-V

Quality Assurance & Automation: Quality Assurance and Software Quality management, CMM levels, CMMI, ISO 9000 standard, Metrics for software quality, Risk management, Automation Testing tools: QTP (10.0), VSTS - WebTest, Load Runner, Performance Testing, Selenium

Bug management tools: Bugzilla,Winrunner, TestDirector

Learning Outcomes:

Upon completing the course, students will be:

Familiar with software testing tools and techniques, and software quality assurance processes.

Able to apply skills for quality software development as per requirement.

Books Recommended:

1. Srinivasan Desikan&Gopalswamy Ramesh "Software testing Principles and Practices" Pearson education, 2006
2. R. Patton; Software Testing; Techmedia (SAMS) 2000
3. Glenford J. Myers, "The Art of Software Testing ", John Wiley & Sons, 1979.
4. Boris Beizer, Black-Box Testing: "Techniques for Functional Testing of Software and Systems ", John Wiley & Sons, 1995.
5. Beginner's Guide for Mobile Applications Testing Paperback – 28 May 2015 by Jeesmon Jacob
6. How to Test Mobile Applications: A Practical Guide to Mobile Application Testing Kindle Edition by Kishore Nuvvula
7. Software Testing Tools by K.V.K.K Prasad.

List of Practical Assignments:

Students are given programming assignments to learn following.

SDLC, agile and STLC phases.

Test website performance with different parameters using GTmatrix, PageSpeed.

Check Web Browsers performance for loading websites.(as IE, Mozilla, Opera, Chrome, UC Browser.

Prepare & execute test cases for application and system software.

Perform load testing for web application using LoadRunner, Jmeter, WebLOAD.

Perform web security testing using AppScan, Webscarab.

Perform automation testing using selenium & QTP 10.0(UFT).
Execute mobile app testing using Appium, calabash, MonkeyTalk, Robotium, Eggplant.

Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**III Year B.E.** **Information Technology** **(Full Time)**			
Subject Code & Name	**Instructions Hours Per Week**			**Credits**			
ITR6G4 **Compiler Design**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper:3 Hours							

Learning Objectives:

Provide a framework for understanding the fundamentals of Compiler.
To familiarize students with new Compilation Problems.
Develop skills to understand how to Design a Compiler.
Develop ability to understand how to enhance performance of a Compiler for newly evolved Programming Languages.

Prerequisite:

Knowledge of Computer Programming, Data Structures, Discrete Mathematics. Knowledge of several different Programming Languages will be useful.

COURSE CONTENTS

UNIT-I

Introduction to Compiling: Compilers: The Analysis-Synthesis Model of Compilation; Analysis of the Source Program: Lexical Analysis, Syntax Analysis, Semantic Analysis; The Phases of a Compiler: Symbol-Table Management, The Analysis Phases, Intermediate Code Generation, Code Optimization; Cousins of the Compiler: System Software, Interpreters, Preprocessors, Assemblers, Linkers and Loaders, Macros; The Grouping of Phases: Front and Back Ends, Passes; Compiler Construction Tools.

UNIT-II

Lexical Analysis: The Role of the Lexical Analyzer: Lexical Analysis Versus Parsing, Tokens, Patterns and Lexemes, Attributes for Tokens, Lexical Errors; Specification of Tokens: Strings and Languages, Regular Expressions; Recognition of Tokens: Transition Diagrams; Finite Automata: Nondeterministic Finite Automata, Deterministic Finite Automata; From Regular Expression to Automata: Conversion of an NFA to DFA, Construction of an NFA from a Regular Expression.

UNIT-III

Syntax Analysis: Introduction: The Role of the Parser, Classification of Grammars; Context-Free Grammars: Parse Tree and Derivations, Ambiguity, CFG Versus Regular Expressions; Writing a Grammar: Lexical Versus Syntactic Analysis, Eliminating Ambiguity; Top- Down Parsing: Recursive Descent Parsing, LL(1) Grammars, Nonrecursive Predictive Parsing; Bottom-Up Parsing: Reductions, Shift Reduce Parsing; LR Parsing: Simple LR, Constructing SLR-Parsing Tables, Constructing LALR Parsing Tables.

UNIT-IV

Intermediate-Code Generation and Run-Time Environment: Variants of Syntax Trees: Directed Acyclic Graphs for Expressions; Three Address Code: Addresses and Instructions, Quadruples, Triples; Type Checking: Rules for Type Checking, Type Conversions; Storage Organization: Static Versus Dynamic Storage Allocation; Stack Allocation of Space: Activation Trees; Introduction to Garbage Collection.

UNIT-V

Code Optimization and Planning a Compiler: Basic Blocks and Flow Graphs: Basic Blocks, Flow Graphs; Optimization of Basic Blocks: The DAG Representation of Basic Blocks, Local Common Subexpressions Elimination, Semantic Preserving Transformations; Loop Optimization; Virtual Machines and their Interpreters; The LLVM Modular and Reusable Compiler Technologies, Overview of The HiPE Compiler; Case Studies of Compilers and Future Trends: The Sun Compilers for SPARC, The IBM XL Compilers for the POWER and POWERPC Architecture.

Learning Outcomes:

Upon completing the course, students will be:

Acquire advance knowledge and understanding of Compiler.

Use skills in Compiler Design.

Apply acquired knowledge to improve performance of a Compiler.

In addition to development in technology computer architectures offers a variety of resources of which students will be able to innovate in the Compiler Design.

Recommended Books:

1. Compilers: Principles, Techniques, and Tools; Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman; Pearson Education.
2. Compilers: Principles, Techniques, and Tools; Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman; Pearson Education.
3. System Programming: D M Dhamdhere; McGraw Hill Education.
4. System Programming and Operating Systems: D M Dhamdhere; McGraw Hill Education.

Suggested Exercises:

For a Defined Language:

1. Design a symbol table mechanism.
2. Write an interpreter for quadruples.
3. Write the lexical analyser.
4. Write the semantic actions.

5. Write the parser.
6. Write the error-handling routines.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. Information Technology (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
	L	**T**	**P**	**L**	**T**	**P**	**Total**
ITR6L4 **Mobile Technology Lab**	**0**	**0**	**2**	**0**	**0**	**1**	**1**
Duration of Practical: 2 Hours							

Learning Objectives:

To learn Android programming skills to develop mobile applications for modern computing requirements.

To provide knowledge of different mobile technologies.

To familiarize students with Android operating system.

To provide knowledge of Android programming language and platform.

Develop skills to design and implement various Mobile applications.

Prerequisite:

Programming Concepts. Programming languages, Core JAVA, Database

COURSE CONTENTS

UNIT-I

Introduction: Introduction to Android architecture and core building blocks, Installing Android SDK and Software Stack, mobile App APK ;

Android UI Design: Working with buttons & other components, Activity lifecycle, Intent – implicit and explicit, Fragment lifecycle, Menu, Layout manager, Adaptor and view;

UNIT-II

Android Service & Data Storage: Introduction, Android service API, Android service life cycle, Shared preferences, internal storage, external storage, SQLite, XML & JSON.

UNIT-III

Android Content Provider & Notification: Contact content provider, other built-in content providers, Understanding content URI, Content Resolver, Content sharing, Content Searching, Notification API, Setting notification properties, issuing notification.

UNIT-IV

Android APIs & Connectivity: Overview of TextToSpeech API, Telephony API, Location API and Sensor API, Bluetooth API, Wi-Fi API:Creating P2P Connections with Wi-Fi**,** Using Network Service Discovery**,** Using Wi-Fi P2P for Service Discovery**,** Networking Operations: Connecting to the network, Manging network uses, Parsing XML Data;

UNIT-V

Best Practices: Interaction & Engagement, User Interface, User Input, Background Jobs, Performance, Security & Privacy, Permissions & Identifiers;

Testing Apps on Android : Fundamentals of Testing, Building Effective Unit Tests ,Automating UI Tests, Testing App Component Integrations, Testing UI Performance, Espresso ;Using google play to distributing;

Learning Outcomes:

Upon completing the course, students will be:

Familiar with Android architecture, operating system and its SDK.

Able to develop mobile applications using Android technology.

Books Recommended:

1 Programming Android by Z. Mednieks, L. Dornin, G. Blake, M. Nakamura, Oriely'spublication. 2e

2 Professional Android™ 4 Application Development by Reto Meier, John Wiley & Sons publication. 1e

3 Beginning Android™ 4 Application Development by Wei-Meng Lee, John Wiley & Sons publication. 1e

4 Android Programming for Beginners by John Horton, Packt Publishing Ltd. 1e

5 https://developer.android.Com/Training/Index.Html

6 https://www.Tutorialspoint.Com/Android/Android_Tutorial.Pdf

List of Practical Assignments:

Students are given programming assignments to learn following.

1. How to install Android SDK and create environment.
2. Concepts of activity and apply activities.
3. Techniques of designing layout, fragment, views and menu with view.
4. Concept of Android service API’s and storages.
5. To work with database interface (Sqlite).
6. Concepts of using server side database.
7. To work with content provider for data sharing, searching, Saving and Loading User Preferences,
8. Concept of networking using API’s.(use of Wifi, Bluetooth, GPS)
9. A project to be developed which uses the above concepts.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**III Year B.E. (Information Technology (Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
SIR6S6	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Entrepreneurship Development & IPR	**2**	**-**	**-**	**2**	**-**	**-**	**2**
Duration of Theory Paper:3 Hours							

Learning Objectives:

1. To provide awareness about entrepreneurship.
2. To develop the skills of entrepreneurship & to encourage the students to become an entrepreneur.
3. To self motivate the students by making aware of different opportunities and successful growth stories
4. To impart the basics of Intellectual property Rights.

Pre requisite:Nil

COURSE CONTENTS

UNIT I

Introduction to Entrepreneurship: Entrepreneurship- Concept, Nature, Functions and Importance; Entrepreneurs- Characteristics, Types and Motivation; Entrepreneurial process; Enterprise- Definition and Classification (MSME- Micro, Small & Medium Enterprises).
Case Study: Success and Failure stories of entrepreneurs and discussing their characteristics and reasons for success/failure.

UNIT II

Entrepreneurial Journey: Creativity and Innovation,Recognizing opportunities and Generating ideas, Feasibility analysis, Industry and Competitor analysis, developing effective business model.
Class Activity: Idea generation by students.

UNIT III

Business Plan for Start-ups in IT Industry: Project Identification, Market Survey, Production plan, Operational plan, Marketing plan, Organizational plan and financial plan; writing a business plan.
Class Activity: Students asked to finalize on their ideas and start writing business plans

UNIT IV

Institutional Support to Entrepreneurs: Need for Institutional support different Government &Non Government institutions to support Entrepreneurs like, NSIC, SIDO, SSIB, SSIDC, SISIs , DTICs, industrial Estates, Specialized Institutions.

UNIT V

Intellectual Property Rights: Introduction of IPR, General Provisions & Basic principles of IPR, various perspective of IPR like Innovation & Creation, Innovators & Creators; Patents, Copyrights and Trademarks.

Learning Outcomes:

At the end of the course, students should be able to do the following:

1. Learn how to start an enterprise and design business plans those are suitable for funding by considering all dimensions of business.
2. Understand entrepreneurial process by way of studying different cases and performing class activities.

1. Robert D. Hisrich, Mathew J. Manimala, Michael P Peters and Dean A. Shepherd, “Entrepreneurship”, 9th Edition, Tata Mc-graw Hill Publishing Co.ltd.-new Delhi, 2014.
2. Bruce R. Barringer and R. Duane Ireland, “Entrepreneurship”, 4th Edition, Pearson Publications, New Delhi, 2011.
3. N.K. Acharya, Text book on intellectual Property Rights, Asha Law House New Delhi, New Edition, 2001.

B.E.IV Yr .(IT)_Syllabus _CBCS

Semester – VII

S.No.	Sub_Code	Sub_Name	Type	L-T-P	Credits
1	ITR7PR	Project Phase-I/Project Phase- II	PC	0-0-0	7
2	ITR7C1	Cloud Computing	PC	3-1-1	4+1(P)
3	ITR7C2	Computer Graphics	PC	3-1-1	4+1(P)
4	ITR7E1	Big Data Analytics	PE	3-1-1	4+1(P)
5	ITR7G5	Artificial Intelligence	GE	3-1-0	4
6	ITR7V7	Comprehensive Viva - VII	Virtual	0-0-4	4
			Total Credits		**30**

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year BE Information Technology (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR7C1 **Cloud Computing**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**2**	**3**	**1**	**1**	**5**

Learning Objectives:

To provide knowledge of cloud architecture, deployment models. To introduce broad perceptive of cloud services.

To introduce about storage and database management in cloud computing.

To make them understand about resource management in cloud computing

To make them familiar with the various cloud security issues and research trends in cloud

Pre requisites:

Fundamentals of Computer Network, Storage and Internet Technology

COURSE CONTENT

UNIT-I

Introduction to Cloud Computing and Cloud Computing Architecture: Computing era, Cloud evolution, Principles of Parallel and Distributed computing, Web services, Cloud Computing Introduction, Characteristics as per NIST, Need of Cloud Computing, Cloud Computing Reference Model, Cloud Architecture, Clodu Service Models, Cloud Deployment Models, Cloud Adaptation Policy.

UNIT-II

Virtualization and Migration: Concept, Benefits of Virtualization, Challenges in Virtualization, Characteristics of Virtualized environments, Virtualization Techniques, Hypervisor, Components of Virtualization, Hot and Cold conversion, Resource Virtualization, Virtualization Platforms.

Cloud Migration: Migrating Strategies, Risk Associated, Precuations

UNIT-III

Inter Cloud Computing/Federated Environment:

Legal and Compliance Issues- - Global Exchange of Cloud Resources, Inter Cloud Resource Management, Service level Agreement management. Cross Border Data Storage Issue, Cloud Governance Model, Compliance monitoring, Ownership of Data, storage and backup policy.

Federated Cloud- Characteristics, Cloud Federation Stack, Motivation for Cloud Interoperability, Cloud Interoperability Scenario, Challenges, Intercloud enabling techniques, Inter-Cloud Standards, Inter-Cloud Project examples.

UNIT-IV

Thretas, Security and Disaster Management in Cloud Computing:

Cloud threats- Threat actors in cloud, Current Threats in cloud, Mitigation techniques for Cloud threats, Cloud Contracting models, Methods for Data loss prevention, Viability of third party services vendors.

Data Security issues in Cloud storage- Cloud Security Challenges, Security Governance, Risk Management, Security Monitoring, Security Architecture Design, Data in Rest, Data in Motion, Identity and Access Management, Authentication Services in cloud.

Disaster Management- Disaster recovery as a service model **(DRaaS**), Recovery Point Objectives, Recovery Time Objectives, Monitoring, Load Balancing, Database Recovery, Business Continuity.

UNIT-V

Resource Management in Cloud Computing, Case Studies, Advance Topics: Performance and Scalability of Cloud Services, Data Centre, Components, Architecture with Reference Model, Resource Provisioning and allocation approaches, Challenges in Resource Management.

Cloud Platforms: Case studies on Cloud Platforms - Amazon web services, Google App Engines, Microsoft Azure, Salesforce Cloud.

Cloud Application Development, Green Computing, Fog Computing, Big Data application on Cloud, Cloud Mining, Mobile Cloud.

Cloud Deployment- Setting up a Small Cloud, Cloud Simulator.

Learning Outcomes:

Upon completing the course, students will be able to:

- Understand about cloud architecture and deployment models
- Learned about broad perceptive of cloud services
- Learned about database management in cloud computing
- To make them understand about resource management in cloud computing
- To make them familiar with the various cloud security issues and research trends in cloud

BOOKS RECOMMENDED:

[1] Rajkumar Buyya; Cloud Computing Principles and Paradigms; John Wiley & Sons 2011.
[2] Rajkumar Buyya; Mastering Cloud Computing; Elsevier Inc 2013.
[3] Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010.
[4] Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach" McGraw-Hill Osborne Media; 1 edition [ISBN: 0071626948], 2009.
[5] Dimitris N. Chorafas, "Cloud Computing Strategies" CRC Press; 1 edition [ISBN: 1439834539],2010.

List of Practical Assignment:

During the learning of course, students need to do assignments:

1. Configuration of Baremetal or Para Hypervisor.
2. Study of various cloud data centers and green cloud models.

3. Installation and configuration of Eucalyptus/Aneka cloud.
4. Study of cloud CRM applications i.e Salesforce, Zoho.
5. Hadoop Configuration with Hortonworks.
6. Deployment of CloudSIM tool.

<table>
<tr><th colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</th><th colspan="4">IV Year B.E. (Information Technology (Full Time)</th></tr>
<tr><th>Subject Code & Name</th><th colspan="3">Instructions Hours per Week</th><th colspan="4">Credits</th></tr>
<tr><td rowspan="2">ITR7C2
Computer Graphics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
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Learning Objectives:

To provide knowledge of different techniques used for visual object representation.

Familiarize students with different hardware/ software and algorithm implementation used by today's input/output devices.

Develop skills to design and implement various 2D/3D objects representation in virtual reality.

Learning about the basics of computer based games and data visualization.

Pre requisites:

Programming language: C++/JAVA.

COURSE CONTENTS

UNIT-I

Introduction: Application of Computer Graphics, Raster Graphics Fundamentals: Scan conversion, Pixel, Frame Buffer. Graphics Primitives; Line algorithms Circle algorithms, Ellipse, Character generation, Polygon Representation, inside test, Polygon filling algorithms, Antialiasing.

UNIT-II

Display devices: Random scan and Raster scan monitors, Colors CRT monitor, Plasma Panel; Hard Copy devices: Printers and Plotters; Input devices: Joysticks, Mouse, Digitizer, Scanner, and Camera; Input Techniques;

UNIT-III

Windowing and clipping: 2D Transformation, Raster method of Transformation, Window, View port, Viewing, Window to View port Transformation, Line clipping algorithms, Polygon clipping algorithms.

UNIT-IV

Three Dimensions:3D Modeling techniques, 3D Display Techniques, 3D Transformation, Viewing Parameters, Hidden Surface and back face removal algorithms. 3D Curves & Surfaces: Bezier, B spline.

UNIT-V

Shading and Color Models: Diffuse illumination, Point source illumination, Reflection, Refraction, Transparency, Shadows, Polygon rendering algorithms, Dithering, Half toning, Color Models and applications.

Learning Outcomes:

Upon completing the course, students will be able to:

Able to learn the basics of2D/3D design and it implementations.

Able to write programs for latest Input/ Output Devices and Human computer Interaction.

Students will be aware about the latest technology used in display technology.

BOOKS RECOMMENDED:

[1] Hearn Donald and Baker M.Pauling, Computer Graphics, 2/e, Prentice Hall of India.
[2] Hearn Donald and Baker M.Pauling, Computer Graphics with OpenGL, 3/e, Prentice Hall, 2004.
[3] David F. Rogers, Procedural Element of computer Graphics, McGraw Hill International.
[4] William M. Newman Robert F. Sproull, Principles of Interactive Computer Graphics, McGraw Hill.
[5] J.D. Foley, A. van Dam, S.K. Feiner, J.F. Hughes, and R.L. Philips, Introduction to ComputerGraphics, Addison-Wesley, 1994. [6] Zhigang Xiang and Roy Plastock, Computer Graphics, Tata McGraw Hill Publications.

List of Practical Assignments:

1. Implement various line drawing algorithm & compare it on the basis of performance and prepare the table.
2. Implement various Circle drawing algorithm & compare it on the basis of performance and prepare the table.
3. Implement Cohen Sutherland and Cyrus Back line clipping algorithms and display the clipped portion of line as demonstration.
4. Implement Cohen Hoghman polygon clipping algorithm to clip a polygon against a rectangular boundary and combine Cohen Hoghman polygon clipping algorithm with Cyrus Back line clipping algorithms to clip a polygon against another polygon and display the clipped portion of polygon.
5. Implement the following 2D transformation using matrix multiplication: Translation Rotation Scaling Shearing Reflection
6. Implement parallel (oblique and axonometric) and perspective projection and display following objects using projections: Pyramid and Rectangles
7. Implement the following 3D transformation using matrix multiplication. And display using perspective projection: Translation Rotation Scaling Shearing Reflection
8. Implement rotation of an object about any arbitrary axis.
9. Implement reflection of an object about any arbitrary plane. 11. Implement the L-system for generation of symmetric objects (Fractals)
10. Generate 2D curve and surfaces using implementation of Bezier curve.
11. Implement the following visible surface detection algorithm and compare them on the basis of complexities and execution time. Z-buffer Scan-line Depth sorting Octree Ray Casting

12. Implement the following rendering algorithm and compare them on the basis of complexities and execution time. Flat Shading Gouraud shading Phong shading Ray tracing.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Information Technology (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR7E1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Big Data Analytics	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

To increase knowledge of the Big Data landscape.

Develop a comprehensive knowledge R, Hadoop and Spark for effective data analysis.

Develop skills in independent managing Big Data projects and related issues.

Develop ability to carry out research in area of Big Data Analytics.

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Prerequisites:

Some programming experience (in any language) is recommended.

COURSE CONTENTS

UNIT- I

Introduction to Big Data : Definition & importance of Big Data - Five Dimensions of Big Data - Volume, Velocity, Variety, Veracity, Valance – Industry examples – Terminologies – Structured Data, Unstructured Data, Semi Structured Data, Streaming Data, Real-Time Data, Meta Data, data at rest, Big Data Applications, Challenges Process of Data Analysis.

UNIT-II

Big Data analytics: Introduction – Concepts - Storing Big Data - Analyzing your data characteristics - Selecting data sources for Analysis - Eliminating Redundant Data - Open Source Technology for Big Data analytics - Predictive Analytics - Crowdsourcing Analytics - Computing Platforms, Limitations, and Emerging Technologies - Consumption of analytics - Modern Analytic Approaches – Ensemble Modeling, Commodity Models, and Text Analysis.

UNIT- III

Introduction to R: R-Environment Setup, Programming with R, Basic Data Types, Vectors**,** Creating and Naming Vectors, Vector Arithmetic, Introduction to Factors, Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, Subsetting of Data Frames, Extending Data Frames, Sorting Data Frames, Creating a List: Creating a Named List, Accessing List Elements, Reading from CSV files, Writing to CSV file.

UNIT- IV

Introduction to Hadoop: Introduction to learning and knowledge analytics - Big Data From Technology Perspective – Hadoop - Components of Hadoop, Application Development in

Hadoop, The Distributed File System - HDFS, GPFS, Hadoop Cluster Architecture, Batch Processing - Low Latency NoSQL.

UNIT- V

Introduction to Apache Spark: Resilient Distributed Datasets (RDDs), DataFrames & SparkSQL, Spark Operations, Spark Workflow, Python RDD API Examples, Broadcast Variables and Accumulators, Spark's Main Use Cases, Case Studies – Market Basket Analysis using R & Spark, Linear Regression using R & Spark.

Learning Outcomes:

Upon completing the course, students will be able to:

Apply Knowledge of Big Data to solve real world big data problems.

Understand the fundamentals of R, Hadoop, Spark programming.

Work on a real life Project, implementing R, Hadoop, Spark Analytics to create Business Insights.

Undergo into further research in Big Data.

BOOKS RECOMMENDED:

[1.] Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Todays Businesses, Michael Minelli, Michele Chambers, Ambiga Dhira, Wiley India Pvt Ltd, 2013.

[2.] R for Everyone: Advanced Analytics and Graphics, 1st Ed., Jared P. Lander, Pearson Education, Inc., 2014.

[3.] Big Data Analytics with R and Hadoop, Vignesh Prajapati, Packt Publishing Ltd, 2013.

[4.] Big Data Analytics: Turning Big Data into Big Money, Frank J. Ohlhorst, Wiley, 2012.

[5.] Creating Value with Big Data Analytics: Making Smarter Marketing Decisions, Peter C. Verhoef, Edwin Kooge, Natasha Walk, Taylor & Francis, 2016.

[6.] K Mark Gardener,Wrox Beginning R: The Statistical Programming Language.

[7.] Y. anchang Zhao ,R and Data Mining: Examples and Case Studies . Elsevier in December 2012.

[8.] Alex Holmes, Hadoop in practice, Manning Publications, 2012

[9.] Tom White, Hadoop, The definitive guide, O'Reilly Media, 2010

List of Practical Assignments: **(If Applicable)**

During the learning of course, students need to do assignments:

To learn the R Programming language.

To explore Rstudio for data Analysis problems.

To explore Hadoop for solving the Big data problems.

To explore Spark for analysing Big data problems.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**IV Year B.E. (Information Technology (Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR7G5 Artificial Intelligence	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

Study the concepts of Artificial Intelligence.
Learn the methods of solving problems using Artificial Intelligence.
Learn the knowledge representation techniques, reasoning techniques and planning
Introduce the concepts of Expert Systems and machine learning.

Pre requisites:

Data Structures and Algorithms Analysis of Algorithm

COURSE CONTENTS

UNIT-I

Introduction: Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics Problem solving methods – Defining the problem as state space search, Problem graphs, Matching, Indexing and Heuristic functions.

UNIT-II

Search Techniques: Hill Climbing-Depth first and Breath first, heuristic search strategies-Best-first search, A*, AO* search, Constraints satisfaction, Means end analysis, simulated annealing, etc. Measure of performance and analysis of search algorithms. Adversarial search –Minimax search procedure, alpha-beta pruning, iterative deepening, genetic algorithms - Related algorithms, etc.

UNIT-III

Representation of Knowledge : Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge. Knowledge representation -Production based system, Frame based system, Scripts, CD, Ontologies, Sementic web and RDF.

UNIT-IV

Knowledge Inference and Planning: Inference – Backward chaining, forward chaining, Rule value approach, uncertain knowledge and reasoning: Probabilistic reasoning, Bayesian networks, Fuzzy logic and reasoning, Theory-Bayesian Network-Dempster - Shafer theory. Planning overview, components of planning system, Goal stack planning, Hierarchal planning, and other planning techniques.

UNIT-V

Machine Learning and Expert Systems: Overview of different forms of learning, Statistical methods, Learning Decision Trees, Neural Networks, Clustering- basic agglomerative, divisive algorithm based on similarity/dissimilarity measures. Introduction to Natural Language Processing.

Architecture of expert systems, Roles of expert systems - Knowledge Acquisition –Meta knowledge. Typical expert systems - MYCIN, DART, XOON, Expert systems shells. Basic knowledge of Prolog programming language.

Learning Outcomes:

Upon completing the course, students will be able to:

Familiar with Artificial Intelligence, its foundation and principles.
Identify appropriate AI methods to solve a given problem.
Examine the useful search techniques, knowledge representation techniques,
Inference methods; learn their advantages, disadvantages and comparison.
Understand important concepts like Expert Systems, AI applications.
Learn Prolog Programming to program intelligent systems.

BOOKS RECOMMENDED:

[1] Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Mc Graw Hill-2008.

[2] Stuart Russel and Peter Norvig “AI – A Modern Approach”, 2nd Edition, Pearson Education 2007 Peter Jackson, “Introduction to Expert Systems”, 3 rd Edition, Pearson Education, 2007.

[3] Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007. (Unit-III).

[4] http://nptel.ac.in.

[5] Carl Townsend, “Introduction to Turbo PROLOG”, BPB Publication.

[6] Ivan Bratko,”Prolog Programming for Artificial Intelligence”, 3rd Edition, Pearson Education.

IV BE (Information Technology)

CBCS SCHEME

Semester-VIII-A (Scheme for students who opted for Project work)

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
1.	ITR8P2	Project Phase - II	--	0-0-7	7
2.	ITR8C1	Data warehousing and Mining	PC	3-1-1	4+1(P)
3.	ITR8C2	Human-Computer Interaction	PC	3-1-1	4+1(P)
4.	ITR8E1	Machine Learning	PE	3-1-1	4+1(P)
5.	ITR8G6	Principles of Mobile Computing	GE	3-1-0	4
6.	ITR8V8	Comprehensive Viva - VIII	Virtual	0-0-4	4
			TOTAL CREDITS		**30**
Programme Electives for VIII Semester					
4.	ITR8E2	Enterprise Resource Planning	PE	3-1-1	4+1(P)
4.	ITR8E3		PE	3-1-1	4+1(P)
4.	ITR8E4		PE	3-1-1	4+1(P)

Semester-VIII-B (Scheme for students who opted for internship)

S No	Sub_Code	Sub_Name	Type	L-T-P	Credits
7.	ITR8I1	Industry Internship	--	0-0-18	18
8.	ITR8G1	Advanced IOT application	PC	4--0-0	4
9.	ITR8G2	Privacy and Security in Online Social	PC	4-0-0	4
10.	ITR8VI	Comprehensive Viva - VIII	Virtual	0-0-4	4
			TOTAL CREDITS		**30**

*They will be offered in self study/ MOOCS mode for students who have opted for internship and went at other institutions/organization.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV B.E. (Information Technology			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ITR8C1 **Data warehousing and Mining**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**2**	**3**	**1**	**1**	**5**

Learning Objectives:

- To learn the latest development of Data warehousing & data mining concepts and techniques.
- To understand and apply theories and wide range of data mining algorithms.
- To develop skills for using recent data mining software, including WEKA, SPSS, or the R language to solve practical problems in a variety of disciplines.
- To develop skill in selecting the appropriate data mining algorithm for solving practical problems.

Pre requisites: Basic knowledge of a programming language and Basic knowledge of probabilities and statistics is required.

COURSE OF CONTENTS

UNIT I
Data Warehouse:
Introduction to Data Warehouse, Differences between OLAP and OLTP. Data Warehouse characteristics, Data Warehouse Architecture and its components, Extraction-Transformation-Loading, Data Modeling, Schema Design, star and snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non-Addictive Measures; Dimension Table characteristics; OLAP cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.

UNIT II
Introduction to Data Mining:
Introduction to Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing- Data Cleaning, Missing Data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binarization, Data Transformation; Measures of similarity and dissimilarity-Basics.

UNIT III
Classification:
Problem definition, General Approaches to solving a classification problem, Issues regarding classification, Classification techniques, Decision trees-Decision Tree Construction, Measures for Selecting the Best split, Algorithm for Decision tree Induction, Naïve-Bayes classification, Bayesian Rule-based classification, Classification by back-propagation.

UNIT IV
Association Rules:
Introduction to Association Rule, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation, APRIORI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Frequent Item Set-Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT V
Clustering:
Clustering overview, Evaluation of clustering algorithms, Partitioning clustering K-Means Algorithm, K-Means Additional Issues, PAM Algorithm, Hierarchical Clustering-Algorithm-Agglomerative Methods and Divisive Methods, Basic Agglomerative Hierarchical Clustering Algorithm, Specific techniques, Key Issues in Hierarchical Clustering, Strengths and weakness, Outlier Detection.

RECOMMENDED BOOKS

[1] Sam Anahory and Dennis Murray, Data Warehousing in the real World, Pearson Education Asia, 2000.
[2] P. Tan, M. Steinback and V. Kumar, Introduction to Data Mining, Addison Wesley, Second Edition, 2016.
[3] J. W. Han and M. Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, San Francisco, CA, Third Edition, 2011.

Learning Outcomes:
Upon Completing the Course, students will have knowledge of Data Warehousing and various Data Mining Algorithm useful for solving the real world problems.

List of Assignment in Data Mining Lab:

- Problem based on different Data Mining algorithm
- Works on different Data Mining Algorithm
- Case Study on different data sets

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">IV B.E. (Information Technology)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ITR8C2
Human Computer Interaction</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To understand the principles, techniques and methods in the field.
- To introduce students to theoretical frameworks, models and major developments in HCI.
- To design and evaluate interactive technologies on various grounds to improve the interaction between humans and computers.

Pre-requisites: Fundamentals of programming using structured and object-oriented languages along with a basic understanding of creation of user interfaces using some GUI development tool.

COURSE CONTENTS

UNIT I

Introduction, History and Foundations of HCI, the challenges: People and Technology,
human and Machine- Interaction, Command Line Interface, Graphical User Interface,
Ergonomics, Cybernetics, Haptics, Usability of a computer based interactive system, areas of
knowledge that relate with HCI, HCI in the context of mobile devices, consumer devices, business applications, scientific applications, web-based applications, collaboration systems, games, etc. Social
issues influencing HCI

UNIT II

Basics of Interaction Design: Design, Design process, Navigation design, Screen design and layout. Design rationale. Rules for designing GUIs: Principles, Standards, Guidelines, Golden rules and heuristics, HCI patterns. Implementation details: Perception, gestalt perception, typography, Graphic design- color, display, paper, and other output devices, designing forms and information visualization, events, action object and object action. Overview of the elements of windowing systems, Programming the application, using toolkit and User interface management systems. Software process involved in HCI, Usability engineering, Iteration and prototyping, virtual reality.

UNIT III

Evaluation, Universal Design and User Support: Evaluation techniques: evaluation, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, choosing an evaluation method. Heuristic evaluation and cognitive walkthroughs. Universal design: principles, Multi-modal interaction, designing for diversity. User support: Requirements of user support, Approaches to user support, Adaptive help systems, designing user support systems.

UNIT IV

Models and Theories: Cognitive models: Goal and task hierarchies, Linguistic models, The challenge of display-based systems, Physical and device models, Cognitive architectures. Socio-organizational issues and stakeholder requirements: Organizational issues, Capturing requirements. Communication and collaboration models: Face-to-face communication, Conversation, Text-based communication, Group working. Task analysis: Differences between task analysis and other techniques, Task decomposition, Knowledge-based analysis, Entity–relationship-based techniques, Sources of information and data collection, Uses of task analysis. Dialog notations and design, Models of the system: Standard formalisms, Interaction models, Continuous behavior. Modeling rich interaction.

UNIT V

Groupware, Ubiquitous computing and WWW: Groupware: Groupware systems, Computer-mediated communication, Meeting and decision support systems, Shared applications and artifacts, Frameworks for groupware, implementing synchronous groupware. Ubiquitous computing and augmented realities: Ubiquitous computing applications research, Virtual and augmented reality, Information and data visualization. Hypertext, multimedia and the World Wide Web: Understanding hypertext, Finding things, Web technology and issues, Static web content, Dynamic web content. Case Studies.

Learning Outcomes:

1. Evaluate the usability of a computer- based system using the concepts studied with respect to HCI
2. Integration of HCI concerns in the software development process

BOOKS RECOMMENDED:

[1] Alan Dix, Janet E. Finlay, “Human-Computer interaction”, Pearson Education.
[2] Olsen, “Human-Computer Interaction”, Cengage Learning.
[3] Preece, J. Sharp, H. & Rogers, “Interaction design: beyond human-computer interaction”, Y. Wiley.
[4] Smith Atakan Serengal, “Human-Computer Interaction”, Cengage Learning.

List of Practical Assignment (Tentative):

1. Designing command line interface (CLI)-based programs using argc and argv in C/ C++.
2. Designing command line interface (CLI)-based programs using String args[] in Java.

3. Hands on experience with the Java AWT to create simple GUIs
4. Designing a simple GUI and a few complex GUIs using Visual Basic or other tools of student's choice.
5. Evaluation of a few websites and documenting observations.
6. Evaluation of a few forms with respect to usability, verification and validation.
7. Building an interface using prototyping paradigm
8. Documentation of the tool the student has used for building GUIs.
9. Study and working with the haptic glove available with the university.
10. Study of HCI design from ergonomics point of view.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">IV Year B.E. (Information Technology
(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ITR3E1
Machine Learning</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce the theoretical foundations of machine learning & Deep Learning.
- To provide practical experience of applying machine learning & Deep Learning techniques
- To investigate new problems where machine learning techniques can do better.

Pre requisites: Basic knowledge of probability and statistics and computer programming.

COURSE OF CONTENTS

Unit-I

Introduction:

Definition, Applications of machine learning, Machine Learning Workflow, Define Problem, Specify Inputs & Outputs, Exploratory Data Analysis, Data Collection, Data Preprocessing, Data Cleaning, Visualization, Model Design, Training, and Offline Evaluation, Model Deployment, Online Evaluation, and Monitoring, Model Maintenance, Diagnosis, and Retraining.

Unit-II

Machine Learning Algorithms:

Aspects of developing a learning system: Training Data, Validation Data and Test data, Types of learning: supervised, unsupervised and Reinforcement learning, Classification and Regression learning methods, Linear Regression with One Variable, Linear Regression with Multiple Variables, Logistic Regression, Support Vector Machine.

Unit-III

Introduction to Neural Networks:

Neural Network Representation, Perceptron, Artificial Neural Network, Backpropagation algorithm. Backpropagation Intuition, Random Initialization, Diagnosing Bias vs. Variance, Regularization and Bias/Variance. Learning Rate, implementing gradient descents, training neural networks, Cost Function.

Unit-IV

Deep Learning:

Introduction, Application, Deep neural network, Single Layer Perceptron Model (SLP), Multilayer Perceptron Model (MLP), Fully Connected (FC) Layer, Convolutional neural networks, recurrent neural networks, Activation Function, Sigmoid, Rectified Linear Units (ReLU), tanh, SoftMax, Pooling Layer, Bias, Variance, Hyperparameters, Data Augmentation,

Unit-V

Convolutional Neural Networks:

Terminologies: Channels, pooling, Padding, Stride, Preparing the image, Generate filters, Convolve using filters Measuring performance, CNN models: LeNet, AlexNet, ResNet, MobileNet, YoLo Algirithm, Recurrent Neural Networks, Generative Adversarial Networks.

RECOMMENDED BOOKS

[1] Michael Bowles, Machine Learning in Python, John Wiley & Sons, Inc., 2015
[2] Jason Brownlee, Machine Learning Mastery With Python, 2016.
[3] Machine Learning with TensorFlow, Version 10, 2017, Manning Publications.
[4] Ian Goodfellow and Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016

Learning Outcomes:

Upon Completing the Course, students will have knowledge of various machine learning & Deep Learning techniques useful for solving the real world problems.

List of Assignment in Machine Learning Lab:

- Problem based on different machine Learning & Deep Learning
- Works on different machine learning & Deep Learning Tools
- Case Studies on different data sets

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">IV Year B.E. (INFORMATION TECHNOLOGY)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>ITR8G6</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Principles of Mobile Computing</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Objectives: To understand the principles and techniques of how computers use and share data in an environment in which location is not fix.

Prerequisites: Basic knowledge of Wireless communication and Networks.

Course Contents

Unit-I

Review of Wireless communication technologies. Mobile computing definition, difference between mobile communication and mobile computing, Adaptability-key to mobile computing, mechanisms for adaptation, Support for building Adaptive Mobile Applications-Transcoding Proxy, Odyssey, Rover models

Unit-II

Mobility Management:

Mobility Management, Location Management principles and techniques: registration area based location management, dynamic update schemes, location caching, replicating location information, flat and hierarchical organization, location management case studies PCS, Mobile IP

Unit-III

Data Dissemination and Management

Challenges, Publish-subscribe mode, information caching, Data Dissemination, mobile data caching, mobile cache Maintenance schemes, Mobile Web Caching

Unit-IV

Context Aware Computing:

Ubiquitous or Pervasive Computing, Context: various definitions and Types, Context Aware Computing and Applications, Middleware support, Middleware for application development: Adaption and Agents.

Unit-V

Service Discovery Middleware: Finding needed Services, Services, Discovery and Advertisement Protocols, Garbage Collection, Eventing, Security, Interoperability.

Learning Outcomes:

Upon Completing the Course, students will gain the knowledge of various issues involved in mobile computing environment and techniques to resolve.

Books Recommended:

1. Frank Adelstein, Sandeep K. Gupta, Golden G. Richard, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing, McGraw-Hill Education (India), 2005.
2. Reading material from other online sources.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">IV Year B.E. (INFORMATION TECHNOLOGY)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ITR8G1

Advanced IOT Application</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

The Above Course ITR8G1 Advanced IOT Application is as per the course available at

MOOC/SWAYAM Course - I
Applications

They will be offered in self study/ MOOCS mode for students who have opted for internship and went at other institutions/organization.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (INFORMATION TECHNOLOGY)			
Subject Code & Name	Instructions Hours per Week			Credits			
ITR8G2	L	T	P	L	T	P	Total
Privacy and Security in Online Social Media	4	0	0	4	0	0	4
Duration of Theory Paper: 3 Hours							

The Above Course ITR8G1 Advanced IOT Application is as per the course available at

MOOC/SWAYAM Course - I
Applications

They will be offered in self study/ MOOCS mode for students who have opted for internship and went at other institutions/organization.

DEVI AHILYA VISHWAVIDYALAYA, INDORE

FACULTY OF ENGINEERING

SCHEME OF EXAMINATION (CBCS)
&
COURSE OF CONTENTS

BE I Year Programme
(Common to All Branches)
Effective from July 2015

INSTITUTE OF ENGINEERING & TECHNOLOGY
(www.iet.dauniv.ac.in)

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

CBCS SCHEMES OF EXAMINATION FOR BE I PROGRAMME
(Subject to Revision)

B. E. I YEAR (Common to all branches)

(Computer Engineering, Information Technology and Civil Engineering*)

SEM - 1				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR1C1	Applied Mathematics-I	3-1-0	PC1
2.	ACR1C2	Chemistry & Environment Science	3-1-1	PC2
3.	MER1C3	Elements of Mechanical Engineering	3-1-1	PC3
4.	ETR1C4	Basic Electronics	3-1-1	PC4
5.	MER1C5	Workshop Practice	0-1-2	PC5
6.	SSR1S1	Technical English	3-1-0	SS1
7.	BER1V1	Comprehensive Viva I	0-0-4	Viva1
Total Credit for SEM I			**26 actual + 4 Virtual credits**	

SEM – 2				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR2C1	Applied Mathematics-II	3-1-0	PC1
2.	APR2C2	Applied Physics	3-1-1	PC2
3.	MER2C3	Engineering Drawing	2-1-2	PC3
4.	EIR2C4	Electrical Engineering	3-1-1	PC4
5.	COR2C5	Computer Programming in C++	3-1-1	PC5
6.	SSR2S2	Humanities	2-0-0	SS2
7.	BER2V2	Comprehensive Viva II	0-0-4	Viva2
Total Credit for SEM II			**26 actual + 4 Virtual credits**	

*Semester 1 for three branches and Semester 2 for other three branches for the teaching load balancing.

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

CBCS SCHEMES OF EXAMINATION FOR BE I PROGRAMME
(Subject to Revision)

B. E. I YEAR (Common to all branches)

(Mechanical Engineering, Electronics & Telecommunication Engineering and Electronics & Instrumentation Engineering*)

SEM - 2				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR2C1	Applied Mathematics-II	3-1-0	PC1
2.	APR2C2	Applied Physics	3-1-1	PC2
3.	MER2C3	Engineering Drawing	2-1-2	PC3
4.	EIR2C4	Electrical Engineering	3-1-1	PC4
5.	COR2C5	Computer Programming in C++	3-1-1	PC5
6.	SSR2S2	Humanities	2-0-0	SS2
7.	BER2V2	Comprehensive Viva II	0-0-4	Viva2
Total Credit for SEM II			**26 actual + 4 Virtual credits**	

SEM – 1				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	AMR1C1	Applied Mathematics-I	3-1-0	PC1
2.	ACR1C2	Chemistry & Environment Science	3-1-1	PC2
3.	MER1C3	Elements of Mechanical Engineering	3-1-1	PC3
4.	ETR1C4	Basic Electronics	3-1-1	PC4
5.	MER1C5	Workshop Practice	0-1-2	PC5
6.	SSR1S1	Technical English	3-1-0	SS1
7.	BER1V1	Comprehensive Viva I	0-0-4	Viva1
Total Credit for SEM I			**26 actual + 4 Virtual credits**	

[*] Semester 1 for three branches and Semester 2 for other three branches for the teaching load balancing.

Semester 1

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE-I Year (Common to all branches)
Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AMR1C1:
Applied Mathematics-I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To develop the concepts of calculus, useful to create mathematical models in order to arrive into an optimal solution in various disciplines like physics, engineering, economics, and statistics.
- Provide the fundamentals of formal techniques like differentiation to find the slope of a curve, find approximation to the original function by Taylor's series, determine the stationary points of functions in order to sketch their graphs, optimization of functions and so on; Integration to find areas, volumes, central points and many useful things; Vector fields to represent many physical quantities like velocities, forces (useful in fluid mechanics), particle displacements (useful in solid mechanics), and electric and magnetic fields (electromagnetism).

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT-I
Differential Calculus: Review of Successive differentiation, Leibnitz theorem and problems; Expansion of functions by Taylor's and Maclaurin's Theorem; Asymptotes; Curvature in Cartesian and Polar Coordinates; Envelopes; Evolutes and Involutes.

UNIT-II
Advanced Differential Calculus: Function of Several Variables; Partial Differentiation; Approximations and errors; Jacobians; Taylor's Series of Two Variables; Maxima and Minima of Function of Two and More Variables; Lagrange's Method of Undetermined Multipliers.

UNIT-III
Integral Calculus: Beta and Gamma functions; detailed study of tracing of curves-Cartesian, polar and parametric curves; Area; Length of Curve; Volume; Surface of Revolution; Theorems of Pappus and Guldin and problems.

UNIT-IV
Advanced Integral Calculus: Multiple integrals: Double and Triple Integration; Change of Order of Integration; Area; Volume; Centre of Gravity; Moment of Inertia.

UNIT-V
Vector Calculus: Differentiation of a Vector; Gradient; Divergence; Curl; Integration of a Vector Function; Gauss's, Green's and Stoke's Theorems.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply the concept of function derivatives to study the behaviour and rate of how different quantities change, how the graph of a function can actually be computed, analysed, and predicted and use integrals to find the summation of infinitely many small factors to determine whole.
- Learn the applicability of calculus in various fields like, in physics, it is used in the study of motion, electricity, heat, light, harmonics, acoustics, astronomy, dynamics and advanced physics concepts including electromagnetism and Einstein's theory of relativity use calculus. In the field of chemistry, calculus can be used to predict functions such as reaction rates and radioactive decay. In addition, it is used to check answers for different mathematical disciplines such as statistics, analytical geometry, and algebra.
- Find a way to construct relatively simple quantitative models of change, and deduce their consequences.

BOOKS RECOMMENDED

[1] B.S.Grewal, Engineering Mathematics, 39/e, Khanna Publishers, 2006.

[2] Erwin. Kreyszig, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.

[3] Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.

[4] C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co. Ltd., 6/e, 2003.

[5] H.K.Das, Higher Engineering Mathematics, S.Chand New Delhi.

[6] E Mendelson, G J Hademenos, F Ayres, Schaum's Easy Outline: Calculus, McGraw-Hill, 2000.

[7] R C Wrede, M Spiegel, Schaum's Outline of Advanced Calculus, 2/e, McGraw-Hill, 2002.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE -I Year (Common to all branches) Semester- 1			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ACR1C2:	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Applied Chemistry & Environmental Science	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: **3 Hours**							

Learning Objectives:

- To learn chemistry of various engineering materials and processes, their importance, properties, testing, structure-property relationship, tailoring and their applications in various technologies.
- To understand and aware with various environmental issues and pollution and control studies in modern society for sustainable development.

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Prerequisite: Nil

COURSE OF CONTENTS

UNIT-I WATER AND ITS APPLICATIONS

Sources, impurities, applications, Hardness- its expression and determination; Boiler troubles and their causes; Industrial water requirement, Treatment of water for industrial purpose; De-ionization of water; Analysis of water; Water quality parameters, Numerical problems on water analysis and water treatment processes.

UNIT-II ENGINEERING MATERIALS AND TESTING

Introduction, classification and requirement of engineering materials. Material testings.

Polymers: Chemistry of polymer materials and their diversification; Types of polymerization and their brief account; Examples of polymers.

Cement, Glass and Refractories: Different types, composition, properties and uses.

UNIT-III LUBRICANTS

Introduction, Principle and functions of lubrication, Types of lubricants, Properties, tests and applications of solid, semi-solid and liquid lubricants; Synthetic lubricants and lubricating emulsions.

UNIT-IV INSTRUMENTAL TECHNIQUES IN MATERIAL CHARACTERIZATION

Classification, Lamberts and Beers Law; Introduction, Principle and applications of Colorimetry, IR, UV-Vis, NMR and Mass spectroscopy; Chromatographic Techniques and applications, Numerical Problems on spectroscopic techniques.

UNIT-V ENVIRONMENTAL SCIENCE

Components of Environment and their interactions, Natural resources, Ecosystem, Impacts of development of environment, Environment protection act, EIA, Sustainable development.

Pollution and its types, Description, effects and control measures of Air, Water, Land and Noise pollution, Chemical toxicology, Global warming, Depletion of ozone layer, Acid rains, Eutrophication, Rain water harvesting, Pollution case studies.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply applications of various engineering materials in different technologies.
- Relate structure-property-uses relationship of engineering materials and tailoring of materials for technology development.
- Use of material testing and material characterization required in different engineering applications.
- Understand the components of Environment and their interactions with modern world. Also to analyse factors affecting, causes of Environmental Pollution and to apply possible control measures for Sustainable development.

BOOKS RECOMMENDED:

[1] Jain & Jain, Engineering Chemistry, Dhanpat Rai Publications, 2007.
[2] S. S. Dara, A Text Book of Engineering Chemistry, S. Chand & Company, 2007.
[3] B.Joseph, Environmental Studies, Tata McGraw Hill.
[4] A.K. De, Environmental Chemistry, New Age International, 1996.
[5] Shashi Chawala, A Text Book of Engineering Chemistry, Dhanpat Rai Publications, 2006.

Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**BE-I Year (Common to all branches)** **Semester- 1**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER1C3:	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Elements of Mechanical Engineering	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: **3 Hours**							

Learning Objectives:

- To understand the basic fundamentals of Mechanical Engineering in light of thermal engineering and production engineering.
- To provide an insight about the basic thermal and production processes, materials, components and applications.

Prerequisites: Nil.

COURSE OF CONTENTS

UNIT I

Thermodynamics and energy, Temperature and Zeroth law of thermodynamics, Systems and control volume, Properties of a system, Energy transfer by heat and work, First law of thermodynamics, Energy analysis of closed systems, Internal energy and enthalpy of ideal gases, Energy analysis of steady flow systems, Analysis of some steady flow engineering devices, Relevant review problems.

UNIT II

Properties of pure substance, p-v and T-s diagram for a pure substance, Mollier diagram for a pure substance, Quality or dryness fraction, Steam tables, Methods for measurement of steam quality, Relevant review problems.

UNIT III

Basic considerations in the analysis of power cycles, Air standard assumptions, Overview of reciprocating engines, Thermodynamic analysis of Otto cycle: Ideal cycle for spark ignition engines, Thermodynamic analysis of Diesel cycle: Ideal cycle for compression ignition engines, Comparison of Otto and Diesel cycles, Effect of Specific Heat and Dissociation on the performance of the cycles, Relevant review problems.

UNIT IV

Metal Casting: Classification and overview of metal casting processes: sand casting, expandable mould casting and permanent mould casting; Patterns, cores and moulding; Elements of gating systems; Heating, pouring and solidification; Casting quality: cleaning, finishing and defects.

UNIT V

Welding and Machining: Fundamentals of welding and overview of welding processes: Oxy-Acetylene gas welding, Arc welding: TIG, MIG, SAW etc., Resistance welding; Soldering & Brazing; weld quality and defects; Fundamentals of metal machining and introduction to turning and related operations; Constructional features of lathe, Geometry of single point cutting tool and cutting tool materials.

Learning Outcomes:

- Upon Completing the Course, Student will able to:
- Understand basics of thermodynamics and components of steam.
- Identify engineering materials, their properties, manufacturing methods encountered in engineering practice.
- Understand basics of internal combustion engines.
- Understand functions and operations of welding, casting and machine tools including milling, shaping, grinding and lathe machines.

BOOKS RECOMMENDED:

[1] Nag P K, Engineering Thermodynamics, The McGraw-Hill Companies, Fourth Edition.
[2] P N Rao, Manufacturing Technology, Vol. I and Vol.2 Tata McGraw-Hill, 4^{th} Edition, 2014.
[3] Hajra & Chaudhary, Work Shop Technology, Vol. 1 & 2, 12^{th} Edition, Media Promoters & Pub, 2007.
[4] Cengel Y A, Boles M A, Thermodynamics-An Engineering Approach, The McGraw-Hill Companies, Fifth Edition.
[5] Mikell P. Groover, Fundamentals of Modern manufacturing, 3^{rd} Edition, John Wiley and Sons.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE-I Year (Common to all branches) Semester- 1			
Subject Code & Name	Instructions Hours per Week			Credits			
ETR1C4:	L	T	P	L	T	P	Total
Basic Electronics	3	1	2	3	1	1	5
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To introduce the basic concepts of electronics along with the understanding of working fundamental circuit devises such as diode, transistors and op-amp. To apply the basics of diode to describe the working of rectifier circuits such as Full and half wave rectifiers and zener diode as a voltage regulator in line and load regulation.Describe the application of transistors for Current and voltage amplification, the characteristics of different configurations of the transistor, DC load line and bias point. List, explain, and design and analyse the different biasing circuits, to give basic knowledge of working of op-amp, its characteristics and applications
- **Prerequisite(s):** nil

COURSE OF CONTENTS

UNIT I
Discrete electronic devices: Diode, zener diode, BJT (Bipolar junction transistor), LED, photodiode phototransistor, varactor; characteristic and operation (qualitative description and quantitative behaviour with black box approach)

UNIT II
Diode circuits; clipper, clamper circuits, DC power supply: rectifier-half wave, full wave (center tapped, bridge), zener regulated power supply, regulation (with regulator IC-LM317)

UNIT III
BJT characteristics; BJT biasing; CE-biasing circuits: operating point; h-parameter model of transistor; large/small signal models (concept);large/small signal models of CE-BJT amplifier, Design of amplifier; Differential amplifier (using BJT).

UNIT IV
Operational amplifier: basic model; virtual ground concept; inverting amplifier; non-inverting amplifier; integrator; differentiator; Schmitt trigger; astable multivibrator, Simple active filters: low pass, high pass, bandpass, notch filter

UNIT V
Basic feedback theory; +ve and -ve feedback; concept of stability; oscillator, Waveform generator using op-amp schimitt trigger for Square wave, triangular wave Wien bridge oscillator for sinuisoidal waveform.

Learning outcomes:

- Students will be able to get the knowledge of Q point and can calculate it using different biasing circuits. They will easily compare different biasing circuits on the basis of stability factor.
- Students will be able to solve clipper and clamper circuits. They get the knowledge og op-amp

and its various applications as integrator, differentiator and as an oscillator.

BOOKS RECOMMENDED:

[1] Ralph J.Smith, R.C.Dorf circuits, devices and systems, john Wiley, 1992.
[2] R.L.Boylestad, L. Nashelsky, Electronic devices, and circuit theory, Prentice Hall, 2002.
[3] A. S. Sedra, K.C. Smith, Microelectrinic circuits, Oxfort University Press, 1998
[4] R.A. Gayakwad, OP-amps and linear integrated circuits, Prentice Hall of India.
[5] Millman, Grabel, Microelectronics, Mc-Graw-Hill.
[6] De Carlo, and Lin, Linear circuit analysis, Oxford Univesity Press, 2001 (second edition).
[7] Hayt, Kammerly and Durbin, Engineering Circuit Analysis, Tata McGraw Hill, sixth edition.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE-I Year (Common to all branches)
Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SSR1S1:
Technical English</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

. **Learning Objectives:**

- To develop the English communication skills in terms of reading, writing and understanding of Engineering terms.
- To develop the technical ideas in English and to be able to express the technical ideas.

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT I

Basic of technical communication: Meaning of technical communication; process of communication; Forms of communication: Verbal and Non-verbal; technology-enabled communication; Barriers to communication; Essentials of effective communication; Types of communication; Defining audiences for technical communication; Aspects of communication: Global, Ethical and Legal.

UNIT II

Professional correspondence: Qualities of professional correspondence: Goodwill techniques; Types of correspondence: Letters, Memos, E-mails; Business Letters: Elements of a Letters, Basic Letter Formats; Types of Business Letters: Positive Letters, Negative Letters, Inquiry Letters, Sales Letters, Complain and Adjustment Letters. Memos: Meaning and Format of Memos. Writing job application letters & Designing Resumes; Meeting and Minutes.

UNIT III

Technical Writing: Meaning & Concept of Technical Writing: Process of Technical Writing: Forms of Technical Writing: Technical Description, Summaries, Instructions & User Manuals: Technical Reports: Meaning and Essentials of Good Report Writing: Classification of Reports; Report Formats: Formal and Informal; Common Informal Technical Reports: Progress Reports, Lab Reports, Feasibility reports, Problem Solving Reports.

UNIT IV

Reading Comprehension; Precis Writing; Expansion of an idea; Dialogue Writing; Paragraph Writing (Related to Technical Communication).

UNIT V

Foreign Words & Phrases; Antonyms and Synonyms; Transitional Words and Phrases; Articles, Use of Prepositions, Modal Verbs, Connectives, Relative Clauses, Noun/Nominal Compounds: Correction of Sentences and Homophones; Punctuation, Abbreviations, Capitalization and Number Usage; Use of Technical Words and Jargons.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply various technical terms and terminologies practically
- The course aims at developing the fundamentals of Technical English and mastery in the professional writing like Business letters, Business correspondence .designing Business Memorandum, Resume and E-mail writing.
- Will be able to write formal and informal reports in work place.
- Will have complete knowledge of comprehending different passages and Precis writing.
- Apply various grammatical skills practically.

BOOKS RECOMMENDED:

[1] A. Esenberg, A Beginner's Guide to Technical Communication, McGraw-Hills.
[2] A. J. Rutherford, Basic Communication Skills for Technology, Pearson Education Asia.
[3] C. L. Bovee, J. V. Thill & B Schatzman, Business Communication Today, 7/e, Pearson Education, 2002.
[4] R. V. Lesikar, J. D. Perrit, Jr., & ME Flately, Lesikar's Basic Business Communication.
[5] R. C. Sharma and K. Mohan, Business Correspondence and Report Writing, Tata McGraw-Hill, 2002.

Semester 2

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AMR2C1:
Applied Mathematics-II</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce the mathematical concepts of Matrix Algebra, Differential Equation Probability and Statistics and Fuzzy sets for solving engineering problems that shall be used in various branches of engineering.
- Provide the basics of Matrix mathematics useful in providing a more compact way to deal with groups of equations in linear algebra; Differential equations, a mathematical equation that relates some function (usually represent physical quantities) with its derivatives (represent their rates of change), and the equation defines a relationship between the two; Probability distributions describe the dispersion of the values of a random variable; Curve fitting and regression analysis, to find the "best fit" line or curve for a series of data points; Theory of equations, which tells when an algebraic equation has an algebraic solution; Fuzzy sets generalize classical sets (Crisp sets), as the characteristic functions of classical sets are special cases of the membership functions of fuzzy sets.

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT-I

Matrix Algebra: Review of Matrices; Elementary Operations on Rows and Columns; Normal Form; Linear Dependence; Rank; Application of Rank Theory in Solving System of Linear Equations; Linear Transformation; Orthogonal, Unitary and Hermitian Matrices; Characteristic Equation; Eigen- Values and Eigen-Vectors; Caley-Hamilton Theorem; Quadratic and Linear forms.

UNIT-II

First Order Ordinary Differential Equation: Exact Differential Equation; Equations Solvable for x, y and p; Clairaut's Form; Application to Simple Problems.

Higher Order Ordinary Differential Equation: Linear Differential Equations with Constant & Variable Coefficients; Method of Variation of Parameters, Simultaneous Differential Equations; Application to Simple Problems.

UNIT-III

First Order Partial Differential Equations: Formation of Partial Differential Equations; Partial Differential Equations of First Order and First Degree i.e. $Pp + Qq = R$.

Higher Order Partial Differential Equations: Linear Homogenous Partial Differential equations of n^{th} order with constant coefficients; method of Separation of variables; their Simple applications.

UNIT-IV

Probability and Statistics: Conditional Probability, Baye's Theorem; Binomial, Poisson and Normal distributions and their Mean and Variance, Methods of least squares and curve fitting, Correlation and Regression Analysis.

UNIT-V

Theory of Equations: Polynomial equations, relation between root and coefficients, symmetric functions of roots, cube roots of unity, Cardon's method for solution of cubic equations.

Fuzzy sets: Membership function, definition, Operations on Fuzzy sets, Properties of Fuzzy sets.

Learning Outcomes:

Upon completing the course, students will be able to:

- Express a linear map between finite-dimensional vector spaces with a matrix, calculate the electrical properties of a circuit, with voltage, amperage, resistance, etc. with matrix arithmetic, use them in 3D geometry (e.g. computer graphics), can try to improve linear solvers efficiency. Matrices can also represent quadratic forms (for example, in analysis to study hessian matrices, which help us to study the behaviour of critical points) and also computers run Markov simulations based on stochastic matrices in order to model events ranging from gambling through weather forecasting to quantum mechanics.
- Use differential equations to model natural phenomena, engineering systems and many other situations like exponential growth and decay, the population growth of species or the change in investment return over time, describing the movement of electricity, in modelling chemical reactions, in finding optimum investment strategies, describing the motion of waves, pendulums or chaotic systems.
- Handle probability distributions, to indicate the likelihood of an event or outcome, which are used for making forecasts and risk assessments. Pdf's are quite important and widely used in insurance, engineering, physics, evolutionary biology, computer science and even social sciences such as psychiatry, economics and even medical trials.
- Use fitted curves as an aid for data visualization, to infer values of a function where no data are available, and to summarize the relationships among two or more variables.
- Apply Fuzzy sets and logic to reason like a human in terms of linguistic variables, design Traffic monitoring systems, AC and heating ventilation, Gene Expression data analysis, Facial pattern recognition, Weather forecasting systems and many more.

BOOKS RECOMMENDED:

[1] B.S.Grewal, Engineering Mathematics, 39/e, Khanna Publishers, 2006.
[2] Erwin. Kreyszig, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.
[3] Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.
[4] C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co. Ltd., 6/e, 2003.
[5] H.K.Das, Higher Engineering Mathematics, S.Chand New Delhi.
[6] Zafar Ahsan, Differential Equation and their Applications, Prentice Hall of India Pvt. Ltd., New Delhi, 2004.
[7] S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical statistics, Sultan Chand & Sons., 2000.
[8] Freund John E, Mathematical Statistics, PHI, N.D., 7th Ed., 2010.
[9] G. J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PHI, New Delhi, 2005.
[10] H. J. Zimmerman, Fuzzy Set Theory and its Applications, Allied Publishers, 1996.
[11] Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd Edition, John Wiley & Sons, Inc., 2010.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE - I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">APR2C2:
Applied Physics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce the basics concepts of physics and make a bridge between basics and their application.
- To introduce the concept of the modern science like Laser, Optical fire, X-rays and quantum physics.
- To introduce fundamental physics like wave optics, interference, diffraction polarization, and semiconductor physics.

Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I

Optics-I: Interference of Light Waves: Thin film, Newton's Ring experiment, Michelson interferometer; Diffraction of Light Waves: Fresnel's & Fraunhoffer diffraction, Zone plate, Single slit experiment, diffraction by double slit, Diffraction at Circular aperture, Plane transmission Grating.

UNIT-II

Optics-II: Polarization of Light Waves, Double refraction, Nicol Prism, Half Wave & Quarter Wave plates, Circularly & elliptically polarized light, Polarimeter; LASER: Stimulated & spontaneous emission, Population Inversion, Optical Resonator, Einstein's coefficients, He-Ne Laser, Co_2 Laser, Semiconductor Laser; Optical Fiber: types of Fibers (material, refractive index, mode), Acceptance angle, Numerical aperture, V-Number, Propagation of Light through Fibers, Applications.

UNIT-III

Crystal Structure and Semiconductors: Symmetry & properties of Simple crystal structure, Miller's Indices, Interplanar spacing, production and properties of x-ray, Bragg's law; Semiconductors: Band theory of Semiconductors, Intrinsic & extrinsic semiconductors, Fermi level , pn junction diode, LED, Zener diode, npn & pnp Transistors.

UNIT-IV

Electromagnetism: Continuity equation for Charge & Current, Inconsistency of Ampere's law for time varying field, Concept of Displacement current, Maxwell's equations; Wave equations for E & H, Propagation of one dimensional electromagnetic waves in dielectric medium, Energy density in electromagnetic field: Poynting Vector.

UNIT-V

Quantum Physics: Plank's law, Compton's effect, Concept of Matter Waves, Devison & Germer's experiment, Phase velocity & Group velocity, Heisenberg's Uncertainty Principle; Schrodinger 's Wave Equation, Interpretation of Wave function Ψ, Time dependent & Time Independent equations, Schrodinger's Wave equation for a free particle in a box.

Learning Outcomes:

- The student will demonstrate the ability to use concepts of Morden physics to their engineering applications.

- The course aims at developing the fundamentals of wave optics, crystal structure, structure of atoms and their applicable to obtain quantitative solutions of problems in physics.

BOOKS RECOMMENDED:

[1] R K Gaur & S L Gupta, Engineering Physics, Dhanpat Rai & Sons, 2006
[2] H.K. Malik & A.K.Singh, Engineering Physics, Tata McGraw Hill, 2011
[3] N. Gupta & S.K. Tiwary , A Text Book of Engineering Physics, Dhanpat Rai & Co. 2009.
[4] W. T. Silfast, Laser Fundamentals Cambr. Un. Press, 1996,
[5] D Halliday & R Resnick, Physics Vol-II, Wiley Eastern, 1993
[6] H White, Modern Physics: Van Nostrand; 15/e.
[7] D P Khandelwal, Optics and Atomic Physics.
[8] R Feyaman,Feyaman Lectures on Physics, /e, Narosa Publication, 1998.
[9] S.O. Pillai, Solid State Physics, New Age International Publication, 2010.
[10] R.S. Sedha, A Text Book of Applied Electronic, S. Chand & company Lmt. 2005.
[11] R.P. Goyal, Unified Physics-II,,and III Shivlal Agrawal & Co. ,1994.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE I Year (Common to all branches) Semester- 2			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER2C3: Engineering Drawing	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	2	**1**	**4**	**2**	**1**	**2**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To understand the concepts of imagining, envisioning and visualizing the objects & machine parts and drawing them with the instruments & tools.
- To introduce the students to the "universal language of Engineers" for effective communication through drafting exercises of geometrical solids
- **Prerequisite(s):** Nil

COURSE OF CONTENTS

UNIT-I

Introduction, need & Classification of Engineering Drawings, Drawing Instruments and their uses, Indian Standards for Drawing, Drawing Sheet Layout, Various conventions used in drawing, Technical Lettering, Dimensioning, Basic Geometrical Constructions. Engineering Scales & Engineering Curves

UNIT - II

Orthographic Projections, Isometric Projections, Oblique Projections, Perspective Projections & Missing Views.

UNIT - III

Projection of Points, Straight Lines and Plane Surfaces.

UNIT - IV

Projection of Solids, Section of Solids and Development of Surfaces.

UNIT - V

Interpenetration of Solids / Intersection of Surfaces, Introduction to Computer Aided Drawings, Drawing of Machine elements like Riveted Joints, Screw fasteners and Welded Joints.

Learning Outcomes:

- Upon Completing the Course, Student will able to:
- Understand the importance of BIS and ISO Standards in Engineering Drafting.
- Graphically construct and understand the importance of mathematical curves in engineering applications.
- Visualize geometrical solids in 3D space through exercises in Orthographic Projections.
- Interpret Orthographic, Isometric and Perspective views of objects.
- Develop the surfaces of geometrical solids.

BOOKS RECOMMENDED:

[1] Bhatt N D, Engineering Drawing, Charoter Publishing House, Anand, Gujrat Agrawal B, and Agrawal C M, Engineering Drawing, Tata McGraw-Hill Publishing Company Limited.

[2] French T E, Vierck C J, Foster R J, Engineering. Drawing and Graphic Technology Mc Graw-Hill International, Singapore, Low Price Edition.

[3] Luzadder W J, Duff J M, Fundamentals of Engineering Drawing, Prentice- Hall India, New Delhi.

[4] Dhananjay A Jolhe, Engineering drawing, Tata McGraw Hill.
[5] Shah M B and Rana B C, Engineering Drawing, Pearson Education, New Delhi.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE - I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">EIR2C4:
Electrical Engineering</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To understand the concepts and practical ideas of AC/DC circuits along with basic 3 phase power management, Properties of different magnetic material used in Electromagnetic Circuits to create an idea among students that how different magnetic materials were choose for different practical machines.
- Practical concepts of Transformers and different Electric Machines to make students easy understanding of electrical machines surrounded by us and also they are basic to all the engineering streams.

COURSE OF CONTENTS

UNIT-I

AC circuits: Generation of EMF, Phasor Quantities, RMS, Average, Form Factor, Peak Factor Etc, Phasor Diagrams; Single Phase AC Circuits: R, L, C And Combinations, Resonance, Q-Factor, Bandwidth; Three Phase AC Circuits: Generation, EMF, Phase Sequence, Analysis of Star and Delta Connections, and Power Measurement In Single Phase& Three Phase Circuit.

UNIT-II

Circuit analysis tools: Kirchoff's laws, Analysis of DC and AC circuits, Thevenin's theorem, Norton's theorem, Max power transfer theorem, Superposition theorem, and Source transformation.

UNIT-III

Magnetic Circuits: Electromagnetism, Magnetic flux, Magnetic flux density, Intensity of magnetization, B-H curves, hysteresis and eddy current losses, Magnetic circuit calculations, laws of Electro-magnetic induction, Magnetic induction, Lifting power of an electromagnet.

UNIT-IV

Transformer: Construction, principle, ideal transformer, EMF equations, Analysis of transformer on no load and load conditions, Equivalent resistance and reactance, voltage regulations, transformer losses Transformer testing, transformer efficiency, Types of transformer, Cooling methods, Auto transformer.

UNIT-V

Rotating electric Machines: Construction, working principles, EMF equations, Characteristics, Torque equations of DC machines (generators & motors), 3-phase synchronous and induction motor, single phase induction motor.

Learning Outcomes:

Upon completing the course, students will be able :

- To solve circuit problems based on KVL,KCL laws and different network theorems which helps them to solve practical circuits for future industries exposure .
- The course also covers basic knowledge of alternating circuits and their practical applications, which helps students to understand their domestic home load in bettr way.
- Students were also able to understand uses of different magnetic materials available in market for constructing different electrical machines and they also able to solve their circuit parameters which helps in designing a electrical machine at initial level.
- After this course, students were able to understand different properties, characteristics and functioning of different parts of transformer and different rotating electrical machines at basic level.

BOOKS RECOMMENDED:

[1] V Del Toro, Electrical Engineering Fundamentals, 2/e, PHI, 2000.

[2] D P Kothari, I J Nagrath, Basic Electrical Engineering, 2/e, Tata McGraw Hill, 2002 (Fifth Reprint 2003).

[3] A Sudhakar, Network Theory, 2/e, Tata McGraw Hill, 2004

[4] P S Bimbhara, Electrical Machinery, 7/e, Khanna Publishers, New Delhi, 2006.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE I Year (Common to all branches) Semester- 2			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
COR2C5: Computer Programming in C++	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- To learn to analyse a problem and construct a C++ program that solves it using C++ basic constructs and advanced constructs.
- To learn the syntax and semantics of the C++ programming language.
- To learn how to design C++ classes with constructors and class member functions.
- To understand the concept of data abstraction and encapsulation.
- To learn how to overload and override functions and operators in C++.
- To learn how containment and inheritance promote code reuse in C++.
- To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
- To learn how to use exception handling in C++ programs.

.

Prerequisites: Nil.

COURSE OF CONTENTS

UNIT-I
Introduction to flowcharts and problem solving. Types of programming languages, Programming with C++:- C++ Data Types:-auto, bool, int, char, float, double, void. Variables and Constants, Operators, Arithmetic and Logical Expressions, Assignment Statements and Type Casting. Control structures- Iteration statements, Jump Statements and Selective statements. Common C++ Header files, Generation of Random numbers in C++.

UNIT-II
Functions: Introduction - Call by Value and Call by Reference – return values – recursion – Arrays - Introduction to Arrays - Initialization of Array - Multi dimensional Arrays - passing arrays to functions – Strings - Arrays of Strings - Standard Library String Functions.
Structures: Structure elements, Nested Structures, Array of Structures, Array within structures and passing structures to functions.

Unit- III
Pointers:-Declaration and Initialization of Pointers, Dynamic Memory allocation/deallocation operators:-new and delete. Pointers and Arrays:-Array of Pointers, Pointer to an array, Function returning a pointer, Reference variables and use of alias. Invoking functions by passing pointers. Files – Introduction – File Structure - File handling functions - File Types - Error Handling.

UNIT-IV
Object Oriented Programming Paradigm - Basic Concepts of OOP - Benefits of OOP. Class and object fundamentals and various visibility modes in class, Object as function arguments-pass by value and pass by reference. Constructor:-Special Characteristics, Declaration and Definition of a Constructor, Default Constructor, Overloaded Constructor, Copy Constructor and Constructor with default arguments.
Function Overloading:-Need and restrictions of overloaded functions, Steps involved in finding the best match, Default arguments versus overloading.
Destructor:- Special Characteristics, Declaration and Definition of a Destructor. Friend function and its characteristics and friend class.

UNIT-V

Introduction to Operator overloading - Rules for Operator overloading – overloading of binary and unary operators - Introduction to inheritance – Types of inheritance - Abstract Classes - new Operator and delete Operator - Pointers to Objects – this Pointer - Virtual Functions - Pure Virtual Functions - Introduction to Class Templates - Function Templates - Member Function Templates - Basics of Exception Handling - Types of exceptions - Exception Handling Mechanism - Throwing and Catching Mechanism - Rethrowing an Exception - Specifying Exceptions.

Learning Outcomes:-

Upon completing the course, students will be able to:

- To develop C++ programs using basic and advanced constructs that will solve real life problems.
- The course aims to understand the features of C++ supporting object-oriented programming.
- Apply the major object-oriented concepts to implement object-oriented programs in C++ i.e. encapsulation, inheritance and polymorphism.
- Understand advanced features of C++ specifically friends, pointers, virtual functions and operator overloading.

BOOKS RECOMMENDED:

[1] Coohoon and Davidson, C++ Program Design: An introduction to Programming and Object-Oriented Design (3rd edition), Tata McGraw Hill, New Delhi, 2003.
[2] Herbert Schildt, the Complete Reference, Tata McGraw Hill.
[3] E Balagurusamy, Object Oriented Programming with C++, McGraw Hill Education.
[4] Ravichandran, Programming With C++, Tata McGraw Hill.
[5] Dromey G, How to solve it by Computer, Prentice Halll – 1978.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">BE-I Year (Common to all branches)
Semester- 2</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SSR2S2:
Humanities</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce students to understand and interpret the human experience from individual to entire culture.
- It also helps to understand how human beings across time and cultures understand happiness & suffering, understand good from bad, debate political questions.
- To understand that their actions have a Social, economic and environmental impact. To inspire ethical & moral course of thinking.

Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I

Man and society- Theories of man and society, Methodological individualism, structuralism, Society and its features- Social Institutions; Social Stratification and Change; Contemporary Indian Philosophy-its characteristics andCross-cultural Issues.

UNIT-II

Human Behavior: Biological Bases of Behavior, Methods for understanding human psychophysiology, Working of brain, Psychobiology of learning, memory, emotions and personality, Temperament and personality: trait structure and persistence, Extraversion/sociability, Aggression-hostility/agreeableness, Philosophy of Mind & Cognition.Concepts of good life – quality of life and subjective well-being; happiness, life satisfaction, and positive affect.

UNIT-III

Perspectives on Knowledge, Science and Technology, Technological Shaping of Society and Social Shaping of Technology and its Human roots, Role of Humanities in Engineering: Professionalism in Engineering; Professional Engineering Bodies.

UNIT-IV

Governance and Engineers: Political parties; Types & Forms of Governance; Utilitarianism; capitalism, socialism and communism; Marxist and neo-Marxist thoughts; democracy in public and private spheres.

UNIT-V

Engineering and Corporate Social responsibility- Ecology and Natural Resources, Role of corporations in the society, Morals, Values, Consciousness, Experience: Basic codes of Ethics; Engineering Ethics, Evolution of CSR, Strategic CSR, Role of stakeholders in CSR, Consumer awareness towards CSR,CSR as competitive advantage, the Global Competitiveness Index (GCI) & Sustainability , Issues in CSR- organizational, economic & social.

Learning Outcomes:

On successful completion of course we will have

- Aspire students to be world citizens of broad perspective who can make educated and ethical decisions.
- Students who articulate their own values & beliefs and can apply them in their personal & professional life.
- To become a model human being.

BOOKS RECOMMENDED:

[1] D J Kemper, Introduction to Engineering Profession, 2/e, Suanders Publication, 1998.

[2] A S Chauhan, A Text Book of Social Science Jain Brothers 9/e, 2008.

[3] R C Agrawal, Principle of Political Science.

[4] NPTEL

[5] W.B. Werther & D. Chandler, Strategic Corporate Social Responsibility, Thousand Oaks, 2011.

MECHANICAL ENGINEERING DEPARTMENT

Semester-III

S.NO	Sub Code	Sub Name	Type	L-T-P	Credits
1	AMR3C1	APPLIED MATHEMATICS-III	PC	3. 1 . 0	4
2	MER3C2	STRENGTH OF MATERIAL	PC	3. 1 . 1	4+1 (P)
3	MER3C3	MATERIAL SCIENCE	PC	3. 1 . 1	4+1 (P)
4	MER3C4	MANUFACTURING PROCESS	PC	3. 1 . 1	4+1 (P)
5	MER3G1	APPLIED THERMODYNAMICS	GE	3. 1 . 0	4
6	MER3L1	WORKSHOP / PRACTICAL(APP. THERMODYNAMICS)		0. 0 . 1	1(P)
7	SMR3S3	EFFECTIVE COMMUNICATION SKILL		2. 0 . 0	2
8	MER3V3	COMPREHENSIVE VIVA-III	VIRTUAL	0. 0 . 4	4
		TOTAL CREDITS			30

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">II Year B.E. (Mechanical Engg.)
(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AMR3C1:
APPLIED MATHEMATICS-III</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

1. To develop an understanding of the underlying mathematics as a preparation for a specialist study of applications areas like, Laplace transform to solve the diffusion equation, heat transfer equation, mass transport, heat transport, fluid transport, and process controls; Complex Analysis in fluid mechanics and potential theory useful in steady state conduction, electrostatic and gravitational fields; Fourier analysis relevant for PDE-solving and probably the heat equation in three dimensions. Vibration sensitive instruments with Fourier transformers attached can be used for tuning pianos and motor engines, for aircraft and submarine detection and so on.
2. Numerical approach enables solution of a complex problem with a great number of very simple operations. It is useful to find the solution with use of computers making calculation easy and fast.

Pre requisite(s): Basic knowledge of determinants, matrices, differentiation and integration of functions and complex numbers.

COURSE CONTENTS

UNIT-I

Laplace transform: Definition and properties of Laplace transform, Inverse Laplace Transforms. Convolution theorem, Application of Laplace transform in solution of ordinary differential equations, Simultaneous differential equations with constant coefficients.

UNIT-II

Function of Complex variables: Analytic functions, Cauchy-Riemann conditions, Harmonic functions, Conjugate functions and their applications, Cauchy's integral theorem, Cauchy's integral formula, Taylor's and Laurent' series, Residue theorem, Solution of integrals, Conformal transformation, bilinear transformation, their properties and classification.

UNIT-III

Numerical solutions of algebraic and transcendental equations-Bisection method, Regula- Falsi method, Newton-Raphson method.
Solution of system of linear algebraic equation-Iterative methods: Gauss-Seidel and Gauss-Jacobi's iterative methods.
Numerical Solutions of ordinary differential equations - Single and multi-step methods.
Numerical solution of partial differential equation: Classification of second order Partial differential equation, Solution of elliptic, parabolic and hyperbolic equations by Iteration method.

UNIT-IV

Interpolation: Finite difference operator, Interpolation formula with equal and unequal intervals, Numerical differentiation, General quadrature formula, Numerical integration using Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule, Weddle's rule.

UNIT-V

Fourier series, Fourier Integral, Fourier transforms, Finite Fourier sine and cosine transform, Parseval's theorem, continuous time and discrete time Fourier Transform, DFT and FFT, solution of partial differential equations with constant and variable coefficients.

Learning Outcomes:

Upon completing the course, students will be able to:

1. Apply Laplace Transform methods, useful in problems where mechanical/electrical driving force has discontinuities, is impulsive or is a complicated periodic function.
2. The course aims at developing the fundamentals of Complex Analysis, applicable to potential theory useful in steady state conduction, electrostatic and gravitational fields.
3. Apply Fourier Theory to analyze the quality of signals, how crosstalk, interference, noise, and distortion affect signal quality and to extract information from noisy signals.
4. Learn that many problems were analytical methods seems to fail, like solving highly nonlinear equation, numerical methods works very well.

BOOKS RECOMMENDED:

1. B.S. Grewal, Engineering Mathematics, Khanna Publishers, 42/e, 2015.
2. Erwin. Kreyszig, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.
3. Gupta P.P. & Malik G.S., Calculus of Finite Differences and Numerical Analysis, Krishna Prakashan Mandir, Meerut, 21/e, 2006.
4. Kasana H.S., Complex Variables: Theory and Applications, Prentice-Hall of India Pvt. Ltd, 2nd edition, 2005.
5. A.R. Vasishtha and R.K. Gupta, Integral Transforms, Krishna Prakashan Media Ltd, Meerut, India, 2000.
6. Murray R. Spiegel, Schaum's Outline of Fourier Analysis, McGraw-Hill, New York, 2004.
7. J. F. James, A Student's Guide to Fourier Transforms with Applications in Physics and Engineering, 3rd Edition, Cambridge University Press, 2011.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER3C2
STRENGTH OF MATERIALS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

1. To provide the knowledge of Strength/Load Bearing capacity of Different Materials.
2. To give basic concepts of different types of stresses & strain/ Mechanics of Material.
3. To develop skill to analyze the distribution of stresses in material.
4. To know how to find the Torsional stresses and Beam strength of column.

Pre requisite(s): Engineering Physics, Engineering Mathematics

COURSE CONTENTS

UNIT-I

Stress and strain: Tensile, compressive and shear stresses, complimentary shear stresses with varying cross section, Temperature stresses, Modulus of Elasticity. Modulus of rigidity, Bulk modulus, Poisson's ratio, Relations between the three moduli, Stress on oblique Section of a bar subjected to axial stress, Compound stresses, Principle stresses & strain, Mohr's circle of stresses and strain.

Elastic strain energy, Different type of loading, Resilience, Proof resilience, Strain energy in Tensile, Static, Sudden falling, gradually applied and Impact loading. Strain energy due to shear stresses.

UNIT-II

Shear force and Bending moment of Beams: Beams, Classification of beams, Types of loading, span, Shear force and Bending moment, Relation between load, shear force and bending moment, shear force and bending moment diagram for cantilever and simply supported beam with concentrated load, Point load, uniformly distributed load, gradually varying load, Eccentric point load.

UNIT-III

Bending stresses & Deflection of Beams: Introduction, Pure Bending ,Simple Bending theory, Expression for Bending Stress, Moment of inertia of section, Bending Stresses in Symmetrical Section, Shearing stresses in Beams, Distribution of shearing stress in different sections..

Slope & Deflection of Beam subjected to Uniform Bending Moment, Relation between Slope, Deflection and Radius of Curvature, Deflection of simply supported beam carrying a point load and uniform distributed load, Macaulay's Method and Moment Area Method for finding out deflection of beam.

UNIT-IV

Torsion of Circular shaft: Introduction, Pure Torsion, Torsional stress & strain in circular shafts, Polar moment of Inertia, Torsional moment of resistance, Torsion equation of circular shaft, Power transmitted by shaft, composite shaft, Strength of shaft, Torsional shear stress in shaft, Shaft of varying section.

UNIT-V

Columns & Struts: Introduction, Classification of column, Failure of column Euler's theory for column, End conditions of column and struts, Equivalent length of column, Calculation of equivalent length for different end conditions of column, Slenderness ratio, limitations of Euler's formula, Rankin's formula for long column and eccentric loading. Formula for Indian standard code of practice.

Learning Outcomes:
Upon Completing the Course, Student will able to:

5. Learn behavior of different material under different types of loading.
6. To understand the basic concepts of Principal Stress & Strain.
7. Learn basic fundamentals used in Designing a Mechanical Component.
8. Design the column & struts used in Mechanical as well as Civil Engineering.

BOOKS RECOMMENDED:

[1] Warnock Ramamurtham, *Strength of Materials,* 16/e ,Dhanpat Rai Publications, 2011
[2] Bansal R K, *Strength of Materials*,4/e,Laxmi Publications(P) Ltd,2012
[3] Popov *Mechanics of Solids*,2/e, Pearson Education (India), 1998

[4] Timoshenko, *Elements of Strength of Materials,* 3/e,Wadsworth Publishing;2004

LIST OF PRACTICAL ASSIGNMENT

1. Performance of Tensile test to obtained tensile properties of the material.
2. Performance of Tensile test to obtained Stress-Strain curve for Different Material.
3. Performance of Compressive test to obtained Compressive properties of the material.
4. Performance of Shear test to obtained Shear properties of the material.
5. Performance of Bending test to obtained Bending properties of the material.
6. Performance of Brinell hardness Test.
7. Performance of Vickers Hardness Test.
8. Performance of Torsion test to obtained torsional properties of the material.
9. Performance of Torsion test to obtained T-θ Curve.
10. Performance of Impact test to obtained Impact Strength of the materials.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER3C3
MATERIAL SCIENCE</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

5. To render the information that involves investigating the relationship that exists between the structures and properties of materials.
6. To provide the knowledge of Engineering Materials.
7. To give basic concepts of Material properties in terms of their utilization in machine design.
8. To provide the knowledge about testing of materials.

Pre requisite(s): Engineering chemistry, Engineering Physics.

COURSE CONTENTS

UNIT-I

Description of Crystal Structure and Imperfections in metal crystals : Review of crystal structure :Seven Crystal System. Bravais lattice. Symmetry and properties of simple crystal structure, Millers indices. Imperfections in metal crystals, Point Defects, Edge Dislocation, Screw dislocations slip planes.

UNIT-II

Ferrous and Non-Ferrous Metals and Alloys : Properties and application of various steels and cast iron. Effect of impurities, in ferrous metals. Effect of common alloying elements on the steels, High speed steels, Stainless steel, Other steel. Corrosion and its prevention. Composition, microstructure, properties and applications of Aluminum and its principle alloys, Copper and its principle alloys, Nickel and its principle alloys.

UNIT-III

Concept of Phase Diagrams and Equilibrium Diagrams : Iron Allotropy, cooling curves, phase diagrams, Gibbs phase rule, Various types of phase diagrams, Interpretation of Phase diagrams, Iron carbon equilibrium diagram, Classification of Equilibrium Diagrams: Eutectic, Eutectoid and Peritectic transformation, Iron carbon equilibrium diagram, TTT diagrams, Comparison of Iron carbon equilibrium diagram and TTT diagrams.

UNIT-IV

Heat Treatment of Metals and Alloys and Powder metallurgy : Classification of Heat treatment processes, Surface or case hardening of steel, Defects in heat treated parts. Manufacturing of metal powders. Sintering and secondary operations. Design considerations and applications.

UNIT-V

Metallography , Destructive and Non-Destructive Testing : Introduction to Metallography, Study of sample preparation and metallurgical Microscope. Study of Mechanical Properties and their significance in Engineering Applications, Classification of testing of materials, Tensile, Compression, Bend, Torsion, Fatigue, Impact, Hardness, Creep Tests, Ultrasonic, Magnetic, Radiography Tests etc.

Learning Outcomes :
After Completing the Course, Student will be able to:

9. Have the knowledge of materials.
10. Understand the mechanical properties of materials.
11. Know about the development of new materials having comparable properties.
12. Consider the “cradle-to-grave” life cycle of materials relative to machine design and manufacturing processes.

BOOKS RECOMMENDED:

[1] Calllister W.D.Jr., Mateials Science and Engineering an Introduction, Wiley Publications(P) Ltd,2004.
[2] Askeland D. R.,Fulay,P.P., Essentials of Materials Science and Engineering, Cengage Learning Publications,2010
[3] Raghavan, V.,Materials Science and Engineering, Prentice-Hall of India (P) Ltd.,2001.
[4] Khanna, O.,P., Material Science and Metallurgy, Dhanpat Rai Publications,2005

LIST OF PRACTICAL ASSIGNMENT

1. Performance of hardness test of ferrous materials using Rock Well hardness testing machine
2. Performance of magnetic particle crack detection to detect the cracks
3. Performance of impact test on a plastic test sample to detect impact strength of material.
4. Performance of crack detection using ultrasonic crack detector.
5. Study and perform steps involved in sample preparation for observing the microstructure under metallurgical microscope
6. Study and perform various heat treatment process using muffle furnace
7. Study of construction and function of metallurgical microscope.
8. Study of microstructures of ferrous metal alloys
9. Study of iron carbon diagram
10. Study of T.T.T. diagram

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER3C4
MANUFACTURING PROCESSES</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:3 Hours</td></tr>
</table>

Learning Objectives:

9. To provide an understanding of the various processes which are used extensively in the manufacturing of mechanical components.
10. To learn about the constructional features of the standard types of machine tools used in shop floor
11. To learn about the process parameters and the standard tooling used on various machine tools.
12. To learn about the basic measurement and inspection tools used in shop floor.

Pre requisite(s): Elements of Mechanical Engineering, Workshop Practice

COURSE CONTENTS

UNIT-I

Production of Axi-symmetric Parts: Introduction to the mechanics of metal cutting, Turning and related processes, Turning parameters, Constructional features and operation of turning and related machine tools: Lathes, Capstan-Turret lathes, Automats, CNC lathes, Machining centers and Turning centers. Single point cutting tools: types and geometry, Tool Materials.

UNIT-II

Production of Prismatic Parts: Introduction to the Shaping, Planning and Milling processes and their process parameters, Constructional features and operation of Shaper, Planner, Slotter and Milling machines, Tool holding, Work holding and Indexing methods, Cutting tools: types and geometry.

UNIT-III

Drilling, Broaching, Screw Thread and Gear cutting: Introduction to operations like Drilling, Boring, Reaming, Counter Boring and Counter Sinking. Machine Tools for drilling and related hole making processes, Drilling machine accessories, Process parameters for drilling and boring operations, Accuracy and finish of drilled holes, Broaching processes and broaching machines, power calculations. Cutting tools like drills, reamer, broach and taps: types and geometry. Thread forms and thread fits, External and Internal thread cutting processes. Gear: types and methods of gear manufacturing, Machine tools and tooling used for gear manufacturing.

UNIT-IV

Abrasive Machining: Introduction to various grinding operations, Types of abrasives and bonds, Marking system for grinding wheels and their selection criteria, Mechanics of grinding, Truing and dressing of grinding wheels, Grinding machines for cylindrical and surface grinding, Tool & cutter grinders. Safety in grinding, Other abrasive processes: Honing, Lapping, Super finishing, Polishing and Buffing.

UNIT-V

Metrology: Basic measurements and the use of Squares and Surface Plates, Micrometers, Vernier

Calipers, Gage blocks, Inside, Depth and Height measuring instruments, Angular measurements, Limits, tolerances and fits: Need for limit systems, Interchangeability, Statistical assembly,Selective assembly, Limit system. Taylor's principles of gauge design, Gauge tolerance and wear allowances, Types of limit gauges, Thread or screw gauges, Advantages & limitation of limit gauges. Measurement and inspection of external screw threads and gears.

Learning Outcomes :
Upon Completing the Course, Student will able to:

13. Identify the processes used for the manufacturing of components of various sizes and shapes.
14. Understand the construction and working of the machine tools used for various operations along with the hands on experience of some of them during laboratory work.
15. Select the tooling and the process parameters for the processing of common engineering work materials.
16. Understand the use of basic measurement and inspection tools used in shop floor, recognize and design the three types of plug and ring gauges based on the limit system.

BOOKS RECOMMENDED:

[1] Gupta I.C., *A Textbook of Engineering Metrology,7ed*, Dhanpat Rai Publications.
[2] Sharma P. C., *Production Technology*, *Production Engineering*, S. Chand and Co.
[3] HMT *Production Technology* , Tata McGraw-Hill Publishing Company Ltd.

[4] Chapman W.A.J., *WorkshopTechnology Part1,2 and,3, 4ed*, Viva Books Private Ltd.

[5] Hajra Choudhury A.K., Hajra Choudhury S.K., Roy Nirjhar *Elements of Workshop Technology : Machine Tools* (Volume - 2),Media Promoters and Publishers Pvt. Ltd.

List of Practical Assignment:

11. Study of the geometry of single point cutting tools.
12. Study of the geometry of milling cutters.
13. Study of the geometry of double fluted twist drill.
14. Study of the geometry of Taps and Reamer.
15. Study of constructional features of the Lathe and to machine a job as per given dimensions on it.
16. Study of constructional features of the Shaper and to machine a job as per given dimensions on it.
17. Study of constructional features of the Milling m/c and to machine a job as per given dimensions on it.
18. To study the indexing of workparts, to be milled, using a dividing head.
19. Study of comparators.
20. Measurement and inspection of screw threads and cutting tools using a Tool Makers Microscope and Profile Projector.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER3G1
APPLIED THERMODYNAMICS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:
The basic objectives of the subject are:
1. To understand fundamentals of thermal systems and their processes.
2. To understand the engineering applications of thermodynamics

Prerequisite(s): Engineering Physics and Elements of Mechanical Engineering.

COURSE CONTENTS

UNIT- I
Second Law of Thermodynamics: Cyclic Heat Engine, Kelvin Planck Statement, Claussius Statement, Equivalence of Kelvin Planck and Claussius Statements, Reversibility and Irreversibility, Carnot Cycle, Carnot's Theorem, Absolute Thermodynamic Temperature Scale, Efficiency of the Reversible Heat Engine, Illustrative Problems .

UNIT- II
Entropy: Introduction, Claussius Theorem, Property of Entropy, Inequality of Claussius, Entropy change in an Irreversible Processes, Entropy Principle, Applications of Entropy Principle, Entropy Transfer with Heat Flow, Entropy and Disorder, Absolute Entropy Illustrative Problems .

UNIT- III
Fuels and Combustion: Introduction, Classifications of fuels, Combustion Equations, Theoretical Air and Excess Air, Stoichiometric Air-Fuel Ratio, Weight of Carbon in Flue Gases, Weight of Flue Gases per kg of Fuel Burnt, Analysis of Exhaust and Flue Gases .

UNIT-IV
Thermodynamic Relations: Mathematical Theorems, Maxwell's Equations, TdS Equations, Difference in Heat Capacities, Ratio of Heat Capacities, Energy Equation, Joule-Kelvin Effect, Illustrative Problems.

UNIT- V
Gas Compressors: Compression Processes, Work of Compression, Single Stage Reciprocating Air Compressor, Volumetric Efficiency, Multi Stage Compression, Illustrative Problems .

Learning Outcomes:
Upon Completing the Course, Student will be able to:

17. Develop the ability to apply the basic principles of Classical Thermodynamics in a systematic way.
18. To understand the basic concepts of heat transfer and work transfer involved in the process.

19. Equip them with tremendous useful set of tools for thermal analysis of any thermodynamic system

BOOKS RECOMMENDED :

[1] Yunus A Cengel ,*Thermodynamics-An Engineering Approach*, Tata Mc-Graw Hill Publishing House, New Delhi, V Edition.

[2] Sonntag R E, Van Wylen G J, Borgnakke C, *Fundamentals of Thermodynamics*, John Wiley & Sons Pte Limited , Singapore, V Edition.

[3] Nag P K , *Engineering Thermodynamics*, Tata Mc-Graw Hill, New Delhi, V Edition.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE II Year (Mechanical Engineering) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER3L1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
WORKSHOP/PRACTICALS SEMINAR	**0**	**0**	**2**	**0**	**0**	**2**	**2**
Duration of Theory Paper: 0 Hours							

Learning Objectives:
The basic objectives of the subject are:
1. To understand Practical of thermal systems and their processes.
2. To understand the Practical applications of thermodynamics

Prerequisite(s): Engineering Physics and Elements of Mechanical Engineering.

COURSE CONTENTS

UNIT- 1
Second Law of Thermodynamics:
1. Finding out the Coefficient of Performance of a refrigerator.
2. Finding out Energy Performance Ratio of a refrigerating plant used as a heat pump.
3. Establishing the relation between EPR and COP.

UNIT- II
Entropy:
1. Verifying the entropy principles in generalized fluid flow.

UNIT- III
Fuels and Combustion: Introduction, Classifications of fuels, Combustion Equations, Theoretical Air and Excess Air, Stoichiometric Air-Fuel Ratio, Weight of Carbon in Flue Gases, Weight of Flue Gases per kg of Fuel Burnt, Analysis of Exhaust and Flue Gases .

UNIT-IV
Thermodynamic Relations:
1. Derive the Maxwell equation in Thermodynamic relations.
2. Derive the Tds equation in Thermodynamic relations.

UNIT- V
Gas Compressors:
1. Finding out the Isothermal, Volumetric Efficiency of the Reciprocating Air Compressor.
2. Finding out the effectiveness of the intercooler in two stage compressor.

Learning Outcomes:
Upon Completing the Course, Student will be able to:

1. Develop the ability to apply the basic principles of Classical Thermodynamics in a systematic way.
2. To understand the basic concepts of heat transfer and work transfer involved in the process.
3. Equip them with tremendous useful set of tools for thermal analysis of any thermodynamic system

BOOKS RECOMMENDED:

[1] Yunus A Cengel ,*Thermodynamics-An Engineering Approach*, Tata Mc-Graw Hill Publishing House, New Delhi, V Edition
[2] Sonntag R E, Van Wylen G J, Borgnakke C, *Fundamentals of Thermodynamics*, John Wiley & Sons Pte Limited , Singapore, V Edition
[3] Nag P K , *Engineering Thermodynamics*, Tata Mc-Graw Hill, New Delhi, V Edition.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**II Year B.E. (Mechanical Engg.) (Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
SMR3S3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
EFFECTIVE COMMUNICATION SKILL	**2**	**0**	**0**	**2**	**0**	**0**	**2**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

13. To make fundamentally strong base for decision making skills by applying the concepts of communication.
14. To develop effective communication skills in engineers for expressing the technical ideas and for discussing the technical issues with confidence.
15. To develop soft skills of presentation, for developing affectivity in communication.

Pre requisite(s): Basic English.

COURSE CONTENTS

UNIT-I

Fundamentals of Communication: The Importance of Communication; the Basic forms of Communication; The Process of Communication; Types of Communication; Art of Communication. Barriers of Communication and their remedies.

UNIT-II

Inter-personal skills: Building Positive Relationships; Giving Praise; Dealing with Criticism; Managing Conflicts; Telephone speaking skills and Cross-cultural communication skills.

UNIT-III

Fundamentals of public Speaking: Speeches on topics of current concern ,listening- The importance of listening; Barriers to Effective Listening; Approaches to Listening; How to be a Better Listener; What speakers can do to ensure better listening.

UNIT-IV

Interviews: Points to be remembered as an interviewer or an interviewee; commonly asked questions; Types of interviews; Do's and Don'ts.

UNIT-V

Making Presentations: Speech Purpose- General and Specific; Methods of Speaking; Analyzing the Audience; Nonverbal Dimensions of Presentation, Group Discussions: Importance; Process; Points to be kept in mind while participating; Do's and don'ts.

Learning Outcomes:

Upon Completing the Course, Student will able to:

20. Understand importance of communication process.
21. Understand importance of presentation.
22. Improve the barriers of communication.
23. Participate in interviews and group discussion.

BOOKS RECOMMENDED:

[1] Chaturvedi P D, Chaturvedi M, *Business Communication: Concepts*, Cases and Applications, Pearson Education, Singapore Pvt. Ltd, 2004.

[2] ICMR, *Business Communication*, Feb 2001.

[3] Davies J, *Communication Skills: A Guide for Engineering and Applied Science Students*, 2/e Pearson Education, 2006.

MECHANICAL ENGINEERING DEPARTMENT

Semester-IV

S-NO	Sub Code	Sub Name	Type	L-T-P	Credits
1	MER4C1	INDUSTRIAL ENGG- & MANAGEMENT	PC	3- 1 - 0	4
2	MER4C2	THEORY OF MACHINE	PC	3- 1 - 1	4+1 (P)
3	MER4C3	MACHINE DESIGN & DRAWING	PC	3- 1 - 1	4+1 (P)
4	MER4C4	FLUID MECHANICS	PC	3- 1 - 1	4+1 (P)
5	MER4G2	MECHATRONICS	GE	3- 1 - 0	4
6	MER4L2	WORKSHOP / PRACTICAL (MECHATRONICS)		0- 0 - 1	1(P)
7	SMR4S4	ENGINEERING ECONOMICS		2- 0 - 0	2
8	MER4V4	COMPREHENSIVE VIVA-IV	VIRTUAL	0- 0 - 4	4
		TOTAL CREDITS			30

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE II Year (Mechanical Engineering) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER4C1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
INDUSTRIAL ENGG. & MANAGEMENT	**3**	**1**	**-**	**3**	**1**	**-**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

The basic objectives of the subject are:

3. To understand fundamentals of industrial engineering management practices.
4. To understand the linkages of concepts and organizational efficiency and effectiveness.
5. To understand the concepts of productivity.
6. To understand the basic concepts of quality and its management.

Prerequisites: Basic knowledge of engineering and English is pre requisites for this subject.

COURSE CONTENTS

UNIT-I

Methods Engineering: Introduction to Productivity and Methods Engineering, Methods study, Recording techniques, Work Measurement tool and techniques. Work place Design - Fundamental of Work place Design. Introduction to job Evaluation and Wage Incentive Schemes.

UNIT-II

Operations Management: Introduction to Operations management, manufacturing v/s service, Tools and Techniques. Types of Production system. Facilities planning, Introduction to plant layout.

UNIT-III

Organization and Management: Principles of Management and Management functions. Organization, Principles, Structures, Span of Control, Delegation, Centralization and Decentralization, Formal and Informal Organizations. Personal Management, Introduction, Communication, Motivation and Leadership.

UNIT-IV

Quantitative Techniques for Decision Making: Introduction to operation Research, Basic Transportation and Assignment Models and Their Applications, Network Techniques and its Applications.

UNIT-V

Quality Control:

Quality planning and quality control Programme. Economics of Quality Control and control chart for variables and attributes. Introduction to TQM.

Learning Outcomes:

Upon Completing the Course, Student will be able to:

1. After studying this subject the students will be able to visualize the industrial operations with respect to Productivity.
2. After studying this subject the students will be able to visualize Production Operations, Quality and Optimisation of industrial processes.
3. This subject will help the student to understand the concepts of Industrial Engineering in higher semester of this course.

REOMMENDED BOOKS:

1. Industrial Labour Organization (I.L.O.), *Work study*.
2. Monks, J.E. *Operations Management*, Mc. Graw Hills.
3. Hira and Gupta, *Operation Research*, S. Chand and Co, New Delhi.
4. Mahajan, *Statistical Quality Control*, Dhanpat Rai, New Delhi.

<table>
<tr><td colspan="3">Devi Ahilya University, Indore, India
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(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>MER4C2</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>THEORY OF MACHINES</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Durationof Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

16. To provide the knowledge of basics of mechanisms(Gears, cams,etc), degrees of freedom.
17. To give basic concepts of velocity and acceleration of mechanisms.
18. To develop skill to analyze the behavior and applications of gear trains.
19. To know the concept and effect of gyroscope.

Pre requisites: Engineering Mechanics, Engineering Physics, Engineering Mathematics.

COURSE CONTENTS

UNIT-I

Basics of Theory of Machines: Degree of Freedom (Grubler's criterion), Concept of mechanism,Inversions of Quadric cycle chain, single and double slider crank mechanism. Grashof's criterion, Types of kinematic synthesis, Synthesis of four bar function generator , Study of Straight line mechanisms(Paucellier,Tchebicheff's mechanisms), Steering Mechanisms (Ackerman's mechanism, Devi's Steering Gear mechanism). Hooke's joint and engine indicators.

UNIT-II

Velocity and Acceleration Analysis: Determination of velocity and acceleration by analytical and/or graphical methods of various mechanisms. , Study of Coriolis components, Klein's construction.

UNIT-III

Cams and Followers : Types of Cams and followers, Cam profiles with specified follower motion e.g. simple harmonic, constant velocity and acceleration and deceleration,cycloidal types, Cams with specified contours. Tangent Cams, Displacement, Velocity and Acceleration of followers.

UNIT-IV

Gears and Gear Trains : Types of gears, Terminologies of various gears (Spur. Bevel gear, Helical gear, Worm and Worm wheel), Condition for correct gearing, Basics of gear meshing, Tooth profiles (cycloidal and involute). Gear trains, Epicyclic gear trains and their analysis.

UNIT-V

Gyroscopes: Product of Inertia, Principle Axis, Gyroscopic Motion, Gyroscopic Torque, Gyrostabilizer, Gyrocompass. Application to Ships and Aero planes. Stability of Two & Four Wheelers.

Learning Outcomes:

Upon Completing the Course, Student will be able to:

24. Understand the concept of mechanisms and their applications
25. Analyze the motion aspects of mechanisms.
26. Understand the Gears and their uses.

27. Learn basic fundamentals associated with Gyroscopic effect.

BOOKS RECOMMENDED:

[1] Thomas,B., Theory of Machines, CBS Publications & Distributions,2000
[2] Shigley, J.,Theory of Machines and mechanisms, Oxford University,2006.
[3] Ambekar, A.G.,Mechanism and Machine Theory, Jain Brothers,2005
[4] Singh Sadhu, Theory of Machines, Pearson's Education ,2006.
[5] Rattan,S.S.,Theory of Machines, Tata McGraw Hill Education (P) Ltd.,2011

LIST OF PRACTICAL ASSIGNMENT

1. Study of cam and follower and finding velocity and acceleration of follower.
2. Study of slider crank mechanism.
3. Study of different kinematic pairs.
4. Generation of involute teeth profile for different gears.
5. Performance of interference and undercutting of tooth (by plotting).
6. Study of gyroscopic effect using gyroscope .
7. Reducing and enlarging drawings using pantograph ,study of straight line mechanisms.
8. Study of Double Hooks joint.
9. Study of Oldham's coupling .
10. Verification of Grashof's law.
11. Study of automobile steering gears.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER4C3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Machine Design & Drawing	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 4 Hrs							

Learning Objectives:

1. To develop in students, machine drawing skills for communication of design concepts, ideas and design of engineering products
2. To expose them to existing national standards related to drawings of machine parts.
3. To introduce the concept of design procedure of simple machine elements.

Prerequisite(s): Engineering Drawing.

COURSE CONTENTS

UNIT-I

Design Practice Introduction: Introduction, Classification, General Considerations and Procedure of Machine Design, Design Stress, Factor of Safety, Stress and Deflection Analysis, Engineering Materials and Applications, Design of Pins / Keys, Cotter and Knuckle.

UNIT-II

Design of Permanent Joint: Design of Riveted Joints for Boiler, Structures and Eccentric Loading. Design of Welded Joints for Direct and Eccentric loading.

UNIT-III

Design of Temporary Joints: Design of Screw Fasteners for Direct and Eccentric loading. Design of Shafts and Couplings.

UNIT-IV

Machine Drawing Concepts and Practices: Introduction, Classification of Machine Drawings - Assembly Drawing, Part Drawing, Detailed Drawing, Catalogues Drawing, Drawing for Instruction Manuals, Schematic Representation, Patent Drawing. Principles of Drawings, Sectioning, Dimensioning, Limits, Fits and Tolerance, Symbols and Conventional Representation. Assembly Drawings – Introduction, Types of Assembly, Importance of BOM, Assembly procedures, Assembly of Engine Parts.

UNIT-V

Assembly Drawing Concepts and Practices and Introduction to CAD: Assembly of Machine Tools Parts, Assembly of Boiler Mountings. Production Drawings - Definitions, Difference with Normal Drawings, Method of amendment of Corrections. Reproduction of Drawing - Blue printing, Ammonia Printing, Xeroxing, Printing, Plotting. Introduction of Computer Aided Drafting - Computer Aided Drafting and Design, Advantages of Computer Aided Drafting and Design, CAD Software.

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Perform free hand sketching of machine parts with standard of machine drawing.
2. Select engineering materials based on their mechanical properties.
3. Design and draw the simple machine elements such as keys, cotters, knuckles, riveted joints, welded joints.
4. Design and draw the simple machine elements such as keys, cotters, knuckles, riveted joints, welded joints and couplings using CAD/CAM software.

Books Recommended:

[1]. V B Bhandari, *Design of Machine Elements*, 3/e, McGraw Hill Education, 2015.
[2]. N D Bhatt and V M Panchal, *Machine Drawing*, Charotar Publishing House, 2015.
[3]. K. Mahadevan, K. Balaveera Reddy, *Design Data Hand Book*, CBS Publishers & Distributors, New Delhi, 2015.
[4]. V B Bhandari, *Design Data Hand Book*, McGraw Hill Education, 2015.
[5]. PSG, *Design Data: Data Book of Engineers* by PSG college –Kalaikathir Achchagan- Coimbatore.

[6]. P S Gill, *A Text Book of Machine Drawing*, S K Kataria & Sons, 2015.
[7]. P C Gope, *Machine Design: Fundamentals and Applications*, 1/e PHI, 2015.
[8]. R L Norton, *Machine Design: An Integrated Approach*, Pearson Education, 2015.

LIST OF PRACTICAL ASSIGNMENT

1. Draw the Symbols and Conventional Representation and Sections of Simple Machine Elements.
2. Design and Conventional Drawing / Computer Aided Drawing of Cotter Joint and Knuckle Joint.
3. Design and Conventional Drawing / Computer Aided Drawing of Couplings.
4. Design and Conventional Drawing / Computer Aided Drawing of Riveted Joints.
5. Design and Conventional Drawing / Computer Aided Drawing of Welded Joints.
6. Design and Conventional Drawing / Computer Aided Drawing of Screw Fasteners.
7. Conventional Drawing / Computer Aided Drawing of Engine Parts.
8. Conventional Drawing / Computer Aided Drawing of Machine Tool Parts.
9. Conventional Drawing / Computer Aided Drawing of Boiler Mountings.
10. Design / Analyse a mechanical structure which may involve different components included in syllabus. Prepare assembly and production drawings

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<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER4C4
FLUID MECHANICS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

20. To make a fundamentally strong base to design fluid systems
21. Understand the different fluid properties
22. To develop skill to analyze fluid-flow patterns
23. To become conversant with ‘Fluid Dynamics, Fluid Kinematics in External and internal flows, Compressible flows.

Pre requisite(s) : Applied Mathematics I/II/III/IV, Applied Mechanics, Strength of Materials, Engineering Thermodynamics, Engineering Physics

COURSE CONTENTS

UNIT-I

Review of Fluid Mechanics: Introduction, Fluid Properties, Pressure and its measurement, Hydrostatic forces on submerged surfaces, Buoyancy and Stability. Relative Equilibrium.
Fluid Kinematics: Lagrangian and Eulerian Approaches, Fundamentals of Flow visualization, Potential flow, Stream function and Velocity Potential function, Vorticity, Rotationality and Circulation, Flow Nets, Reynold’s Transport Theorem.

UNIT-II

Fluid Dynamics: Introduction, Conservation of mass, Mechanical energy and efficiency, Bernoulli’s equation, Applications of Bernoulli’s equation, Correction factors, Newton’ Law and Conservation of momentum, Linear Momentum equation, Angular Momentum equation. Introduction to boundary layer, Laminar and Turbulent boundary layers, Boundary Layer Thickness, Reynold’s, Number, Boundary Layer Separation.

UNIT-III

Flow over Bodies: Introduction, Navier-Stokes Equations, Drag and Lift, Friction and Pressure Drag, Drag Coefficients of common geometries, Parallel Flow over Flat Plates, Flow over Cylinders and Spheres, Aerofoils, Lift, Von-Karmon Vortex Street, Kutta-Joukowski Equation.

UNIT-IV

Flow Trough Conduits: Flow through Pipes: Introduction to Laminar and Turbulent Flows, Entrance region, Fully Developed flow, Laminar Flow in pipes, Turbulent flow in pipes, Losses in Pipe flow, Hagen-Poiseuille’s Equation, Darcy’s Weisbach Equation, Moody’s Chart, Piping Networks.
Open Channel flow: Classification, Froude’ Number and Wave Speed, Specific energy, Continuity and Energy equations, Uniform flow and Gradually Varied flow.

UNIT-V

Compressible Flow: Stagnation Properties, Speed of Sound and Mach Number, One- Dimensional Isentropic Flow, Isentropic Flow Through Nozzles, Shock Waves and Expansion Waves, Rayleigh and Fanno Flows. Introduction to Computational Fluid Dynamics (CFD) System.

Learning Outcomes:

Upon Completing the Course, Student will able to

28. Well established concepts of the theory of fluid mechanics

29. Develop bases of analyses in fluid mechanics
30. Understand the fundamental mechanics involved in different fluid flow cases in applications
31. Develop a base for Computational Fluid Dynamics (CFD)

BOOKS RECOMMENDED:

[1] Douglas John F., *Fluid Mechanics*, Pearson Education, 2005.
[2] Centgel Y. A., *Fluid Mechanics: Fundamentals and Applications*, McGraw-Hill Co, 2003.
[3] Streeter V. L and Wylie E. B., *Fluid Mechanics*, McGraw-Hill Co, 2003.
[4] White F., *Fundamentals of Fluid Mechanics*, McGraw-Hill Co, 2003.
[5] Fox R.W., McDonald A T., Pritchard P. J., Mitchell J. W., *Fluid Mechanics*, 9ed 2015

LIST OF PRACTICAL ASSIGNMENT

1. To verify Bernoulli's Theorem.
2. Calibration of Venturimeter and Orifice-meter.
3. To find the Friction Coefficient of different pipes.
4. Determination of different coefficients of the orifice
5. Calibration of external cylindrical mouth pieces of different diameters/ Different L/D ratios
6. Calibration of internal cylindrical or Borda's mouth piece.
7. To Visualize the Forced/ Free Vortex Phenomenon.
8. To determine loss of head in the fittings at various water flow rates.
9. To Plot velocity potential and stream functions.
10. To find the metacentric height of prismatic body.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER4G2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
MECHATRONICS	**3**	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper:3 Hours							

Learning Objectives:

24. To provide an understanding of the mechatronic systems and their design process.
25. To learn about the response and behavior of the devices that go into a mechatronic product, their interactions and overall behavior of the mechatronic system.
26. To learn about the variety of sensors/tranducers used in mechatronic applications and the processes used for the conditioning of signals.
27. To learn about the methods used for the actuation and control of mechatronic systems.

Pre requisites: Basic course in electrical and electronic devices along with the concepts of digital electronics and a basic course in computer science and engineering.

COURSE CONTENTS

UNIT-I

Introduction to Mechatronic: Introduction to the field of mechatronic, Elements of a mechatronic system, Mechatronic design process, Applications in mechatronic. Introduction to signals & system: Block diagram approach to system modeling, Modeling of electrical, mechanical, translational and rotational, fluid and thermal systems, Measurement of system response, Linearization of non linear systems, Fourier series representation of signals, O/P response of first order and second order systems.

UNIT-II

Sensors & Transducers: Introduction of sensors and transducers, Performance characteristics of sensors and measurement systems, Sensors for motion & position measurement, Force torque & tactile sensors, Flow sensors, Temperature measuring devices, Ultra sonic sensors, Range sensors, Magnetostrictive transducers, Semiconductor, Fiber optic & Microelectromechanical system (MEMS) devices in mechatronic.

UNIT-III

Signal conditioning & recording of data: Basic steps of signal conditioning, Devices for signal conditioning & data conversion : Voltage divider & rectifiers , bridge circuits, Operational and instrumentation amplifiers, filters, comparators & oscillators multiplexers, timers, amplitude modulation & demodulation,voltage to frequency & frequency to voltage converters, pulse width modulation. Analog to digital conversion & digital to analog conversion.

UNIT-IV

Actuators: Introduction, Mechanical actuation systems, Electrical actuation systems: solenoids & relays, electric motors: DC motors, AC motors, Stepper motors, Servo motor drive circuits, selection of a motor, Fluid power actuators: Hydraulic and Pneumatic actuation systems, piezoelectric actuators.

UNIT-V

Interfacing & control of mechatronic systems: Elements of a data acquisition & control system, Microprocessor and Microcontroller based systems, Overview of input / output systems: Interfacing, I/O addressing, Interface requirements, Peripheral interface adapters, Serial common interface, Input /Output card & software, open systems, Communication interfaces, Voltage regulators and power supplies, Introduction of various control systems, Control modes and control system performance.

Learning Outcomes:

Upon completing the course, student will able to:

32. Acquire the basic knowledge for the application of the core technologies in the areas of mechanics, electronics and information processing to the solution of problems.
33. Recognize the need for models of the systems in order to predict their behavior.
34. Select and integrate the appropriate devices for the pickup, conditioning and display of signals related to the various processes involved in a mechatronic system..
35. Select the suitable actuation and control system for a mechatronic application.

BOOKS RECOMMENDED

[1] W.Bolton, *Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 4th Ed*, Pearson Education.

[2] Nitai Gour & P.Mahalik, *Mechatronics: Principles, concepts and applications*, Tata McGraw-Hill Publishing Company Ltd.

[3] Alciatore David G. & Histand Michael B., *Introduction to mechatronics and measurement systems, 4th Ed* McGraw-Hill Publication.

[4] Carryer J.Edward, Ohline R.Matthew, Kenny Thomas W., *Introduction to Mechatronic Design,* Pearson Education, Indian Edition 2013.

[5] Ramachandran K.P., Vijayaraghavan G.K., Balasundaram M.S., *Mechatronics Integrated Mechanical Electronic Systems, Wiley India Pvt.Ltd.*

[6] Narka and Choudhary, *Instrumentation, Measurement and analysis* Tata Mc Graw Hill Publishing Company Ltd.

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<tr><td rowspan="2">MER4L2
Workshop/Practical (MECHATRONICS)</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">1</td><td rowspan="2">1</td></tr>
<tr><td>Duration of Theory Paper:
0 Hrs.</td></tr>
</table>

Learning Objectives:

1. To learn about the construction and working of a variety of sensors/tranducers used in mechatronic applications.
2. To learn about the actuation and control of mechatronic systems using hydraulic and pneumatic methods.
3. To learn about the construction and working of mechatronic systems used in a day-to-day lives.

Pre requisite(s): Basic course in electrical and electronic devices along with the concepts of digital electronics.

Learning Outcomes:

Upon completing the course, student will able to:

36. Acquire the basic understanding of the characteristics of various sensors and tranducers used in mechatronic and measurement systems.
37. Select the suitable devices and arrange them in the circuit for the control of actuators using hydraulic and pneumatic means.
38. Acquire the basic understanding of common mechatronic systems.

LIST OF PRACTICAL ASSIGNMENT

1. Study of electrical resistance strain gauges.
2. Study of linear variable differential transformer (LVDT).
3. Study of capacitive transducer.
4. Study of piezoelectric transducer.
5. A mechatronic approach to the study of the following: Printers, Photocopier machine, Ignition system in automobiles, TV remote control, Washing Machine etc.
6. Calibration of pressure gauge using dead weight pressure gauge tester.
7. Calibration of orifice plate using anemometer.
8. Study and Calibration of Thermocouple.
9. Study on Hydraulic system power pack.
10.
11. Study on Pneumatic system power pack.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
SMR4S4	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
ENGINEERING ECONOMICS	**2**	**0**	**0**	**2**	**0**	**0**	**2**
DurationofTheory Paper: 3 Hours							

Learning Objectives:

1. To make fundamentally strong base for decision making skills by applying the concepts of economics.
2. Educate the students on how to systematically evaluate the various cost elements of a typical manufactured product, an engineering project or service, with a view to determining the price offer.
3. Prepare engineering students to analyze profit/revenue data and carry out make economic analysis in the decision making process to justify or reject alternatives/projects.

COURSE CONTENTS

Unit-I

Introduction to Engineering Economics: Definitions, Nature and Scope of Economics; Difference between Microeconomics and Macroeconomics; Concepts of Engineering Economics-Engineering Efficiency and Economic Efficiency.

Consumer Demand Analysis: Meaning, Features and Determinants of demand; Law of Demand and its Exceptions; Reasons for Law of Demand; Importance of Law of Demand; Elasticity of Demand.

Unit-II

Supply Analysis: Meaning, Supply Function, Law of Supply, Determinants of Supply, Fluctuation of supply; Elasticity of supply and its measurement.

Unit-III

Theory of Production: Production Function, Factors of Production; Law of Variable Proportions; Law of returns to scale

Cost, Revenue and Profit Analysis: Cost Classifications for Predicting Cost Behavior; Concept of Profit, Gross Profit and Net Profit; Break Even Point (BEP).

Unit-IV

National Income: Circular Flow of Income, Meaning and Concept of National Income: GNP/GNI, NNP/NNI, Personal Income and Disposable Income; Methods of Computing National Income - Production Method, Income Method, Expenditure Method.

Unit-V

Economic Stabilization: Monetary Policy- Meaning, Objectives, Tools; Fiscal Policy- Meaning, Objectives, Tools.

Learning Outcomes:

1. Upon completing the course, students will be able to:
2. Understand major principles of economic analysis for decision making among alternative courses of action in engineering.

3. Apply economic principles to prices and quantities in competitive supply and demand for goods and for money.
4. Solve economical problems involving comparison and selection of alternatives by using analytical techniques including benefit-cost ratio and breakeven analysis.

Books Recommended:

[1] C S Park, Contemporary Engineering Economics, Pearson Education, 2002.
[2] J S Chandan, Statistics for Business and Economics, Vikas Publishing.
[3] H. L. Ahuja, Principles of Microeconomics, S. Chand (G/L) & Company Ltd, 2002.
[4] D. N. Dwivedi, Macroeconomics Theory and Policy, Tata McGraw-Hill Publishing Company, 2010.
[5] S Damodaran, Managerial Economics, Oxford University Press, 2010.

List of Assignments (Theory):

During the learning of course, students need to do assignment:

- Students are required to research and submit an outline of the past, present and future position of a company of their choice. The outline must include at least one properly labelled table and figure and at least two references.

MECHANICAL ENGINEERING DEPARTMENT

Semester-V

S.No	Subject Code	Subject Name	Type	L-T-P	Credits
1	MER5C1	DYNAMICS OF MACHINES	PC	3-1-1	4+1(P)
2	MER5C2	MACHINE DESIGN - I	PC	3-1-0	4
3	MER5C3	HEAT TRANSFER	PC	3-1-1	4+1(P)
4	MER5C4	I.C. ENGINES & JET PROPULSION	PC	3-1-1	4+1(P)
5	MER5G1	PRODUCTION ENGINEERING - I	GE	3-1-0	4
6	SMR5S5	PRINCIPLES & PRACTICES OF MANAGEMENT	--	2-0-0	2
7	MER5L3	WORKSHOP/PRACTICAL (Machine Design - I)	--	0-0-1	1(P)
8	MER5V5	COMREHENSIVE VIVA -V	VIRTUAL	0-0-4	4
TOTAL CREDITS					30

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER5C2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
MACHINE DESIGN I	**3**	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 4 Hours							

Learning Objectives:

28. To introduce the students about the concept and importance of the design (A decision making)
29. To give the concept about the theories of failures and importance of material's selection in design
30. To give the concepts about the design of basic mechanical components like springs, rotating elements etc.

Pre requisite(s): Theory of Machines, Strength of Materials, Material Science.

COURSE CONTENTS

UNIT-I

Theory of Failures & Applications: Theories of failure, their applications to the design problems. Design of parts subjected to torsional and/ or bending such as spiral, helical and leaf springs.

UNIT-II

Pressure Vessels and Cover Plates: Analysis of thick cylindrical and spherical shells, compound cylinders, joint for steam and hydraulic pipes, parts of press fit and shrink fit, design consideration of pressure vessels and cover plates.

UNIT-III

Rotating Rings and Disks: Disk of uniform thickness and disk of uniform strength. Effect of drilled hole and extra mass, design of flywheel and pulleys.

UNIT-IV

Design Analysis of Curved Machine Members: Crane Hook, Chain link, open and closed links, M/c. Frames, Wall brackets, design and selection of hooks and wire ropes.

UNIT-V

Experimental Methods in Design: Brief idea about experimental stress analysis techniques and their applications and limitation.

Note: Only Mechanical Engineer's Handbook, Data-books and Certified notes are allowed in the examination hall.

Learning Outcomes:

After Completing the Course, Student will be able to:

39. Have the importance, role and concept of design
40. Learn to apply the knowledge of material science in real life situations.
41. Design the basic machine elements like spring, cylinder etc.
42. Know about the latest stress analysis techniques

BOOKS RECOMMENDED:

[1]. Shingley J.E., *Mechanical Engineering Design*, McGraw-Hill 2003.

[2]. Spotts M.F.,Shoup T.E., Hrnberger L.E., *Design of Machine Elements*, Pearson Education ,8e, 2006
[3]. Sharma P.C. & Aggarwal D.K., *Machine Design*,S.K.Kataria & Sons,11e, 2006
[4]. Shariff A.,*Design of Machine Elements*,Dhanpat Rai Publications(P) Ltd.,3e, 1995

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**III Year B.E. (Mechanical Engg.) (Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER5C1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
DYNAMICS OF MACHINE	3	1	2	3	1	1	5
Duration of Theory Paper: 3 Hrs							

Learning Objectives:

4. To make students to understand the concept of development of forces in various machines/mechanisms.
5. To develop the understanding of the effects and their consequences on mechanism / machines.
6. To make them able to determine this forces and to develop the various methods to counter this forces.

Prerequisite(s): Theory of Machines, Strength of Materials, Applied Mathematics.

COURSE CONTENTS

UNIT-I

Friction in Screw threads: Screw Frictions and Screw jack.
Friction in Bearings: Pivot and Collar Bearings, Journal Bearings, Thrust Bearings, Ball and Roller Bearings.
Friction in Clutches: Single & Multi-plate Clutch, Cone clutch, Centrifugal Clutch.
Friction Drives: Belt, Rope and Chain Drives

UNIT-II

Brakes: Introduction, Classification and Types of Brakes, Shoe/Block Brake, Band Brake, Band and Block Brake, Internal Expanding Shoe Brake, Disc Brake. **Dynamometer**: Introduction, Classification and Types of Dynamometers.
Propulsions and Breaking of Vehicles.

UNIT-III

Dynamic Force Analysis: Inertia Force and Inertia Torque, D. Alembert's Principle.

Dynamic Analysis in Reciprocating Engines: Gas Forces, Equivalent masses, Piston Efforts, Crank shaft Torque, Turning moment diagrams, Fly wheels, fluctuation of energy and speed.

UNIT-IV

Governors: - Introduction, Types and Classifications, Centrifugal Governors, Gravity Controlled and Spring Controlled Governors, Inertia Governors, Governor Characteristics and Effect of friction.

UNIT-V

Balancing of Rotating Masses: Static and Dynamic Balancing, Balancing a Single Cylinder Engine, Balancing Multi-Cylinder Engines

Balancing of Reciprocating Masses: Primary and Secondary Balancing, Locomotive Balancing, Hammer Blow, Pitching and Swaying Couples, Conditions of Balance in V-Engine, Radial Engine and Multi-Cylinder in line Engines.

Learning Outcomes:

Upon Completing the Course, Student will be able to:

5. Determine the Forces and Torques due to Friction in Bearings, Clutches and Belt Drives.
6. Determine the Forces and Torques due to Friction in Brakes and Vehicle Propulsion.
7. Determine the Forces and Torques in Reciprocating Engines.
8. Determine the Forces and Torques in Governor Mechanisms.
9. Determine the unbalancing Forces / Torques in Engines and Machines and to balance this Forces/Torques.

BOOKS RECOMMENDED:

[9]. Rattan S.S., *Theory of Machines*, Tata McGraw Hill Publishing Company Ltd., New Delhi, Second Reprint 2005.

[10]. Shigley J.E. and Uicker J.J., *Theory of Machines and Mechanisms*, McGraw Hill, Inc., 1995.

[11]. Thomas Bevan, *Theory of Machines*, CBS Publishers and Distributors, 1984.

[12]. Ghosh A. and Mallick A.K., *Theory of Mechanisms and Machines*, Affiliated East-West Press Pvt.Ltd., New Delhi, 1988.

[13]. Rao J.S. and Dukkipati R.V., *Mechanism and Machine Theory*, Wiley-Eastern Limited, New Delhi, 1992.

[14]. John Hannah and Stephens R.C., *Mechanics of Machines*, Viva low-Priced Student Edition, 1999.

LIST OF PRACTICAL ASSIGNMENTS

1. To determine the coefficient of friction between the surfaces of different materials by inclined plane method.
2. To determine coefficient of friction between leather belt and CI pulley by Simple & differential band brake method.
3. To determination the coefficient of friction between leather belt and wooden pulley by belt and pulley apparatus.
4. To determine the pressure distribution in the oil film of the journal bearing for various speeds and plot the curves, determine total load and tractional torque.
5. To determine the moment of inertia of objects using trifilar suspension method.
6. To determine the moment of inertia of connecting rod by compound pendulum method.
7. To determine characteristic curves of
   a) Speed v/s sleeve displacement.
   b) Controlling force v/s radius of rotation of the ball center, for Watt, Porter, Proell and Hartnell type governors.
8. To Perform balancing
   a) Static balancing of given weights by balancing apparatus.
   b) Dynamic balancing of given weights by balancing apparatus.
9. To determine the Brake Power using Rope Brake Dynamometer.

10. To determine the Slip and Creep in belt drive and to plot the various curves.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Mechanical Engg.)
(Full Time)</td></tr>
<tr><td rowspan="2">Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>MER5C3
HEAT TRANSFER</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hrs</td></tr>
</table>

Learning Objectives:
1. To make a fundamentally strong base theory of heat transfer.
2. To understand different modes of heat transfer.
3. To model and simulate heat transfer phemenon.
4. To extend the theory of heat transfer equipment.

Prerequisite(s): Fluid Mechanics, Engineering Thermodynamics, Applied Mathematics.

COURSE CONTENTS

UNIT- I
Steady State Heat Conduction: One Dimensional Heat Conduction Equation, General Heat Conduction Equation, Heat Conduction in Cylinders and Spheres, Heat generation in Plane wall and cylinders, Variable Thermal Conductivity, Thermal Contact Resistance, Illustrative Problems

UNIT- II
Heat Transfer from Extended Surfaces and Transient Heat Conduction: Steady flow of heat along a rod, Governing differential equations and its solutions, Heat dissipation from infinitely long fin, Heat dissipation from fin having insulated tip, Fin performance, Critical Radius of Insulation, Lumped System Analysis, Transient Heat Conduction in Large Plane Walls and Long Cylinders, Illustrative Problems

UNIT- III
Fundamentals of Convection: Physical Mechanism on Convection, Velocity Boundary Layer and Thermal Boundary Layer , Derivation of Differential Convection Equation, Natural Convection over Surfaces, Natural Convection from Finned Surfaces and PCBs, Forced Convection across Cylinders, Spheres and Tube Banks, Combined Natural and Forced Convection.

UNIT-IV
Fundamentals of Thermal Radiation: Introduction, Radiative Properties, View Factor Relations, Radiation Heat Transfer, Radiation Shields and the Radiation Effects.

UNIT- V
Heat Exchangers: Classification of Heat Exchangers, Nature of Heat Exchange process, Mechanical design of heat exchange surfaces, Performance analysis, Overall heat Transfer Coefficient, Effectiveness-NTU method, Cooling of Electronic Equipments, Illustrative Problems.

Learning outcomes:

Upon Completing the Course, Student will be able to:

10. List and Tabulate the Temperature Measuring Devices.
11. Determine the thermal conductivity of an insulating powder.
12. Calculate the overall heat transfer coefficient and intermediate temperatures in Composite Wall Apparatus
13. Effectiveness and efficiency of pin fin by using pin fin apparatus
14. Determine and verify the value of Stefan Boltzmann constant experimentally..
15. Determine the effectiveness and overall heat transfer coefficient of Parallel and Counterflow type Heat Exchanger.
16. Determine the effectiveness and overall heat transfer coefficient of Shell and tube type Heat Exchanger

BOOKS RECOMMENDED

[1] Cengel YA.,*Heat Transfer-A Practical Approach,* Tata McGraw Hill, New Delhi 2e,2002.
[2] Rudramoorthy R. *Heat Transfer-Theory and Problems* ,Pearson Education, New Delhi, 2006
[3] Christopher A, *Essential Heat Transfer*, Pearson Education, New Delhi, 2001.
[4] Nag,P.K., *Heat Transfer*, Tata McGraw Hill, New Delhi, 1e , 2006.

List of Practical Assignments:

1. List and Tabulate the Temperature Measuring Devices
2. To determine the thermal conductivity of an insulating powder
3. To Calculate the overall heat transfer coefficient and intermediate temperatures in Composite Wall Apparatus
4. To determine the Effectiveness and efficiency of pin fin by using pin fin apparatus
5. To Determine and verify the value of Stefan Boltzmann constant experimentally
6. Determining the effectiveness and overall heat transfer coefficient of Parallel and Counterflow type Heat Exchanger
7. Determining the effectiveness and overall heat transfer coefficient of Shell and tube type Heat Exchanger.

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER5C4: IC ENGINES AND JET PROPULSION</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

7. To make students to understand principal and working of Engines and Turbines
8. To develop the understanding of the effects of fuel combustion on environmental pollution.
9. To make students to understand principal and working of different systems used in IC Engines and Jet Propulsion.
10. To make them able to understand the testing performance parameters and various testing methods to determine these parameters of IC Engines and Jet Propulsion.
11. To understand the latest trends in IC Engines.

Pre requisite(s): Applied Thermodynamics, Elements of Mechanical Engineering.

COURSE CONTENTS

UNIT-I

Introduction to I.C. Engine & Fuels: Air standard cycles, Otto, Diesel, Stirling, Ericsson cycles, Engine classification- Two and four stroke-SI and CI engines, Stirling engine, Rotary engines, Stratified charge engine, Variable compression ratio engine. Valve timing diagram,

Fuels: Fuels for SI and CI engine, important qualities of SI engine fuels, important qualities of CI engine fuels, dopes, additives, gaseous fuels, LPG, CNG, biogas, alternative fuels.

UNIT-II

SI Engine: Carburetion, mixture requirements and thermochemistry of petrol fuel, Carburetor types, theory of carburetor, Calculation of air /fuel ratio supplied by carburetor, MPFI System (petrol injection). Combustion in SI engine, flame Speed, ignition delay, abnormal combustion and its control, combustion chamber design for SI engines. Ignition system requirements, battery ignition systems, magneto ignition system, electronic ignition system, ignition timing, firing order and spark plugs, variable valve control- VVC, VVA, VVE, VVS VTC, VTEC, VTEC-E, i -VTEC, AVTEC, SI Hybrid Engine.

UNIT-III

CI Engine: Requirements of Fuel injection in CI engines, types of diesel fuel injection systems (Mechanically controlled and electronically controlled), fuel pumps, fuel injectors, injection Timings. Fuel injection computation in CI Engines, Combustion in CI engines, ignition delay, knock and its control, combustion chamber design of CI engines. Scavenging in 2 stroke engines.

UNIT-IV

Engine Cooling, Lubrication, Supercharging & Testing: Engine Cooling: Different cooling systems, radiators and cooling fans, Lubrication: Total Engine friction, lubrication principle, lubricating oils, type of lubricating systems,

Testing and Performance: Performance parameters, basic measurements, testing of SI and CI engines and calculation of performance parameters.

Supercharging: Effect of altitude on power output, Types of supercharging and turbocharging and effects on engine performance.

New Technologies of Engines- C**ylinder Deactivation,** Camless engines, DI Turbo Ethanol engine, KERS, HCCI, OPOC, and IC Engine with oscillating shaft.

UNIT-V

Compressors, Gas Turbines & Jet Propulsion: Dynamic Compressors- Centrifugal compressor and Axial Flow Compressor- elementary theory, vector diagram efficiencies, and performance analysis and curves, Losses in dynamic compressors, surging and stalling,

Gas Turbines: Introduction, Classification and Application, Gas turbine main components, , Optimum pressure ratio for maximum specific output and thermal efficiency in actual gas turbine cycle, Air rate and work ratio, Open cycle Gas turbine with Regeneration , Reheat and Intercooling,Effect of operating variables on thermal efficiency.

Jet Propulsion- Turbo jet, Turbo fan, Turbo Prop, Ram jet, Rocket engines, thrust power, propulsive efficiency and thermal efficiency, Jet propulsion performance, Specific thrust and specific fuel consumption in each case for turbo jet and turbo propulsion units.

Learning Outcomes:

Upon Completing the Course, Student will able to:

17. Determine the air fuel ratio supplied by carburettor and MPFI system.
18. Determine the thermochemistry of fuels.
19. Design and select the combustion chambers of SI Engines.
20. Draw the valve timing diagram of SI Engines(Two and Four Stroke).
21. Determine the Torque/Mean effective pressure / BHP/FHP/IHP/volumetric efficiency/Brake thermal efficiency/Specific fuel consumption and other parameters of engines.

22. Determine the performance parameters of Centrifugal compressors, gas turbine, air crafts and rocket engines.

Books Recommended:

[1]. Mathur & Sharma, "*Internal combustion Engines*", Dhanpat Rai Publications, 2007.
[2]. Ganeshan V "*Internal Combustion Engines*", Tata Mc Graw Hill Publication, 1992.
[3]. Heywood J. B, "*Internal Combustion Engine Fundamentals",* Mc Graw Hill, 1988.
[4]. Khajuria P.R., Dubey S.P., *Gas Turbines & Propulsive Systems*, Dhanpat Rai Pub, 2005
[5]. Sarvanamatto, Cohen H, Rogers, "*Gas Turbine Theory",* Longmans Green, 1996
[6]. Yahya S. M., "*Turbines, Compressors and Fans*", Tata McGraw Hill Publications, 1996
[7]. Dr. R. Yadav, "*Steam and Gas Turbines",* Central publishing House, 2015
[8]. Dr. R. Yadav, *Applied Thermodynamics*, Central Publishing House, 2012
[9]. Ganesan V. *Gas Turbines*, Tata McGraw Hill Publications, 1999

LIST OF PRACTICAL ASSIGNMENTS

11. To Study of carburettor, Induction system and combustion chamber in petrol engine
12. To study of MPFI systems and performance testing on MPFI SI engine.
13. To study of fuel injection systems and its components in diesel engines.
14. To study the Battery ignition system, Magneto ignition system and Electronic ignition system
15. To Study of Water Brake Dynamometer with Four Stroke Four Cylinder S. I. Engine.
16. Performance testing of Four Stroke Four Cylinder S. I. Engine
17. To Study of Swinging Field Electrical Dynamometer with twin cylinder Four Stroke Diesel

8. Performance testing of Four Stroke Four Cylinder C. I. Engine.
9. To Study of Engine Cooling and Lubrication Systems.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER5G1
PRODUCTION ENGINEERING - I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

31. To provide an understanding of the design features of the machine tools and the types tooling used in the manufacturing of mechanical components.
32. To learn about the various sheet metal processes and the equipments and tooling used to produce sheet metal parts.
33. To learn about the DFMA approach and methodologies
34. To learn about the basics of production systems and automation in production systems.

Pre requisite(s): A basic course in manufacturing processes and workshop practice.

COURSE CONTENTS

UNIT-I

Fundamentals of Machine Tools: Introduction and classification of machine tools, requirements and characteristics of machine tools, elements of machine tool structure: beds, columns and frames, slides and sideways, spindles and spindle bearings, machine tool drives, machine tool testing, maintenance and safety.

UNIT-II

Tooling for Machine Tools: General tooling for machine tools, jigs-fixtures: locating and clamping, principles of jigs and fixture design, design of drilling jigs, drill jig bushes and type of jigs ; milling fixtures, lathe fixtures, grinding fixtures, broaching fixtures, assembly fixtures, automated jigs and fixtures, materials for jigs and fixtures and jigs & fixture economics.

UNIT-III

Sheet Metal Working & Press Tools: Introduction to sheet metal forming, forming limit diagram, basic operations on sheet-metal, press working equipment & press selection, components of a die assembly, types of dies, die and punch clearances, forces and power requirements, center of pressure, blanking die design, piercing die design, pilots, drawing dies, bending dies, design considerations and defects in sheet-metal parts, materials & manufacture of sheet metal working dies.

UNIT-IV

Design for Manufacture & Assembly: Role of processing in design, factors determining process selection, Design for Manufacturability (DFM), Design for Assembly (DFA), product design considerations for machining, casting, forging, welding, plastic and composite parts. Design evaluation: minimum part assessment, robustness assessment, design for reliability, failure mode-effect analysis, value analysis, development of modular design and design for safety.

UNIT-V

Production systems and automation: Types of production systems, review of production concepts and mathematical models, reasons for automation, automation strategies and levels of automation, automation for machining operations, design and fabrication considerations, automated flow lines, methods of workpart transport and transfer mechanisms, assembly systems, types and design considerations for the automated assembly systems, types of material handling equipment, design considerations for material handling system, conveyor systems, automated guided vehicle systems(AGV's).

Learning Outcomes:

Upon Completing the Course, Student will be able to:

43. Understand the design features of the machine tools and tooling like jigs-fixtures and select them appropriately for different production processes and environments.
44. Understand the basic processes and set-ups used to produce sheet metal parts.
45. Understand some of the contemporary design methodologies used for the design and manufacture of parts.
46. Learn about basics of production systems and automation in materials handling and assembly systems.

BOOKS RECOMMENDED:

[1] Sharma P. C., *A text Book of Production Engineering,* S. Chand Publishing ,11ed,1982.

[2] Pandey PC & Singh CK, *Production Engineering and Science,* Standard Pub. & Distr. 2011.

[3] Dieter E. George, Schmidt Linda, *Engineering Design,* McGraw-Hill Education,5ed, 2012.

[4] Rao P.N., *Manufacturing Technology,Vol-1,Vol-2,*McGraw-Hill Education,2017

[5] Groover Mikell P. *Automation, Production Systems & Computer Integrated Manufacturing*, PHI Learning Pvt Ltd.3ed, 2015.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER5L3
Workshop/Practical
(MACHINE DESIGN – I)</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>0</td><td>0</td><td>1</td><td>1</td></tr>
</table>

Learning Objectives:

35. To solve the Practical based problems for the designing the Mechanical Components.
36. To introduce the market survey practice to the students.
37. To develop the practice for literature survey to the students.
38. To prepare the students to work in a team.

Pre requisite(s): Machine Design I, Material Science, Strength of Material.

COURSE CONTENTS

1. Problem based on theory of failure.
2. Problem on Design for Helical Spring.
3. Problem on Design for Leaf Spring.
4. Problem on Design for Pressure Vessels
5. Problem on Design for Pipe Joints.
6. Problem on Design for Rotating Disc
7. Problem on Design for Flywheel.
8. Problem on Design for Pulleys.
9. Problem on Design for Crane Hook.
10. Problem on Design for Chain Drive

Learning Outcomes:

Upon Completing the Course, Student will able to:

47. Get the practical knowledge of designing the various components of Internal Combustion Engine.
48. Learn the market survey practice.
49. Get practice of literature survey.
50. Learn to work in a team.

BOOKS RECOMMEDED:

[1]. Shigley J.E., *Mechanical Engineering Design*, McGraw-Hill 2015.
[2]. Spotts M.F.,Shoup T.E., Hrnberger L.E., *Design of Machine Elements*, Pearson Education ,8e,2007.
[3]. Sharma P.C. & Aggarwal D.K., *Machine Design*, S.K.Kataria & Sons,11e,2013
[4]. Bhandari V.B., Design of Machine Elements, McGraw-Hill, 4e,2017.
[5]. Black and Adams, *Machine Design*, Mc.Graw Hill,1968.
[6]. Maleev V.L., *I.C.Engine Design*, Mc.Graw Hill ,1945.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SMR5S5
PRINCIPLES & PRACTICE OF MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:
1. To provide engineering students with an accelerated introduction to the basics of management and the language of business.
2. To provide a basis of understanding to the students with reference to working of Business Organizations through the process of Management.
3. To inculcate the managerial skills and to teach how it can be executed in a variety of circumstances.

Pre requisite(s): Nil

COURSE CONTENTS

UNIT-I
Introduction to Management and Organization: Basic concepts of management- definition, principles , levels and functions of management; Managerial roles and skills; Organization- meaning, types, business environment, efficiency and effectiveness.

UNIT-II
Planning: Nature and purpose of planning: Types of planning, planning process, forecasting; Objectives- setting objectives, types of objectives; Decision making.

UNIT-III
Organizing and Staffing: Organization chart, Organization structures, departmentalization, span of control, delegation of authority- centralization and decentralization; Informal organization; process of Staffing.

UNIT-IV
Directing: Direction- meaning, process and components; motivation- theories of motivation; leadership- types and theories of leadership; communication- process, barriers and types.

UNIT-V
Controlling Meaning and process of managerial control, techniques of control evaluation- budgetary and non-budgetary control techniques; Use of computers and IT in management

Learning Outcomes:
At the end of the course, students should be able to do the following:
1. Identify the key management processes and the relevance of management in organisations.
2. Understand the key management skills required in organisations and how these might be applied.
3. Evaluate their own managerial skills and the ways in which these might be developed.

BOOKS RECOMMENDED:

[1]. Agrawal R.D, *Organization & Management*.1/E PHI 1997.
[2]. Tripathy PC And Reddy PN, *Principles of Management*, Tata McGraw-Hill, 5th Edition, 2012.
[3]. Dinkar Pagare, *Principles of Management*, Sultan Chand & Sons, 2000.
[4]. G.K.Vijayaraghavan and M.Sivakumar, *Principles of Management*, Lakshmi Publications, 5th Edition, 2009.

MECHANICAL ENGINEERING DEPARTMENT

Semester-VI

S.No	Subject Code	Subject Name	Type	L-T-P	Credits
1	MER6C1	MACHINE DESIGN - II	PC	3-1-0	4
2	MER6C2	PRODUCTION ENGINEERING - II	PC	3-1-1	4+1(P)
3	MER6C3	FLUID MACHINES	PC	3-1-1	4+1(P)
4	MER6C4	ENERGY CONVERSION SYSTEM	PC	3-1-1	4+1(P)
5	MER6G1	MATERIALS MANAGEMENT	GE	3-1-0	4
6	SMR6S6	ENTEREPRENUERSHIP DEVELOPMENT & IPR	--	2-0-0	2
7	MER6L4	WORKSHOP/PRACTICAL(Machine Design - II)	--	0-0-1	1(P)
8	MER6V6	COMREHENSIVE VIVA -VI	VIRTUAL	0-0-4	4
TOTAL CREDITS					30

<table>
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<tr><td>Subject Code &Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER6C1 MACHINE DESIGN - II</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 4 Hours</td></tr>
</table>

Learning Objectives:
1. To provide the knowledge of fundamentals of designing the Mechanical Components.
2. To introduce the designing of Internal Engine Components.
3. To develop skill to analyze the component under dynamic loading.
4. To introduce the importance of seals & gasket in Engine.

Pre requisite(s): Machine Design I, Material Science, Strength of Material.

COURSE CONTENTS

UNIT-I
Design of Power Transmission Elements: Design for single plate clutch, cone clutch, centrifugal clutch, flat belt, V belt, power screw, spur gear, helical gear and Bevel gear.

UNIT-II
Design for Dynamic Loading: Stress concentration factor, design of parts subjected to Fatigue loading.

UNIT -III
Design for Brakes: Design of shoe brakes, band brakes, block brakes, internal expanding brakes and disc brakes.

UNIT-IV
Design for Internal Combustion Engine Parts: Design for Engine cylinder, piston, connecting rod.

UNIT-V
Design of Crank Shaft , Concept of Seals and Gasket:
Design of crank shaft, valves and valve gear mechanism Brief Introduction about seals and gasket.

Note: Only Mechanical Engineer's Handbook, Data-books and certified notes are allowed in the examination hall.

Learning Outcomes:
Upon Completing the Course, Student will able to:
1. Design the various components of Internal Combustion Engine.
2. Design the components under Dynamic Loading.
3. Understand the applications of seals & gaskets.
4. The different types of failure mode in mechanical components.

BOOKS RECOMMEDED:

[1]. Shigley J.E., *Mechanical Engineering Design*, McGraw-Hill 2015.
[2]. Spotts M.F.,Shoup T.E., Hrnberger L.E., *Design of Machine Elements*, Pearson Education ,8e,2007.
[3]. Sharma P.C. & Aggarwal D.K., *Machine Design*, S.K.Kataria & Sons,11e,2013

[4]. Bhandari V.B., Design of Machine Elements, McGraw-Hill, 4e,2017.
[5]. Black and Adams, *Machine Design*, Mc.Graw Hill,1968
[6]. Maleev V.L., *I.C.Engine Design*, , Mc.Graw Hill ,1945

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**III Year B.E. (Mechanical Engg.) (Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER6C2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
PRODUCTION ENGINEERING-II	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

39. To provide an understanding of the mechanics of metal cutting and various aspects of machinability and tool wear.
40. To learn about the fundamentals of bulk metal forming processes.
41. To learn about the various unconventional machining processes.
42. To learn about the various methods to evaluate and measure the surface finish and methods to improve the surface finish of engineering components.
43. To learn about the methods to process particulate materials and composites.

Pre requisite(s): A basic course in manufacturing processes and workshop practice.

COURSE CONTENTS

UNIT-I

Theory of Metal Cutting: Introduction, mechanics of metal cutting, oblique and orthogonal cutting, shear angle, rake angle and strain relationships, force and power relationships, heat generation and temperature rise in metal cutting. Machinability: criteria for evaluating machinability, factors affecting machinability, tool life and tool wear, variables influencing tool life, economics of metal cutting.

UNIT-II

Theory of Metal Forming: Introduction, plastic deformation and yield criteria, temperature and friction in metal forming, overview of bulk metal forming processes, mechanics of forming processes: rolling, forging, drawing, bending, extrusion; design consideration for the tooling/dies used in solid forming processes, defects in metal forming, advantages & limitations of hot & cold forming.

UNIT-III

Unconventional Machining Processes: Introduction, need and classification of unconventional machining processes. Principles, process parameters, set-up and applications of the following unconventional machining processes: electric discharge machining (EDM), electrochemical machining (ECM), ultrasonic machining (USM), abrasive jet machining (AJM), laser beam machining (LBM), electron beam machining (EBM) and plasma arc machining (PAM).

UNIT-IV

Surface Finish Measurement and Surface Improvement: Introduction, elements of surface texture, evaluation and representation of surface roughness, effect of surface finish on functional properties of parts. Measurement of surface roughness, surface cleaning and surface treatment, diffusion and ion implantation, Surface coating and deposition processes: surface plating, conversion coating, physical vapour deposition and chemical vapour deposition processes.

UNIT-V

Processing of Particulate Metals, Ceramics-Composites: Introduction, basic P/M processes, powder manufacture, testing and blending, compacting, sintering, hot pressing, other techniques to produce high-density powder metallurgy products, properties of P/M products, advantages and limitations of powder metallurgy; Processing of traditional ceramics, processing of new ceramics and cermets, types and properties of composites and shaping processes for polymer matrix composites.

Learning Outcomes:

Upon completing the course, student will be able to:

51. Learn the effect of various parameters on the metal cutting process.
52. Learn the mechanics of bulk metal forming processes and select the equipment and tooling needed for the various forming operations
53. Understand the importance of surface finish of manufactured parts and learn about the various methods to improve it.
54. Learn about the powder metallurgy processes and about the processing of ceramics and composites.

BOOKS RECOMMENDED:

[1] Ghosh Amitabh & Mullick Ashok, *Manufacturing science,* East West Press Pvt.Ltd,2ed,2010.
[2] Sharma P. C., *A Text Book of Production Engineering,* S. Chand Publishing,11ed,1982.
[3] HMT(Hindustan Machine Tools), *Production Technology*, McGraw-Hill Education,2017
[4] Mikell P Groover, *Fundamentals of Modern Manufacturing*, Wiley,6ed, 2015
[5] Rao P.N., *Manufacturing Technology,Vol-1,Vol-2,* McGraw-Hill Education,2017.

LIST OF PRACTICAL ASSIGNMENT

21. Measurement of various features of tool geometry of a given single point tool and the tool wear using a tool maker's microscope.
22. Measurement of surface finish of machined components
23. Measurement of a component features using a profile projector.
24. To perform process planning and prepare operations sheet and tool layout for machining a workpart on a capstan/turret lathe.
25. To machine a given workpart according to the prepared process plan and operations sheet.
26. To study the constructional features of EDM machine.
27. To machine a work part as per given drawing on EDM machine.
28. To study of the constructional features of universal cylindrical grinder.
29. To estimate the power requirements and the forces generated theoretically at the chip tool interface during turning, drilling and milling operations.

30. To measure the forces generated at the chip tool interface during machining operations.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">III Year B.E. (Mechanical Engg.)
(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER6C3
FLUID MACHINES</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

44. To fundamentally understand the principle of fluid machines.
45. To understand the working and operation different fluid machines.
46. To model and simulate flow situations.
47. To extend the theory to .related machines.

Pre requisite(s): Fluid Mechanics, Applied Mechanics, Engineering Thermodynamics, Applied Mathematics

COURSE CONTENTS

UNIT-I
Fundamental Principles: Newton's Laws of Motion and Reynolds Transport Theorem; Conservation of Momentum: Linear Momentum Equation, Angular Momentum Equation; Forces on stationary and moving vanes, Forces on closed conduits: Reducer and Expanders, Bends, Torque on Sprinklers

UNIT-II
Modelling and Similitude: Dimensional Homogeneity, Dimensionless parameters, Methods to find Dimensionless numbers, Buckingham π Theorem applications, Similitude: Modelling Criteria; Modelling Laws; Distorted Models. Conservation of Mass and Momentum

UNIT-III
Turbines: Hydraulic Turbines: Impulse and Reaction Turbines; Velocity triangles, Euler's Equation of Work Done, Efficiencies; Pelton, Francis, Kaplan, Propeller and Bulb turbine: Constructional details and Performance characteristics, Unit quantities, Specific Speed; Governing; Comparison with other Turbines: Steam Turbines, Gas Turbines, Jet Engines

UNIT-IV

Pumps: Rotdynamic Pumps: Centrifugal, Axial; Constructional details, Performance Characteristics, Losses and Efficiencies, Net Positive Suction Head, Specific speed, Pumps in series and parallel; Multistage and Specific purpose pumps

Positive Displacement Pumps: Types; Reciprocating Pumps: Indicator Diagram, Acceleration Head, Friction head, Air-Vessels, Double Acting Pumps

UNIT-V

Cavitations and Water Hammers: Cavitations: Definition and Genesis, Effects on pumps and turbines, Thoma-Cavitation Factor, Measurement of Cavitation: Apparatus, Cavitation test, Prevention; Water Hammer: Physical phenomenon, fundamental equation, arithmetic integration, Prevention; Surge tanks; types and Role

Learning Outcomes:

Upon completing the course, student will be able to

55. Apply well-established concepts of the theory of fluid machines.
56. Select Proper fluid machines.
57. Operate and develop insight in maintenance.
58. Develop a base for Computational Fluid Dynamics (CFD).

BOOKS RECOMMENDED:

[1] Douglas John F., *Fluid Mechanics*, Pearson Education, 2005.

[2] Dixon S.L., *Fluid Mechanics and Thermodynamics of Turbomachinery*, Elsevier, 5e, 2002, London.

[3] Modi and Seth, Hydraulics and *Fluid Mechanics including Hydraulic Machines*, Rajsons Publication Pvt Ltd, N Delhi, 5e, 2000.

[4] Lal Jagdish, *Hydraulic Machines,* Metropolitan Book Company, 1995.

LIST OF PRACTICAL ASSIGNMENT

1. To determine the coefficient of impact of water jet on vanes
2. Performance evaluation of Pelton wheel using Pelton Wheet test rig
3. Performance evaluation of Kaplan Turbine using Kaplan Turbine test rig
4. Performance evaluation of Centrifugal Pump using Centrifugal Pump test rig
5. Performance evaluation of Reciprocating Pump using Reciprocating Pump test rig.
6. Measure forces on different shapes model using a wind Tunnel.
7. Performance evaluation of Francis Turbine using Francis turbine test rig
8. Numerical Study of modelling and similitude of rotodynamic fluid machines.
9. Study the phenomenon of water hammer in pipes

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER6C4:ENERGY CONVERSION SYSTEMS	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

12. To make students to understand principal and operation of vapour power cycles.
13. To develop the understanding of the combustion of fuel in boiler furnace.
14. To make students to understand principal construction and working of different types of power boilers used in steam power plants
15. To make them able to perform the testing to find boiler efficiency and heat balance sheet.
16. To understand the operation and design of steam turbines, Nozzles, condensers and cooling towers.

Pre requisite(s): Engineering Thermodynamics, Thermal Engineering

COURSE CONTENTS

UNIT-I

Vapour Power Cycles: Simple Rankine Cycles, Binary Vapour Cycles, Regenerative Cycles, Reheating Cycles, Combined Reheating-Regenerative Cycle, Water Extraction Cycle, Back Pressure, Pass-out and Mixed Pressure Turbine Cycles.

Power Station Economics**:** Elements of fixed and operating costs, power and various tariffs, definitions and applications of load curves, load factor, Capacity factor, plant-utilization factor, diversity factor and demand factor.

UNIT-II

Steam Generators: Fuels and Combustion for Steam Generators. High-pressure steam boilers- Advantages of high pressure boilers, Lamont Boiler, Benson Boiler, Monotube Boiler, Loeffler Boiler, Velox Boiler, Revolving Boilers, Radiant Type boiler for power plants, Heat recovery steam generators(HRSG), Fluidised Bed Boiler, Super Critical Boilers, Draughts, Chimney calculations, Performance of Boiler- Equivalent Evaporation, Boiler Trial , Boiler Efficiency, Heat balance sheet, Overview of Boiler Codes.

UNIT-III

Nozzles: Introduction, General flow analysis, Nozzle equation, , Types and Construction of Nozzles and Diffusers, Design Parameters, Theory of steam injectors, Flow through Nozzles and Diffusers, Nozzle Efficiency, Diffuser Efficiency, Critical Pressure Ratio, effect of friction on performance. Effect of Variation of Back Pressure.

UNIT-IV

Steam Turbines: Steam Turbine types, Flow of Steam through Impulse Turbine Blades, Flow of Steam through Impulse-Reaction Turbine Blades, Energy Losses in Steam Turbines, State Point Locus, Reheat Factor, and Design procedure, Governing and Performance of Steam Turbines, Steam Turbine Auxiliary Systems, Construction, Stress Analysis, Operation and Maintenance of Steam Turbines.

UNIT-V

Condensers and Cooling Towers: Functions of Condensers, Cooling Systems, Elements of Water Cooled Condensing unit, Types of Condensers- Jet Condensers, Surface Condensers, Condenser

Vacuum and Measurement, Dalton's law of partial pressure, Mass of circulating water required, Air leakage, its effects and removal, Air cooling system, Design of condensers, Air Pumps, Vacuum Efficiency, Condenser Efficiency, Cooling Ponds and Cooling Towers, Analysis of Cooling Tower(Cooling efficiency, Range, Approach)

Learning outcomes:

Upon Completing the Course, Student will be able to:

23. Determine the overall efficiency of steam power plant through various arrangements of vapour power cycles.
24. Determine the thermo chemistry of fuels and Actual air and Coal required in Furnace of boilers
25. Understand the working of actual power boilers used in steam power plants, its chimney calculation and to perform the boiler trial for efficiency and input / output of heat
26. Understand the working of steam nozzles and diffusers and determine the performance parameters and efficiency of steam nozzles
27. Determine the Diagram Power, Gross Stage Efficiency, Specific steam consumption and Design parameters of steam turbines.
28. Understand the construction, operation and Maintenance of Steam Turbines and its auxiliaries.
29. Determine the performance parameters of Condensers, air pumps, cooling Towers.

BOOKS RECOMMENDED:

[1]. Skrotzki & Vopat, *Power Station Engg. & Economy*, Mc Graw & Kagakush, 1960.
[2]. Dr. R. Yadav, *Applied Thermodynamics*, Central Publishing House, 2012.
[3]. Dr. R. Yadav, Steam & Gas Turbines and Power Plant Engineering, 2015.

[5] Arora S.C. & Domkundwar S. *Power Plant Engineering* Dhanpat Rai Sons, 2005.
[6] P.K. Nag, *Power Plant Engineering*, TMH, 2008.

LIST OF PRACTICAL ASSIGNMENTS

1. To study the working of High Pressure Boilers.
2. To Study the Induced Draught, Forced Draught and Balanced Draught.
3. To find the boiler efficiency using Orsat's Apparatus.
4. To study the Steam Nozzles and determine the Nozzle Efficiency.
5. To study the Steam Turbines in any Thermal power plant.
6. To study of Condensers and Cooling Towers and determine the Condenser Efficiencies.
7. To study and determine the thermal efficiency of any thermal power plant in an Industrial Visit.

8. To study and determine the thermal efficiency of cogeneration power plant in a Process Industry Visit.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. Mechanical Engg., (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER6G1 **Materials Management**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: **3 Hours**	**3**	**1**	**-**	**3**	**1**	**-**	**4**

Learning Objectives:

1. To inbuilt the concepts of Material handling and purchase procedure of an organization.
2. To impart the basics of standardization & stores management within organization.
3. To concrete the concepts of inventory management for effective decision making related to material & inventory.

Prerequisite(s): Basic concepts of Industrial Engineering and Management, Principles of Management.

COURSE CONTENTS

UNIT-I

Introduction: Objective of materials management, field and scope of material management, general analysis material quality, material planning programming. Integrated approach to Materials Management, Standardization, simplification, codification.

UNIT-II

Purchase Management: Scientific purchasing; objectives, organization of purchasing functions, Purchase cycle, Method of Buying; buying under certainty, buying under uncertainty, Purchasing under different circumstances , inspection and testing , purchasing for mass production , purchase contract , make or buy decision , material import , DGS & D rate contract.

UNIT-III

Stores Management: Stores organization, functions of scientific stores management, types of stores, store layout, store security, stores receipts, methods of storing, record – keeping & checking, issue methods, stores layout.

UNIT-IV

Inventory Management: Selective control of inventory, various inventory models, quantity discounts, shortages, instantaneous production with back orders, fixed time mode, single period model of profit maximization with time independent costs, lead time , re-order point , buffer stock, models with price breaks, , POQ system.

UNIT-V

Supply chain Management: Understanding the Supply chain, Process view of the supply chain, Supply chain performance: achieving Strategic Fit, Supply chain Drivers and Obstacles.

Learning Outcomes:

Upon Completing the Course, Student will able:

1. To understand the basics of Material handling techniques used in industries.
2. To understand the basics of purchase procedure and its management.
3. To understand the basics of stores and inventory management techniques used in industries. An overview of supply chain management.

BOOKS RECOMMENDED:

[1]. Lee & Dobler, *Material management.* Tata Mc.Graw Hill, 1990, 5e
[2]. Arnold J.R Tony & Stephen N. Chapman, *Introduction to Material management. PHI*, 2003, 7e
[3]. Gopal Krishnan, *Material Management*,PHI 2015, 2e
[4] L.C.Jhamb, Materials and Logistics Managemnt, Everest Publication, 1e
[5] Sunil Chopara and Peter Meindl, Supply chain Management, Pearson Education, 6e

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER6L4	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Workshop/Practical(MACHINE DESIGN – II)	**0**	**0**	**2**	**0**	**0**	**1**	**1**

Learning Objectives:

48. To solve the Practical based problems forthe designing the Mechanical Components.
49. To introduce the market survey practice to the students.
50. To develop the practice for literature survey to the students.
51. To prepare the students to work in a team.

Pre requisite(s): Machine Design I, Material Science, Strength of Material.

COURSE CONTENTS

1. Problem on Design of Single Plate Clutch/Cone Clutch
2. Problem on Design of Centrifugal Clutch.
3. Problem on Design of Flat/V Belt.
4. Problem on Design of Screw Jack.
5. Problem on Design of Spur/Helical/Bevel Gears.
6. Problem on Design of parts subjected to Fatigue Loading.
7. Problem on Design of Shoe/Band/Block/Internal Expanding Brake.
8. Problem on Design of Engine Cylinder/Piston/Connecting rod.
9. Problem on Design of Crank Shaft.

10 Problem on Design of Valve and Valve gear mechanism.

Learning Outcomes:
Upon Completing the Course, Student will able to:

59. Get the practical knowledge of designing the various components of Internal Combustion Engine.
60. Learn the market survey practice.
61. Get practice of literature survey.
62. Learn to work in a team.

BOOKS RECOMMEDED:

[1]. Shigley J.E., *Mechanical Engineering Design*, McGraw-Hill 2015.
[2]. Spotts M.F.,Shoup T.E., Hrnberger L.E., *Design of Machine Elements*, Pearson Education ,8e,2007.
[3]. Sharma P.C. & Aggarwal D.K., *Machine Design*,S.K.Kataria& Sons,11e,2013
[4]. Bhandari V.B., Design of Machine Elements,McGraw-Hill,4e,2017.
[5]. Black and Adams, *Machine Design*, Mc.Graw Hill,1968.
[6]. Maleev V.L., *I.C.Engine Design*, Mc.Graw Hill ,1945.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Information Technology (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
SMR6S6 Entrepreneurship Development & IPR	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	2	**-**	**-**	**2**	**-**	**-**	**2**
Duration of Theory Paper:3 Hours							

Learning Objectives:

1. To provide awareness about entrepreneurship.
2. To develop the skills of entrepreneurship & to encourage the students to become an entrepreneur.
3. To self motivate the students by making aware of different opportunities and successful growth stories
4. To impart the basics of Intellectual property Rights.

Pre requisite(s): Nil

COURSE CONTENTS

UNIT I

Introduction to Entrepreneurship: Entrepreneurship- Concept, Nature, Functions and Importance; Entrepreneurs- Characteristics, Types and Motivation; Entrepreneurial process; Enterprise-Definition and Classification (MSME- Micro, Small & Medium Enterprises).

Case Study: Success and Failure stories of entrepreneurs and discussing their characteristics and reasons for success/failure.

UNIT II

Entrepreneurial Journey: Creativity and Innovation, Recognizing opportunities and Generating ideas, Feasibility analysis, Industry and Competitor analysis, developing effective business model.

Class Activity: Idea generation by students.

UNIT III

Business Plan for Start-ups in IT Industry: Project Identification, Market Survey, Production plan, Operational plan, Marketing plan, Organizational plan and financial plan; writing a business plan.

Class Activity: Students asked to finalize on their ideas and start writing business plans

UNIT IV

Institutional Support to Entrepreneurs: Need for Institutional support different Government &Non Government institutions to support Entrepreneurs like, NSIC, SIDO, SSIB, SSIDC, SISIs , DTICs, industrial Estates, Specialized Institutions.

UNIT V

Intellectual Property Rights: Introduction of IPR, General Provisions & Basic principles of IPR, various perspective of IPR like Innovation & Creation, Innovators & Creators; Patents, Copyrights and Trademarks.

Learning Outcomes:

At the end of the course, students should be able to do the following:

1. Learn how to start an enterprise and design business plans those are suitable for funding by considering all dimensions of business.
2. Understand entrepreneurial process by way of studying different cases and performing class activities.

BOOKS RECOMMENDED:

[1]. Robert D. Hisrich, Mathew J. Manimala, Michael P Peters and Dean A. Shepherd, “Entrepreneurship”, 9th Edition, Tata Mc-graw Hill Publishing Co.ltd.-new Delhi, 2014.

[2]. Bruce R. Barringer and R. Duane Ireland, “Entrepreneurship”, 4th Edition, Pearson Publications, New Delhi, 2011.

[3]. N.K. Acharya, *Text book on intellectual Property Rights*, Asha Law House New Delhi, New Edition, 2001.

MECHANICAL ENGINEERING DEPARTMENT

Semester-VII

S.No.	Sub_code	Sub_Name	Type	L-T-P	Credits
1	MER7C1	OPERATIONS RESEARCH	PC	3-1-0	4
2	MER7C2	MACHINE DESIGN - III	PC	3-1-1	4+1(P)
3	MER7C3	REFRIGERATION & AIR CONDITIONING	PC	3-1-1	4+1(P)
4	MER7E1	SQC & TQM	PE	3-1-1	4+1(P)
5	MER7P1	PROJECT PHASE - I		0-0-7	7(P)
6	MER7V7	COMREHENSIVE VIVA -VII	VIRTUAL	0-0-4	4
TOTAL CREDITS					30

List of Elective – I					
S.No.	Sub_code	Sub_Name	Type	L-T-P	Credits
1.	MER7E1	SQC & TQM	PE	3-1-1	4+1(P)
2.	MER7E2	Artificial Intelligence	PE	3-1-1	4+1(P)
3.	MER7E3	Robotics	PE	3-1-1	4+1(P)
4.	MER7E4	Tribology	PE	3-1-1	4+1(P)
5.	MER7E5	Computational Fluid Dynamics	PE	3-1-1	4+1(P)

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">IV Year B.E. (Mechanical Engg.)
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER7C1
OPERATIONS RESEARCH</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

1. To develop the skills of decision making in dynamic business situations through quantitative analysis using different mathematical models like linear programming.
2. To develop the skills of decision making in dynamic business situations through quantitative analysis using different mathematical models like Transportation, Assignment, and Queuing etc.
3. To develop the skills of decision making in dynamic business situations through quantitative analysis using different mathematical models like Strategies formulation with the help of game theory and simulation etc.

Pre requisite(s): Industrial Engineering & Management and Materials Management.

COURSE CONTENTS

UNIT- I

INTRODUCTION: History and development Operations Research, Scientific Methods, Characteristics, Scope, Models in Operations Research. Linear Programming: Formulation, graphical methods, simplex method, Big- M- method

UNIT- II

TRANSPORTATION & ASSIGNMENT MODELS: Definition, Mathematical Representation, Formulation and Solution, Alternate optimal solution Transportation Model: Definition, Formulation and solution, Alternate optimal solution, Stepping stone method, Modified distribution (MODI) or u-v method. Traveling salesman problem, and minimal path problem.

UNIT- III

WAITING LINE MODELS: Introduction, classification, state in queue, probability distribution of arrival and service times. Single server model (M/M/I). Multiple server model (MMS). Birth & death process.

Dynamic Programming: Introduction, Distribution characteristic, Dynamic programming approach, Optimal subdivision problem.

UNIT- IV

GAME THEORY & SIMULATION: Theory of Game, Competitive game, Two persons, zero sum games, maximin and minimax Principles. Saddle point. Method of Dominance, graphical and algebraic method of solution by transforming into linear programming problem. Bidding problem. Building a simulation model, Monte-Carlo simulation and application.

UNIT- V

NETWORK ANALYSIS: Network diagram, Time estimation, Basic steps in PERT and CPM, PERT computation, CPM computation, critical path, Float, Cost analysis, Crashing of activities in the network

Learning Outcomes:

1. Students will be able to apply linear programming models in different practical situations.
2. Students will be able to optimize the resources different conditions.
3. Students will be able to know the various situation for queuing in service and industrial situations.
4. Students will be able to know the various strategies required in business decisions using game theory.
5. Students will be able to know the project implementation and control techniques using network analysis.

BOOKS RECOMMENDED:

[1]. Taha, *Operations Research*, Tata Mc.Graw Hill.
[2]. Wagner, *Operations Research*, PHI. New Delhi, 2003.
[3]. Ravindram & Philips, *Operations Research*, Tata Mc.Graw Hill.
[4]. Gupta & Hira, *Operations Research*, S. Chand. 1e, 2008
[5]. Chitle & Negi, *Operations Research*, Jain Brothers.
[6]. Vohra N.D, Kataria S.K, *Quantitative Techniques for Management*. Tata Mc.Graw Hill, 2004.

Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**IV Year B.E. (Mechanical Engg.)** **(Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER7C2 **Machine Design III**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: **4 Hours**							

Learning Objectives:

1. The objective of the subject to introduce the students about the new and advanced methods of design like optimization in design.
2. The objective of the subject to introduce the students about the new and advanced methods of design like reliability based design,
3. The objective of the subject to introduce the students about the new and advanced methods of design like high temperature resistance part design etc.
4. The objective of the subject to introduce the students about design of Journal Bearing and selection of Anti frictional Bearings from manufacturing catalogues.

Pre requisite(s): Machine Design I, Machine Design II.

COURSE CONTENTS

UNIT-I

Design for Bearings: Introduction about different types of bearings, Design for Journal bearing: Specifying bearing modulus, minimum oil film thickness, flow of oil, bearing heat balancing. Elementary treatment of contact stress, Selection of antifriction bearings.

UNIT-II

Reliability and Optimum based Design: Introduction to optimum design, analysis of simple machine members based on optimum design. Fundamentals of reliability, System concepts in Reliability engineering. Failure distributions, Statistical analysis of failure data, Weibull analysis, dimensioning.

UNIT-III

Design for Tool Drive: Design of machine tool drives such as lathe, drilling and milling machine, speed diagram, ray diagram, preferred number.

UNIT-IV

Design for Creep: Introduction to Design for creep. Combined creep and fatigue failure prevention. Design for low temperature (Brittle failure). Design for corrosion, wear, hydrogen embrittlement, fretting fatigue and other combined modes of mechanical failure.

UNIT-V

Design for Un-symmetrical Bending: Design of parts of unsymmetrical sections, shear center, parts subjected to unsymmetrical bending.

Note: Only Mechanical Engineer's Handbook, Data-books and certified notes are allowed in the examination hall.

Learning Outcomes:

Upon completing the course, student will be able to:

1. Design the machine components on the basis of Reliability.
2. Optimize the mechanical component design.
3. Design the component under high temperature condition.
4. Determine the arrangement and layout for tool drive design.
5. Evaluate and Design the Unsymmetrical component subjected to loading condition.

BOOKS RECOMMENDED:

[1] Shingley J.E., *Mechanical Engineering Design*, McGraw-Hill ,4e,2003.

[2] Spotts M.F.,Shoup T.E., Hrnberger L.E., *Design of Machine Elements*, Pearson Education ,8e,2006.

[3] Sharma P.C. and Aggarwal D.K., *Machine Design*,S.K.Kataria & Sons,11e,2006.

[4] Shariff A.,*Design of Machine Elements*,Dhanpat Rai Publications(P) Ltd.,3e,1995.

[5] Maleev V.L., *I.C.Engine Design*, , Mc.Graw Hill ,1e,1945.

[6] Black and Adams, *Machine Design*, Mc.Graw Hill, 2e, 1968.

[7] Mubeen A., *Machine Design*, Khanna Publishers, 4e, 2005.

LIST OF PRACTICAL ASSIGNMENTS

1. Problem on Design of Journal Bearing.
2. Problem on selection of Antifriction Bearing.
3. Problem on Reliability based design.
4. Problem on Dimensioning of parts.
5. Problem on Optimum based design.
6. Problem on Design for Tool Drive.
7. Problem on Design for creep.
8. Problem on Design for Un-symmetrical Bending.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER7C3
REFRIGERATION AND AIR-CONDITIONING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:
1. Realise the importance of science of Refrigeration and Air-Conditioning.
2. Understand the different Refrigeration and Air-Conditioning systems.
3. Able to apply the learning outcomes of prerequisites for design and selection of Refrigeration and Air-Conditioning systems for specific applications.
4. Learn latest trends in Refrigeration and Air-Conditioning.

Prerequisite(s): Applied Mathematics I/II/III/IV, Engineering Thermodynamics, Fluid Mechanics, Thermal Engineering, Heat Transfer.

COURSE CONTENTS

UNIT -I

Introduction and Air Refrigeration Systems: Introduction: Review of reversed Carnot Cycle, Coefficient of Performance, Types of Refrigeration Systems, Bell-Coleman cycle, Air-Refrigeration Cycles, systems for aircraft, Boot-strap type and simple evaporative systems, Applications of refrigeration systems

UNIT -II

Vapour Compression Refrigeration (VCR) Systems: Thermodynamic Cycle, T-s and P-h diagrams, Components and types: Compressor, Condenser, Expansion device and Evaporator, Analysis, effect of under-cooling and suction superheat, Limitations of VCR systems; Refrigerants: Classification, Properties and nomenclature, primary and secondary refrigerants, eco-friendly Refrigerants.

UNIT-III

Unconventional Refrigeration Systems and Future Trends: Vapor Absorption Systems: absorption cycle, Lithium-bromide system, heat-exchangers, analyzer and diffusers; The Electrolux system; Steam-Jet Refrigeration, Thermo-Electric Refrigeration. Low-temperature refrigeration: Cascade systems, Joule-Thompson effect, liquefaction of gases, application areas.

UNIT -IV

Psycromerty and Load Estimation: Psychrometry: Psychrometers, Terminology, Psychrometric Chart, Psychrometric properties and Processes, Apparatus Dew Point (ADP), By-pass factor; Thermal Comfort: metabolism and heat exchange by the human body, comfort charts, Current ASHRAE Standards; Air-conditioning Load Estimation: Heat Transfer fundamentals; Cooling and heating load estimation, Heat transfer across the building envelope, thermal insulation; Solar Heat Gain, ventilation and infiltration. Sensible heat factors: Room Sensible Heat Gain Factor (RSHF), Grand Sensible Heat Gain Factor (GSHF) Effective Room Sensible Heat Gain Factor (ERSHF) lines

UNIT -V:

Air Conditioning Systems: Air conditioning Systems: Basic Components, Types and selection, Air Systems, Water Systems, Room Air Conditioners – Window Type, Package Type, Split Type, Central Units. Air Supply Systems: Fans and Blowers, performance characteristics, heating and cooling coils, Flow through Ducts, Losses, Duct Design Methods. Air Distribution and control Devices.

Note: Refrigerant tables, Refrigeration and Air-conditioning Data Book and certified data tables are allowed in the examination hall.

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Understand the design and working principles of Refrigeration and Air-Conditioning systems.
2. Select Refrigeration and Air-Conditioning system components.
3. Learn advance subjects of Refrigeration and Air-Conditioning .
4. Industry ready for Refrigeration and Air-Conditioning industry.

BOOKS RECOMMENDED

[1] Stoeker and Jones, Refrigeration and Air-conditioning, McGraw-Hill Co, 2008.
[2] Arora C.P., Refrigeration and Air-conditioning, TataMcGraw Hill, 2008.
[3] Prasad M, Refrigeration and Air-conditioning. New Age Publishers, 9e, 2008.
[4] Ameen Ahmadul, Refrigeration and AirConditioning, Prentice-Hall of India, 2006.
[5] Arora R. C., Refrigeration and Air-conditioning, TataMcGraw Hill, 2008.

LIST OF PRACTICAL ASSIGNMENT

1. To find the coefficient of performance of Vapour compression Refrigeration (VCR) system.
2. To find the Refrigeration effect of Vapour compression Refrigeration (VCR) system.
3. To find coefficient of performance of Air-conditioner Trainer system.
4. To find Refrigeration effect of Air-conditioner Trainer system.
5. To find various psychrometric properties of Air.
6. To find the Refrigeration effect of Vapour Absorption Refrigeration (VAR) system.
7. Estimate cooling load of a building envelop.
8. To prove the relation between the coefficient of performance of a Heat Pump and a Refrigerator.

<table>
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<tr><th>Subject Code & Name</th><th colspan="3">Instructions Hours per Week</th><th colspan="4">Credits</th></tr>
<tr><td>MER7E1</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>SQC & TQM</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

1. The objective of the subject to introduce concepts of quality & quality control.
2. To impart the knowledge of Total Quality Management philosophy this is widely adopted by the business organizations now a day.
3. This course will enable the students to apply the concepts of Quality in the industries & get benefited.

Pre requisite(s): Industrial Engineering & Management & Materials Management.

COURSE CONTENTS

UNIT- I

BASIC CONCEPTS OF QUALITY: Meaning of Quality, Quality of Design, Quality of Conformance, quality of performance, Quality characteristic, Quality functions, Costs of Quality, Value of Quality, Quality control, Quality Control and inspection, Quality Policy, Objectives and organization, Quality Assurance. Statistical concept, Frequency distributions.

UNIT- II

STATISTICAL QUALITY CONTROL: Concepts of Variations Process capability, variables and attributes, Theory of Control chart, Control chart for variable-x bar & R chart, Application of control chart for variables. Patterns of control charts. Control Chart for Attributes: **P, np. C** and demerit control charts & their application.

UNIT- III

ACCEPTANCE SAMPLING: Fundamental concepts, OC Curve-construction of OC curve, Evaluation of parameters affecting OC curve, sampling plans: Single, Double, Multiple & Sequential sampling plans. Selection of sampling plan.

UNIT- IV

TOTAL QUALITY MANAGEMENT: Introduction to TQM :- Feature of TQM System, Application & Benefits of TQM. Objective of TQM, Scope & Approach of TQM, Key Activity Areas of TQM, Principles of TQM, Total Quality management philosophy of Deming, Juran & Philip Crossby. TQM Models – Models for TQM Implementations, Strategic tools & techniques of TQM.

UNIT- V

RELIABILITY & ISO 9000: Basic Concept of reliability, Reliability and Quality, failures and failures modes, Causes of failure and unreliability, Maintainability and availability. System reliability models- System with components in series. Systems with parallel components. Need for Quality system, History of ISO: 9000 series of standards, features of ISO: 9000 series of standards.

Learning Outcomes:

Upon completing the course, student will be able to:

1. Understand the concept of Quality and basic statistical concepts.
1. Preparation of Process control chart in the different industrial process.
2. Understand the concepts of Acceptance Sampling.
3. Apply the basics of Total Quality Management and its implementation.
4. know the system reliability concept and ISO standards.

BOOKS RECOMMENDED:

[1] Kapur K.C. & Lamberson, *Reliability in Engg. Design*, Wiley Eastern.

[2] Grant E.L. & Leave Worth, *Statistical Quality Control*, Tata Macgrawhill.

[3] Juran and Gryan, *Quality Planning Analysis*, Tata Macgrawhill.

[4] Mahajan M.,*Statistical Quality Contro*l, Dhanpat Rai & Sons(P)Ltd, 3e, 2003.

[5] Sharma D. D., *Toatal Quality Management*, Sultan Chand & Sons, 2e,2004.

[6] Besterfield, *Toatal Quality Management*, Pearson Education, 3e,2005.

LIST OF PRACTICAL ASSIGNMENTS

1. Study and Analysis of set parameters relating to different mathematical distributions(Variable).
2. Study and Analysis of set parameters relating to different mathematical distributions (Discrete).
3. Construction & analysis of various process control charts.
4. Performance of Acceptance Sampling for a given set of lots.
5. Analysis of tools of related to total Quality Management like QFD, Fish bone diagram etc.
6. Case studies related to Quality Problems.
7. Case studies related to Quality Control.
8. Case studies related to Quality Management.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER7E2 **Artificial Intelligence**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: **3 Hours**							

Learning Objectives:

1. The main objective of the subject is to introduce the students about the problems and techniques of AI.
2. The course content provides the theoretical aspects of AI and explore the ways that the current AI techniques can be used.
3. The objective of the subject to introduce the students about the Expert Systems and Machine Learning.
4. The objective of the subject to introduce the students about the fuzzy logic systems, Crisp sets and fuzzy sets.

Pre requisite(s): Data structures, Computer Programming, Applied Mathematics I, II, III & IV.

COURSE CONTENTS

UNIT-I

Introduction to Artificial Intelligence: Introduction and history of AI, Human intelligence versus artificial intelligence, Task domains of AI, Representations in AI, Introduction to AI techniques, Limitations of AI. Defining the AI problem as state space search, Problem characteristics and search techniques: Heuristic search techniques. Problem reduction and constraint satisfaction.

UNIT-II

Knowledge Representation: Introduction and need for a good representation, Ways of representing knowledge, Syntactic and semantic systems, Predicate logic, Production rules, Nonmonotonic systems , Statistical reasoning systems, Semantic nets, Frames , Conceptual dependency and Scripts. Problem solving: Inference and Resolution.

UNIT-III

Expert Systems and Machine Learning: Introduction, Rule based expert systems, Kowledge acquisition and Knowledge bases, Architecture of an expert system, Introduction to CLIPS(C Language Integrated Production System),Introduction to techniques for machine learning, Version spaces and Nearest Neighbour Algorithm, Introduction to machine vision.

UNIT-IV

Neural Networks and Fuzzy Logic Systems: Introduction, Supervised learning and Unsupervised learning, Neurons, Perceptrons, Multilayer neural networks, Recurrent networks , Unsupervised learning networks, Learning in Neural Networks and applications of neural networks. Introduction to fuzzy logic systems, Crisp sets and fuzzy sets, fuzzy logic control, Neuro fuzzy systems.

UNIT-V

Planning and Language Processing: Overview of planning and components of planning systems, Planning methods, Introduction to Natural language processing : Syntactic processing and Semantic analysis, Ambiguity and pragmatic analysis, Overview of programming languages of AI like LISP/PROLOG. Implementations of AI based applications in LISP/PROLOG.

Learning Outcomes:

Upon completing the course, student will be able to:

1. Familiar with the history, concept of Artificial Intelligence.
2. Familiar with Expert Systems and Machine Learning processes.
3. Understand, analyse and solve problems in the fuzzy logic systems, Crisp sets and fuzzy sets.

BOOKS RECOMMENDED:

[1] Rich Elaine, Knight Kevin, Nair Shivashankar B., *Artificial Intelligence*, McGraw-Hill ,3e,2009.
[2] Coppin Ben, *Artificial Intelligence Illuminated*, Narosa Publishing House ,2005
[3] Charniak Eugene, McDermott Drew, *Introduction to Artificial Intelligence*, Pearson Education,2e,2007
[4] Russell Stuart, Norvig Peter, *Artificial Intelligence A Modern Approach*, Pearson Education,2e,2007
[5] Winston Patric Henry, *Artificial Intelligence* , Pearson Education Asia ,3e,2000.

LIST OF PRACTICAL ASSIGNMENTS

1. Write a program to solve 8 queens problem.
2. Solve any problem using depth first search.
3. Solve any problem using best first search.
4. Solve 8-puzzle problem using best first search.
5. Solve Robot (traversal) problem using means End Analysis.
6. Solve traveling salesman problem.

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<tr><td>MER7E3</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>ROBOTICS</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

1. The main objective of the subject to introduce the students about the new and advanced methods to implement on design of Industrial robot.
2. Objective of the subject to introduce the students about the new and advanced methods to implement on Industry Automation.
3. Students will demonstrate an understanding of how to program robots and computers that control manufacturing automation.

Pre requisite(s): Theory of Machine, Dynamics of Machine.

COURSE CONTENTS

UNIT-I

Introduction: Automation and Robotics, CAD/CAM and Robotics, An over view of Robotics, Present
and future applications, Classification by coordinate system and control system.

UNIT-II

Components of the Industrial Robotics: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom, Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT-III

Robot Arm Kinematics: Direct and inverse kinematics, Rotation matrices, Composite rotation matrices, Euler angle representation , Homogenous transformation, Denavit Hattenberg representation and various arm configuration.

UNIT-IV

Robot Arm Dynamics: Lagrange – Euler formulation, joint velocities, Kinetic energy, Potential energy and motion equations, Generalised D'Alembert equations of motion.

UNIT-V

Application of Robotics: Robot Application in Manufacturing: Material Transfer, Material handling, loading and unloading- Processing, Spot and continuous arc welding & spray painting, Assembly and Inspection.

Learning Outcomes:

4. Familiar with the history, concept development and key components of robotics technologies.
5. Familiar with various robot sensors and their perception principles that enable a robot to analyse their environment, reason and take appropriate actions toward the given goal.
6. Understand, analyse and solve problems in spatial coordinate representation and spatial transformation, robot locomotion design, kinematics, motion control.

BOOKS RECOMMENDED:

[1] Fu K. S., *Robotics (Control, Sensing, Vision and Intelligence)*, McGraw-Hill, 4e, 2003.
[2] Schilling R.J., *Fundamental of Robotics*, Prentice Hall, 1990.
[3] Wesley, Sryda E., *Industrial Robots: Computer interfacing and Control*, Prentice Hall, 1985.
[4] Groover M.P., *Industrial Robotics Technology Programming and Applications*, McGraw-Hill, 1986.
[5] Asada and Slotine, *Robot Analysis and Control*, John Wiley and Sons, 1986.

LIST OF PRACTICAL ASSIGNMENTS

1. Assignment on introduction to robot configuration.
2. Demonstration of robot with 2 DOF, 3 DOF, 4 DOF etc.
3. Two assignments on programming the robot for applications.
4. Two assignments on programming the robot for applications in VAL II.
5. Two programming exercises for robots.
6. Two case studies of applications in industry.
7. Exercise on robotic simulation software.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER7E4
TRIBOLOGY</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:
1. The basic objective of the subject is to deal fundamentals of friction, wear and lubrication.
2. The subject is useful in understanding the nature of surfaces of engineering materials.
3. The basic objective of the subject is to learn about types of lubricants.
4. The subject is useful in understanding the various tribological applications.

Pre requisite(s): Material Science, Machine Design I & II.

COURSE CONTENTS

UNIT- I

Fundamentals of Tribology: Introduction to tribology and its historical background, Industrial importance, factors influencing Tribological phenomenon. Engineering surfaces- surface characterization, computation of surface parameters. Surface measurement techniques, statistical description.

UNIT- II

Friction of Surfaces: Genesis of friction, friction in contacting rough surfaces, sliding and rolling friction, various laws and theory of friction, friction of elastomers, friction of various materials, friction measurement methods, friction of non metallic materials.

UNIT- III

Wear Mechanism: Introduction, types of wear, wear mechanism, minor forms of wear, wear debris analysis, wear testing method, wear of metals, ceramics, polymers, system approach for wear reduction.

UNIT-IV

Theory of Lubrication: Basic principal of lubrication, choice of lubricant type, selection of lubrication oils, oil changing and oil conservation, oil feed system, Greece and anti seizes, gas bearing, lubricating sealing, lubricating testing and specifications, lubrication monitoring, Additives in lubricants.

UNIT- V

Design for Tribological Elements: An overview of engineering materials having potential for tribological application, characterization and evaluation of ferrous materials for tribological requirements/application, selection of ferrous materials for rolling element bearings, Basic Equation for fluid film lubrication Boundary lubrication, Hydrodynamic lubrication, elastohydrodynamic lubrication.

Learning Outcomes:

Upon completing the course, student will be able to:

6. Understand and importance of Tribological phenomenon
7. Optimize the friction and wear rate.

8. Understand the wear mechanism.
9. Determine the application of Lubricants.

BOOKS RECOMMENDED:

[1] Moore F Desmond ,*Principals and application of Tribology*, ,Pergamon press,1975
[2] Sahoo Prashant *Engineering Tribology*, Prentice-Hall of India, New Delhi, 2005
[3] Lansdown A R ,*Lubrication, A practical Guide to Lubricant selection*, Pergamon Press1982
[4] Majumdar BC*, Introduction to Tribology of Bearings,* Wheeler Publishing, New Delhi,1999.

LIST OF PRACTICAL ASSIGNMENTS

1. Performance analysis of Journal Bearings.
2. Experimental analysis of Lubricants.
3. Experimental analysis of Friction on different material.
4. Study of method for Wear Debris analysis.
5. Design analysis for Hydrodynamic Journal Bearing and rolling contact bearing.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER7E5	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Computational Fluid Dynamics	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives: The objective of the subject is to
1. Introduce the students about the new and advanced methods in fluid dynamics
2. Enable the students to use computer systems and related software for fluid dynamics.
3. Simulate the various flow conditions involving heat transfer and fluid flow.
4. Simulate the real life problems.

Pre requisite(s): Fluid Mechanics, Thermodynamics, Engineering Mathematics, Engineering Graphics

COURSE CONTENTS

UNIT I

Introduction to Fluid Dynamics: Review of conservation equations, Continuum concept, control volume equations, Ideal fluid flow and hydraulic singularities, Navier-stokes equations, and their use. Concept of compressible flow, one dimensional isentropic flow, normal shock, flow with-friction, heat transfer, boundary-Layer theory and applications

UNIT II

Boundary Layer Theory: Basic concepts, Boundary Layer Parameters, Boundary Layer on flat plate, Hiemenz flow, flow near rotating disc. Von-Karman Momentum Equation. General Properties of Boundary Layer equations, Theory of stability. Theory of similarity in heat transfer and exact solutions. Turbulence, correlation coefficient.

UNIT III

Numerical Methods: Fluid Dynamics Equations in Eulerian systems, the characteristic method, finite element methods and application in fluid dynamics, solution of physical flow problems. Scaling and nondimensionalisation Order of Magnitude method.

UNIT IV

Computational Methods: Algebraic equations, ordinary differential equations, Numerical solutions of non-linear equation. Problems leading to system of linear equations. Techniques for solving system of linear equations (direct and iterative). Linear and non linear regression techniques to correlate experimental data. Numerical Integration, application to flow processes. Solution to partial differential equations, Difference forms, implicit and explicit methods for steady state and transient problems.

UNIT V

Optimisation Methods: Classical optimization methods, unconstrained minimization. Univariate, conjugate direction, gradient and variable metric methods, constrained minimization, feasible direction and projections. Integer and Geometric programming, genetic algorithms.

Learning Outcomes:
1. Understand the various flow situations numerically

2. Analyse the flow patterns studied in fluid mechanics
3. Simulate the various flow situations
4. Apply optimisation methods to find most optimum solution.

BOOKS RECOMMENDED:

[1] Anderson, J. D., *Computational Fluid Dynamics: The Basics with Applications,* Pearson Education, 2005.

[2] Veerstig, H and W. Malasekra, E. B., *An Introduction to Computational Fluid Dynamics : The Finite Volume Method,* Pearson, 2e, 2009.

[3] Streeter, V. L and Wylie, E. B., *Fluid Dynamics,* McGraw-Hill Co, 2003.

[4] White F., *Fundamentals of Fluid mechanics,* McGraw-Hill Co, 2003.

[5] Wirz H.J. and Smolderen J.J., *Numerical Methods in Fluid Dynamics,* McGraw-Hill, 1978.

LIST OF PRACTICAL ASSIGNMENTS

1. Introduction to CFD software.
2. To simulate flow over the flat plate.
3. To simulate flow over the cylinder.
4. To simulate flow over an airfoil.
5. To simulate flow through nozzles and diffusers.
6. To simulate flow through Pipe of various cross-section.
7. To simulate flow through convergent-divergent nozzle.
8. To simulate flow across structural element.

MECHANICAL ENGINEERING DEPARTMENT

Semester-VIII

S.No	Sub_code	Sub_Name	Type	L-T-P	Credits
1	MER8C1	PRODUCTION & OPERATIONS MANAGEMENT	PC	3-1-0	4
2	MER8C2	VIBRATIONS & NOISE CONTROL	PC	3-1-1	4+1(P)
3	MER8C3	AUTOMOBILE ENGINEERING	PC	3-1-1	4+1(P)
4	MER8E1	CAD / CAM	PE	3-1-1	4+1(P)
5	MER8P2	PROJECT PHASE - II		0-0-7	7(P)
6	MER8V8	COMREHENSIVE VIVA - VIII	VIRTUAL	0-0-4	4
TOTAL CREDITS					**30**

List of Elective – I					
S.No.	**Sub_code**	**Sub_Name**	**Type**	**L-T-P**	**Credits**
1.	MER8E1	CAD / CAM	PE	3-1-1	4+1(P)
2.	MER8E2	Reliability Engineering	PE	3-1-1	4+1(P)
3.	MER8E3	Product Development	PE	3-1-1	4+1(P)
4.	MER8E4	Power Plant Engineering	PE	3-1-1	4+1(P)
5.	MER8E5	Gas Dynamics	PE	3-1-1	4+1(P)

FOR THE STUDENTS WHO OPTED INTERNSHIP IN VIII SEM
Semester-VIII

S.No	Sub_code	Sub_Name	Type	L-T-P	Credits
1	INR8I1	INTERNSHIP	PC	0-0- 20	20(P)
2	INR8G1	ELECTIVE – I (FROM SVYAM PORTAL)	PE	3- 0- 0	3
3	INR8G2	ELECTIVE – II (FROM SVYAM PORTAL)	PE	3- 0- 0	3
6	INR8VI	COMREHENSIVE VIVA - VIII	VIRTUAL	0- 0- 4	4(P)
				TOTAL CREDITS	**30**

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER8C1 **PRODUCTION & OPERATIONS MANAGEMENT**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**0**	**3**	**1**	**-**	**4**
Duration of Theory Paper: **3 Hours**							

Learning Objectives:

- The objective of the subject is to provide students with an understanding of the theory underlying operations management
- To enable students to contribute to improved operating decisions.
- This course has gradually incorporated an increasing amount of quantitative methodology because quantitative techniques improved decision making.

Pre requisite(s): Industrial Engineering & Management, Materials Management, Operations Research.

COURSE CONTENTS

UNIT- I

PRODUCTION MANAGEMENT: Definition: Production Management operation function in organizations, Systems view of operations, defining, managing the operations subsystems. Framework for managing operations. Forecasting in operations. Methods of Forecasting, selection of the Forecasting models.

UNIT- II

OPERATIONS CAPACITY AND LAYOUT DECISIONS: Need for facility location planning, factors affecting plant location decisions.

Decision tree analysis, Layout concepts, developing the process layout models & behavior, developing the product layout models (Assembly line models & behavior), manufacturing cellular layouts.

UNIT- III

SCHEDULING SYSTEMS AND AGGREGATE PLANNING: Operations planning and scheduling systems, aggregate planning process, strategies for developing aggregate planning, master production schedule. Loading: various approaches of loading, Sequencing: priorities sequencing rules, detailed scheduling, Expediting.

UNIT- IV

MRP&CAPACITY PLANNING: MRP: Objectives, advantages, limitations, preparation of material requirement plan, closed loop MRP, MRP- II, Capacity planning and environment. Strategies to modify the capacity in the short run & long run. Introduction to ERP.

UNIT- V

MATERIAL, MAINTENANCE & ECONMIC ANANLYSIS: Maintenance: objectives, Importance and types of Maintenance systems Preventive and breakdown maintenance. Economic Analysis: Time Value of Money concept, Capital investment evaluation techniques- Pay back, NPV, IRR etc.

Learning Outcomes:

Upon completing the course student will be able to:

- Understand the fundamentals of Production & Operations Management.
- Apply techniques of demand forecasting in practical situations.
- Take decisions related to plant locations and plant layout.
- Understand the basics of aggregate planning and scheduling systems.
- Know the techniques related to materials requirement, maintenance of production system.

BOOKS RECOMMENDED:

[1] Monks Joseph, *Operation management*, McGraw Hill international, 3e, 1987.

[2] Everett E. Adam, et al, *Production & Operations Management*, Prentice – Hall of India, 5e, 2004.

[3] Chase Richard B., et al, *Operations Management*, Tata MacGraw Hill, 11e, 2006

[4] Buffa E., *Production and Operation Management*, McGraw Hill,T/e

[5] Martand Telsung, *Industrial Engineering & Production Management*, S.Chand & Co. Ltd, 2004.

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<tr><td rowspan="2">MER8C2
VIBRATION &
NOISE CONTROL</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
</table>

Learning Objectives:

- The main objective of the subject is to deal with study and analysis of vibration phenomenon, control of vibration in machine parts, balancing.
- The subject also deals with Introduction of basic terminology of noise engineering and noise control.
- The subject also deals with the Whirling of light flexible shaft

Pre requisite(s): Dynamics of machine, Machine Design.

COURSE CONTENTS

UNIT-I

Introduction: Periodical motion, harmonic motion, period, cycle, circular frequency, amplitude andphase angles of vibration motion, non-harmonic periodic motions. classification of vibration: freeand forced vibration, undamped and damped vibration, linear and non linear vibration Harmonic analysis, the vector method of representing vibrations, displacement, velocity and acceleration in harmonic motion, super position of simple harmonic, beats, work done in harmonic motion .

UNIT-II

System with One Degree of Freedom: System having single degree of freedom, free vibration of systems without damping, equilibrium and energy method for determining natural frequency. Raleigh's method, equivalent systems (systems with compound spring, shafts of different dia. Equivalent length, effect of mass of springs and shaft). Free vibration of systems with viscous, coulomb and structural damping. Equations of motions-discussion of solutions. Forced vibrations of systems with and without viscous and coulomb damping,, frequency response plots, Phase shift plots, Equivalent viscous damping, power consumption of vibration systems, forced isolation, commercial isolators, transmissibility.

UNIT-III

Systems with Two Degree of Freedom: System having two degree of freedom system, Normal mode of vibrations, Torsional systems, undamped & damped vibration in two degree of freedom system with free and forced vibration. Vehicle suspension, Undamped dynamic vibration absorber. Centrifugal absorber, friction damper. Vibration Instruments: Principle of nalogies: Electric circuit principles, equivalent circuits.

UNIT-IV

Whirling of Shafts: Whirling of light flexible shaft with an unbalance disk at the Centre of its length with and without damping, discussion of speeds above and below the critical speed, Uniform shaft with and without unbalanced masses attached along its length (by Rayleigh method) for simple supported and fixed ends.

UNIT-VNoise Control: Noise and its causes, sound pressure /intensity/ power level and their interrelation, Decibel scale, Loudness and equal loudness contours, Sound spectra and octave band analysis. Background noise. Weighted networks. Measurement of noise, effect of machine/ process noise on operators, employees and local resident's, standard of noise level and exposure limits. Methods of industrial noise control.

Learning Outcomes:

Upon completing the course student will be able to:

1. Understand the basic phenomenon of Vibration and Noise.
2. Find the natural frequency of different mechanical systems.
3. Find out the performance of viscous dampers in force vibration system.
4. Correlate the Mechanical and Electrical System.

BOOKS RECOMMENDED:

[1] Ambekar A.G. *"Mechanical Vibrations and Noise Engineering"* Prentice-Hall of India, New-Delhi, 2e, 2006.

[2]Singh V.P., *"Mechanical Vibration"* Dhanpat Rai& Co.(p)Ltd., Delhi, 3e, 2001

[3]Thomson W.*T "Theory of Vibration with Application"* CBS Publishers & Distriburors, Delhi, 3e, 1990.

[4]Grover G.K."*Mechanical Vibrations"* Nem Chand & Brothers, 2e, 2007.

[5] Pujara K. *" Vibration & Noise for Engineers*", Dhanpat Rai & Sons, Delhi, 2e,1992.

LIST OF PRACTICAL ASSIGNMENTS

- To find the natural frequency of a simple pendulum.
- To determine the radius of gyration of a compound pendulum using vibration phenomenon.
- To determine the radius of gyration of a body using bifilar suspension method.
- To determine the radius of gyration of a body using trifilar suspension method.
- To determine the natural frequency of a spring mass pulley system.
- To determine natural frequency of a spring mass system.
- To determine the natural frequency of an undamped forced vibration system. .

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Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER8C3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
AUTOMOBILE ENGINEERING	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

1. To understand the principles and working of different systems of automobiles.
2. To understand the principles and design of different systems of automobiles.
3. To understand the principles and working of Microprocessor based automobiles.
4. To understand the principles and working of Electrical systems of automobiles.

Pre requisite(s): IC Engines, Theory of Machines, Dynamics of Machines, Engineering Mechanics. **COURSE CONTENTS**

UNIT-I

Chassis and Body Engineering: Chassis classification, Types of frames, Vehicle body types & construction, Body materials, Driver's visibility and methods for improvement, Safety aspects of vehicles, Chassis layout, layout of an automobile with reference to engine location, stability of vehicles, structural dynamics, Performance of Vehicle, types of automobiles.

UNIT-II

Steering System: Front axle beam, Stub axle, Front wheel assembly, Principles of types of wheel alignment, Front wheel geometry viz. camber, Kingpin inclination, Castor, Toe-in and Toe-out, Condition for true rolling motion, Centre point steering, Directional stability of vehicles, Steering Gears, Power steering, Slip angle, Cornering power, Over steer & Under Steer, electronic steering control, Wheels and tyres Specifications, Types, Construction and tread pattern.

UNIT-III

Suspension System: Vehicle Dynamics and requirement of suspension, Suspension types & construction, Shock absorber, Types of leaf springs coil spring, Air spring, Torsion bar, Location of shackles, electronic suspension system, Brakes-classification & construction, Mechanical, Hydraulic & Pneumatic power brake systems, Air-bleeding of Hydraulic brakes, Antilock braking system, Performance- Braking efforts, Efficiency, Stopping Distance & time, traction control system,

UNIT-IV

Transmission System: Clutches-requirement, Types and construction, Various Resistances to Motion of Automobile, Traction, tractive effort Performance curves, Need for transmissions, Types and construction, Synchronizer, Gear shifter mechanism, Determination of gear ratio for vehicles, Gear box performance at different vehicle speed, Torque converters, Fluid coupling, Automatic transmission, epicyclic and hydromatic transmission – continuously variable transmission (Continuous Variable Transmission – CVT), Electrical drives: advantages and limitations, Modern electric drive for buses and performance characteristics, Propeller shaft, Universal joints, CV joints, Differential gear box, Rear axle types & construction.

UNIT-V

Electrical and Control Systems: Types of storage battery, Construction and operation of lead acid battery, Testing of battery, Principle & operation of starting mechanism, Different Bendix drive systems, Starter relay switch, Electrical accessories -fuel gauge, Fuel pump, Horn, Wiper, Lighting system, Head light dazzling, Signaling devices and circuit, Car air conditioning systems, Battery operated vehicles. Microprocessor based control system for automobiles. Intelligent automobiles control systems.
Indian standards for automotive vehicles exhaust emission-Bharat and Euro norms, Indian Motor vehicle act- preliminary information.

Learning Outcomes:
Upon Completing the Course, Student will able to:

5. Understand the design and working principles of Chassis systems of automobiles.
6. Understand the specifications of automobiles.
7. Understand the working of all systems of automobiles.
8. Learn advanced system of automobiles.
9. Industry ready for Automotive industry.

BOOKS RECOMMENDED:

[1] Singh Kirpal, *Automobile Engineering, Vol.1*, Standard Pub, 9e.
[2] Giri N.K., *Automotive Technology,* Khanna Pub, 4e 2009.
[3] Newton & Steeds, *Automobile Engineering*, Butterworth Int.
[4] Heitner Joseph, *Automotive Mechanics, Principles and Practices*, East-West Pub.
[5] Crouse W.H., *Automotive series Part-I to VI*, Tata McGrawhill, 9.e
[6] Crouse W.H., *Automotive Emission,* Tata McGrawhill.
[7] BIS and Euro –I and Euro-II, *Emission standards*.

LIST OF PRACTICAL ASSIGNMENTS:

1. Study of chassis frame and body.
2. Study by dismantling and assembly of steering linkage mechanism and Steering Boxes.
3. Study by dismantling and assembly of Front and Rear suspension systems.
4. Study by dismantling and assembly of hydraulic brake and power brake system.
5. Study by dismantling and assembly of single plate and multi plate clutch system.
6. Study by dismantling and assembly of sliding mesh, constant mesh, synchromesh gearboxes.
7. Study by dismantling and assembly of -Propeller shaft, Differential, Rear axles.
8. Study of electrical circuit, self-starter and battery.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">IV Year B.E. (Mechanical Engg.)
(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER8E1
CAD/CAM</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hrs</td></tr>
</table>

Learning Objectives:

- To understand the basics of CAD/CAM.
- To understand the concepts of computer graphics and its tools.
- To learn about the geometric modeling techniques concerned to the manufacturing of parts.
- To understand the latest advances in the manufacturing methods.

Prerequisite(s): Engineering Drawing, Machine Design & Drawing.

COURSE CONTENTS

UNIT-I

Fundamentals of CAD\CAM: Introduction to CAD\CAM, CIM, CAE, Reverse Engineering, Concurrent/Simultaneous Engineering.
Hardware: Types of Computer Systems, Workstations, Peripheral Devices, Storage Devices, CPU.
Computer Graphics: 2D & 3D Transformations, Concatenations.
CAD/CAM Software Features & its Organizations.

UNIT-II

Computer Aided Design: Introduction to Design process, Product Life Cycle, Areas of Applications and benefits of CAD. Geometrical Modeling: Wire frame and Surface Modeling - Parametric representation of Analytical and Synthetic Curves and Surfaces, Solid Modeling - Boundary representation, Constructive Solid Geometry. Parametric & Variational Modeling. CAD/CAM Data Exchange Standards.

UNIT-III

Computer Aided Manufacturing: Introduction to CAM, Fundamentals of Numerical Control and Computer Numerical Control Systems: Coordinate Systems, Motion and Position Control.
CNC Control Systems: Direct Numerical Control and Distributed Numerical Control, Adaptive Control.
Part Programming Methods: CNC Codes & Standards, Manual Programming, Computer Assisted Part Programming, APT language.

UNIT-IV

Rapid Prototyping Technologies and Robotics: Basic RP Techniques: Stereo Lithography, Selective Photo Curing, Selective Sintering, Fused Deposition Modeling, Laminated Object Manufacturing, 3D Printing, Application of RP Techniques, RP Methodology. Rapid Tooling. Robot Configurations, Motion and Position Control of Robot Arm, Robot Applications.

UNIT-V: Introduction to Group Technology Concept, Part Classification & Coding Systems, Machine Cell Formations, Introduction to Flexible Manufacturing Systems: Concept, Components and Types, CAPP and its types, Computer Aided Inspection and Quality Control.

Learning Outcomes:

Upon Completing the Course, Student will be able to:

30. Understand the importance of CAD/CAM principles in the Product development.
31. Develop programs related to manufacturing using codes.
32. Analyse the importance of networking in manufacturing environment.

BOOKS RECOMMENDED:

[1]. Groover and Zimmers, *CAD/CAM: Computer Aided Design and Manufacturing*, PHI Pvt. Ltd., New Delhi.
[2]. Groover Mikell P, *Automation, Production Systems and Computer Integrated Manufacturing*, PHI Pvt. Ltd., New Delhi.
[3]. Zeid Ibrahim, *Mastering CAD/CAM*, Tata McGraw Hill Publishing Company Ltd., New Delhi.
[4]. Rao P. N.,*CAD/CAM Principles and Applications*, Tata McGraw Hill Publishing Company Ltd., New Delhi, Second Edition.

LIST OF PRACTICAL ASSIGNMENTS

18. Introduction to CAD/CAM Software (Proe, etc) and understanding its UI and Tools.
19. To Perform Wireframe Modeling using Sketching tool.
20. To Model a 3D Solids (Gears, Pulleys, Keys, Cotters, Shaft etc.).
21. To Perform Surface Modeling.
22. To Create 2D drawing from 3D part generated as above.
23. To Create Assembly of Parts.
24. To Simulate the assembly and create the exploded views.
25. To Generate Automated CNC Tool Path and G-Code from Modeled Part.
26. To Study the Constructional Features of the CNC Trainer Lathe.
27. To create G Code and M Code program for CNC Lathe and Mill Machine.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">IV Year B.E. (Mechanical Engg.)

(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER8E2
RELIABILITY ENGINEERING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration -3Hours</td></tr>
</table>

Learning Objectives:

- The objective of the subject is to acquaint the students about the Theory of Reliability.
- The objective of the subject is to acquaint the students about design optimization of mechanical component.
- The objective of the subject is to acquaint the students about the Statistical analysis.

Pre requisite(s): Machine Design, Mathematics I, II, III & IV.

COURSE CONTENTS

UNIT-I

Introduction

Definition of reliability, types of failures, definition and factors influencing system effectiveness, various parameters of system effectiveness.

UNIT-II

Theory of Reliability

Types of system- series, parallel, series parallel, stand by and complex; development of logic diagram, methods of reliability evaluation; cut set and tie set methods, matrix methods event trees and fault trees methods, reliability evaluation using probability distributions, Markov method, frequency and duration method.

UNIT-III

Reliability Mathematics

Definition of probability, laws of probability, conditional probability, Bay’s theorem; various distributions; data collection, recovery of data, data analysis Procedures, empirical reliability calculations.

UNIT-IV

Optimum based Design

Introduction to optimum design, analysis of simple machine members based on optimum design. System concepts in Reliability engineering. Failure distributions, Statistical analysis of failure data, Weibull analysis, dimension.

UNIT-V

Reliability Improvements & Testing

Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series – parallel, stand by and hybrid, effect of maintenance.

Note: Only Data-books, Reliability Tables and certified notes are allowed in the examination hall.

BOOKS RECOMMENDED:

[1] Billintan R.& Allan R.N.., *Reliability Evaluation of Engineering and Systems*, Plenum

Reliability in Engineering and Design, John Wiely and Sons, 2001.
[3] Sinha S.K., *Life Testing and Reliability Estimation*, Wiely Eastern Ltd, 2003. [4]Shooman M.L., *Probabilistic Reliability, An Engineering Approach*, McGraw Hill, 1998.
[5] Sandler G.H.., *System Reliability Engineering*, Prentice Hall, 2001.

Learning Outcomes:
Upon Completing the Course, Student will able to:

- Understand the principal of Reliability.
- Understand the design optimization of mechanical component.
- Understand the Weibull analysis, dimensioning.

LIST OF PRACTICAL ASSIGNMENTS

1. Design Analysis of Relaibility of M/c component.
2. Problem based on Markov method of Reliability.
3. Optimum Design of M/c omponent.
4. Problem based on Weibull analysis of Reliability.
5. Problem based on Statistical analysis.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER8G1
Product Design & Development</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

The Above Course MER8G1 Product Design & Development is as per the course available at

MOOC/SWAYAM Course - I
Applications

They will be offered in self study/ MOOCS mode for students who have opted for internship and went at other institutions/organization.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER8G2 **Product Design & Manufacturing**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

The Above Course MER8G2 Product Design & Manufacturing is as per the course available at

MOOC/SWAYAM Course - I
Applications

They will be offered in self study/ MOOCS mode for students who have opted for internship and went at other institutions/organization.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER8E3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
PRODUCT	**3**	**1**	**2**	**3**	**1**	**1**	**5**

DEVELOPMENT							
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- This course provides hands-on and real world experience in the development of innovative and realistic customer-driven engineered products.
- Design concepts and techniques are introduced, and the student's design ability is developed in a design project or feasibility study chosen to emphasize ingenuity
- Design concepts and techniques are introduced, and the student's design ability is developed in a design project or feasibility study chosen to provide wide coverage of engineering and business topics.

Pre requisites: Industrial Engineering & Management, Materials Management, Operations Research.

COURSE CONTENTS

UNIT- I

Introduction

Definitions, market needs, product cycle, design methodologies, product specification, conceptual and development phases. Product planning and design decision making. Marketing, forecasting & market research for a new product. Purchasing and sales procedure. Demand analysis for new product.

UNIT- II

Product Design

Introduction to PD, Applications, Relevance, Product Definition, Scope, Terminology. Design definitions, the role and nature of design, old and new design methods, Design by evolution. Need based development, technology based developments. Physical reliability & Economic feasibility of design concepts.

UNIT- III

Development of Prototype Product

Divergent, transformation and convergent phases of product design. Identification of need, Analysis of need. Design for what? Design criteria, functional aspects. Aesthetics, ergonomics, form (structure). Shape, size, color. Mental blocks, Removal of blocks, Ideation Techniques, Creativity.

UNIT- IV

Transformations

Brainstorming & Synectics . Morphological techniques. Utility concept, Utility value, Utility index . Decision making under multiple criteria. Economic aspects of design. Fixed and variable costs. Break-EvenAnalysis.

UNIT- V

Product Appraisal

Information and literature search, patents, standards and codes. Environment and safety considerations. Existing techniques such as work-study, SQC etc. which could be used to improve method & quality of product. Innovation versus Invention. Technological Forecasting.

Learning Outcomes:

Upon completing the course student will be able to:

10. Understand the fundamentals of product cycle.
11. Apply techniques of demand forecasting in practical situations.
12. Understand the phenomenon of prototype product
13. Know the basics of techniques related product development.
14. Know the various standard procedures related to patenting, environmental and other standards for product appraisal.

BOOKS RECOMMENDED:

[1] Chitale A.K. & Gupta R.C., Product Design & Manufacturing, PHI (EEE),1e, 2007.
[2] Crewford R.P., The Technology of Creation Thinking, Prentice Hall, 2e,2004.
[3] Walls Grohem, The Art of Thought, Bruce & Co., New York.
[4] Starr M.K., Product Design & Decision Theory, Prentice Hall,2e, 2006.
[5] Cain C .D., Engineering Product Design , Bussiness Books.
[6] Ulrich, K.T. and Eppinger, S.D., Product Design and Development, McGraw-Hill/Irwin, 4th ed, 2007 (ISBN 978-0073101422).

ASSIGNMENTS:

(1) Study and Analysis of product cycle of different product.
(2) Study and Analysis of forecasting & market research methods for a new product.
(3) Case studies related to Product Design applications.
(4) Case studies related to Prototype Development methods for new product.
(5) Analysis of methods related to transformation of Product idea into product concept & Prototype development.
(6) Case studies related to standards and codes for product development.
(7) Case studies related to Environment and safety considerations for product development
(8) Case studies related to Technological Forecasting for product development.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">IV Year B.E. (Mechanical Engg.)
(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">MER8E4
POWER PLANT ENGINEERING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- The objective of the subject is to acquaint the students about the new and advanced technologies of power generation.
- The objective of the subject is to acquaint the students about the new and advanced technologies of energy scenario.

Pre requisite(s): Steam Engineering, Thermodynamic Power Cycles.

COURSE CONTENTS

UNIT-I

Introduction

Review of world and Indian energy situation in respect of demand, supply and resources in the historic context. Primary and secondary energy sources, their interconvertibility Merits and Demerits and Criterion for selection of power plants.

UNIT-II

Steam Power Plant

Basic principles of sitting and station design, Effect of climatic factors on station and equipment design, Choice of steam cycle and main equipment, Recent trends in turbine and boiler sizes and steam conditions, plant design and layout, Outdoor and indoor plant, System components, Fuel handling, Burning systems, Element of feed water treatment plant, Condensing plant and circulating water systems, Cooling towers, Turbine room and auxiliary plant equipment., Instrumentation, Testing and plant heat balance.

UNIT-III

Nuclear Power Plant

Importance of nuclear power development in the world and Indian context, Review of atomic structure and radio activity, Binding energy concept, Fission and fusion reaction, Fissionable and fertile materials, Thermal neutron fission, Important nuclear fuels, Moderators and coolants, their relative merits, Thermal and fast breeder reactors, Principles of reactor control, Safety and reliability features.

UNIT-IV

Hydro-Power Plant: Elements of Hydrological computations, Rainfall run off, Flow and power duration curves, Mass curves, Storage capacity, Salient features of various types of hydro stations, Component such as dams, Spillways, Intake systems, Head works, Pressure tunnels, Penstocks, Reservoir, Balancing reservoirs, Selection of hydraulic turbines for power stations, Selection of site.

UNIT-V

Diesel Engine and gas turbine power plants: Applications of diesel engines in power field, Types of diesel plants, Layout of a diesel engine power plant, Components of gas turbine plant, Gas turbine fuels, Gas turbine materials, Performance of gas turbine power plants.

Learning Outcomes:

Upon Completing the Course, Student will able to:

- Understand the phenomenon of compressible liquids.
- Understand the phenomenon of flow through nozzles & diffusers.
- Understand the phenomenon of sound waves.
- Understand the phenomenon of shock waves.
- Understand the principles of Flow in constant area ducts with friction.

BOOKS RECOMMENDED:

[1] Nag, P.K., Power Plant Engineering, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2008.
[2] Arora and Domkundwar, A course in power Plant Engineering, Dhanpat Rai and CO, 2005.

[3] EMI Wakil, Power Plant Technology, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2005.
[4] Sharma PC, Power plant Engineering, Kataria and sons, Delhi.

LIST OF PRACTICAL ASSIGNMENTS

1. Study of Steam Power Plant.
2. Study of Nuclear Power Plant.
3. Study of Hydro-Power Plant.
4. Study of Gas Turbine Power Plants.
5. Study of Diesel Engine Power Plant.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MER8E5 **GAS DYNAMICS**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**2**	**3**	**1**	**1**	**5**

Objectives:

- The objective of the subject is to acquaint the students about the fundamental principles of fluid mechanics.
- The objective of the subject is to acquaint the students about the fundamental principles of thermodynamics and compressibility.
- The objective of the subject is to acquaint the students about the fundamental principles of different types of flows.

Pre requisite(s): Fluid Mechanics, Thermodynamics, Heat Transfer.

COURSE CONTENTS

UNIT-I

Introduction

Compressible flow, energy equation, rate equations for control volume, speed of sound –in ideal and perfect gases, in real gases, in almost compressible liquid, in solids, in two phase medium.

UNIT-II

Isentropic Flow with variable area

Comparison of isentropic and adiabatic processes, Mech number variation, stagnation and critical states, Area ratio as function of Mech number, impulse function, Mass flow rate, flow through nozzles, flow through diffusers.

UNIT-III

Flow with Normal Shock Waves

Wave Motion- Wave propagation in an elastic solid medium, sound waves, pressure waves, expansion waves. Development of shock waves, rarefaction waves, governing equations, prandtl-Mayer relation Mach no. downstream of normal shock wave, static pressure ratio across the shock, temperature ratio across the shock, density ratio across the shock, stagnation pressure ratio across the shock, change in entropy across the shock, impossibility of shock in subsonic flow, strength of a shock wave Moving normal shock waves.

UNIT-IV

Flow with oblique shock wave

Nature of flow, fundamental relations, prandtl equation, Rankine-Hugoniot equation, Oblique shock relations, Mach Waves.

UNIT-V

Flow in constant area ducts with friction

Fanno curves, flow equations, solution of fanno flow equations, variation of flow properties and Mach no. with duct length, Isothermal flow. Flow in constant area duct with heat transfer: Reyleigh line, fundamental equations, Reyleigh flow relations, variation of flow properties, Maximum heat transfer.

Learning Outcomes:

Upon Completing the Course, Student will able to:

18. Understand the phenomenon of compressible liquids.
19. Understand the phenomenon of flow through nozzles & diffusers.
20. Understand the phenomenon of sound waves.
21. Understand the phenomenon of shock waves.
22. Understand the principles of Flow in constant area ducts with friction.
23. Understand Behavior of Gas under various conditions.
24. Use the Gas tables
25. Understand basics of compressible flow
26. Correlate fundamentals of Gas Dynamics with various mechanical systems

BOOKS RECOMMENDED:

[1] Bird G. A., *Molecular Gas Dynamics and the Direct Simulation of Gas Flows*, Oxford University.

[2] Carlo C., *Kinetic Theory and Gas Dynamics*, Springer Verlog.

[3] Liepmann H., *Elements of Gas Dynamics* , Dover Publication.

[4] Rathakrishnan E. *Gas Dynamics* Prentice Hall of India.

[5] Yahya S.M., *fundamentals of compressible flow*, Wieley Eastern Limited New Delhi.

LIST OF PRACTICAL ASSIGNMENTS

1. Analysis of Mass flow rate through nozzles.
2. Study of variation of flow properties and Mach no. with duct length
3. Analysis of Heat Transfer through constant area duct.
4. Study & Analysis of Heat Transfer through fins.
5. Analysis of friction loss through constant area ducts.

ME (Information Technology) with Specialization in Information Security Proposed Scheme for CBCS (Full Time)

SEM I				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	ISR1C1	Advanced Algorithms	3-1-1	PC1
2.	ISR1C2	Secure Computing Techniques	3-1-1	PC2
3.	ISR1C3	Advanced Computer Networks	3-1-1	PC3
4.	ISR1Gx	Generic Elective I	3-1-0	GE1
5.	ISR1Ex	Elective I	3-1-1	PE1
6.	ASR1S1	Soft Skills -1	2-0-0	
7.	ISR1W1	Seminar/ Workshop-I	0-2-0	
8.	ISR1V1	Comprehensive Viva I	0-0-4	
Total Credit for SEM I			**28 actual + 4 Virtual credits**	
		List of Generic Elective I	**L-T-P**	
1.	ISR1G1	Advanced Data Base Management Systems	3-1-0	
2.	ISR1G2	Complexity of Security Algorithms	3-1-0	
3.	ISR1G3	Agent Technology	3-1-0	
		List of Elective I	**L-T-P**	
1.	ISR1E1	Data Security	3-1-1	
2.	ISR1E2	Information Theory and Coding	3-1-1	
3.	ISR1E3	Data Compression and Stagnography	3-1-1	
SEM II			**L-T-P**	
1.	ISR2C1	Information Security Management	3-1-1	PC4
2.	ISR2C2	Digital Forensics and Security Audit	3-1-1	PC5
3.	ISR2C3	Secure Wireless Networks	3-1-1	PC6
4.	ISR2Gx	Generic Elective II	3-1-0	GE2
5.	ISR2Ex	Elective II	3-1-1	PE2
6.	ASR2S2	Soft Skills -2	2-0-0	
7.	ISR2W2	Seminar/ Workshop-II	0-2-0	
8.	ISR2V2	Comprehensive Viva II	0-0-4	
Total Credit for SEM II			**28 actual + 4 Virtual credits**	
		List of Generic Elective II	**L-T-P**	
1.	ISR2G1	Cloud Computing	3-1-0	
2.	ISR2G2	Applied Cryptography	3-1-0	
3.	ISR2G3	Cyber Crime and Information Warfare	3-1-0	
		List of Elective II	**L-T-P**	
1.	ISR2E1	Biometric Systems & Security	3-1-1	
2.	ISR2E2	Secure Software Engineering	3-1-1	
3.	ISR2E3	Trust management in E- Commerce	3-1-1	
SEM III	ISR3D1	Dissertation Phase I	0-0-12	
	ISR3V3	Comprehensive Viva III	0-0-4	
Total Credit for SEM III			**12 actual + 4 Virtual credits**	
SEM IV	ISR3D2	Dissertation Phase II	0-0-12	
	ISR4V4	Comprehensive Viva IV	0-0-4	
Total Credit for SEM IV			**12 actual + 4 Virtual credits**	
Total Credit			**80 actual + 16 Virtual credits**	

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India

Institute of Engineering & Technology</td><td colspan="4">ME I Year Information Technology (Sp. Information Security)
Semester- A</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions

Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ISR1C1: Advanced Algorithms</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Course Objective:

- To introduce students a variety of advanced techniques, methods and results from the rapidly-developing field of algorithms to solve problems.
- To familiarise the state of the art in some areas of algorithmic research, including open problems.

COURSE CONTENT

Unit I

Review of basic concepts; Worst case and average case analysis, Asymptotic notation, Solving recurrence equations, Medians and order statistics, Advanced data structures: Binomial Heaps, Fibonacci Heaps, Data Structures for Disjoint Sets – Disjoint-set operations, Linked-list representation of disjoint sets, Disjoint-set forests, analysis of union by rank with path compression.

Unit II

Advanced Design and Analysis techniques: Greedy and Dynamic Programming strategies, Backtracking, Branch and Bound. Algorithms for Knapsack problems, Matrix-Chain Multiplication problem, Travelling Salesperson Problem (TSP), etc. Amortized analysis: the aggregate method, the accounting method, the potential method, Dynamic tables.

Unit III

Graph algorithms: Breadth-first search, Depth-first search, Topological sorting, Minimum Spanning Trees, Single-Source Shortest Paths, All-Pairs Shortest Paths, Maximum Flows: Augmenting Paths and Push-Relabel Methods, Minimum Cost Flows, Bipartite Matching.

Unit IV

Graph algorithms: Breadth-first search, Depth-first search, Topological sorting, Minimum Spanning Trees, Single-Source Shortest Paths, All-Pairs Shortest Paths, Maximum Flows: Augmenting Paths and Push-Relabel Methods, Minimum Cost Flows, Bipartite Matching.

Unit V

Theory of NP-Hard and NP-Complete Problems: P, NP and NP-Complete complexity classes; A few NP-Completeness proofs; other complexity classes.

Dealing with intractability: Introduction, Combinatorial Optimization, approximation factor, PTAS, FPTAS, Approximation algorithms for vertex cover, set cover, TSP, knapsack, bin packing, subset-sum problem etc. Analysis of the expected time complexity of the algorithms.

Text and Reference books:

1. T. Cormen, C. Leiserson, R. Rivest, and C. Stein. Introduction to Algorithms. (3rd Ed). MIT Press, McGraw-Hill, 2010.
2. M.T. Goodrich, R. Tamassia, “Algorithm design – Foundations, Analysis, and Internet Examples”, John Wiley, Second Edition.
3. V. V. Vazirani, Approximation Algorithms, Springer. 2001.
4. Ravindra K. Ahuja, Thomas L. Magnanti, and James B. Orlin, Network Flows: Theory, Algorithms, and Applications,
5. E Horrowitz, S salmi, S Rajasekaran, “Fundamentals of Computer Algorithms”, Second Edition, University Press, 2007.

6. Aho, A V Hopcraft Ullman JD, “The Design and analysis of computer Algorithms”, Pearson Education, 2007.

Course outcomes:

After the completion of course student will be able to:

- Perform variety of advanced techniques, methods and results from the rapidly-developing field of algorithms to solve problems.
- To familiarize the state of the art in some areas of algorithmic research, including open problems.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India

Institute of Engineering & Technology</td><td colspan="4">ME I Year Information Technology (Sp. Information Security)
Semester- A</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions

Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>ISR1C2: Secure Computing Techniques</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td><td>3</td><td>1</td><td>2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
</table>

Course Objective:

- This course aims to provide an understanding of the various security attacks and knowledge to recognize and remove common coding errors that lead to vulnerabilities.
- It gives an outline of the techniques for developing a secure application.

COURSE CONTENT

Unit-I: Introduction

Security: CIA (AIC) Triad, Viruses, Trojans, and Worms In a Nutshell, Security Concepts- exploit, threat, vulnerability, risk, attack. *Malware Terminology*: Rootkits, Trapdoors, Botnets, Key loggers, Honeypots. Active and Passive Security Attacks, IP Spoofing, Tear drop, DoS, DDoS, XSS, SQL injection, Smurf, Man in middle, Format String attack. *Types of Security Vulnerabilities*: buffer overflows, invalidated input, race conditions, access-control problems, weaknesses in authentication, authorization, or cryptographic practices. Access Control Problems.

Unit-II: Secure Software Development Cycle & Threat Modelling

Need for Secure Systems: Proactive Security development process, Secure Software Development Cycle (S-SDLC) , Security issues while writing SRS, Design phase security, Development Phase, Test Phase, Maintenance Phase, Writing Secure Code – Best Practices SD3 (Secure by design, default and deployment), Security principles and Secure Product Development Timeline.

Identifying the Threats by Using Attack Trees and rating threats using DREAD, Risk Mitigation Techniques and Security Best Practices. Security techniques, authentication, authorization. Defence in Depth and Principle of Least Privilege.

Unit – III: Secure Coding Techniques

Protection against DoS attacks, Application Failure Attacks, CPU Starvation Attacks, *Insecure Coding Practices in Java Technology*: ARP Spoofing and its countermeasures. Buffer Overrun- Stack overrun, Heap Overrun, Array Indexing Errors,FormatString Bugs. *Security Issues in C/C++ Language*: String Handling, Avoiding Integer Overflows and Underflows and Type Conversion Issues- Memory Management Issues, Code Injection Attacks,Canary based countermeasures using StackGuard and Propolice. Socket Security, Avoiding Server Hijacking, Securing RPC, ActiveX and DCOM. Secure coding issues in Android Applications, Language Specific issues like C/C++, Perl, Python, Scripting Languages, Ada, Java, PHP etc.

Unit – IV: Database and Web-specific issues

SQL Injection Techniques and Remedies,Race conditions, Time of Check Versus Time of Use and its protection mechanisms. Validating Input and Interprocess Communication, Securing Signal Handlers and File Operations. XSS scripting attack and its types – Persistent and Non persistent attack XSS Countermeasures and Bypassing the XSS Filters.

Unit – V: Testing Secure Applications

Security code overview, secure software installation. The Role of the Security Tester, Building the Security Test Plan. Testing HTTP-Based Applications, Testing File-Based Applications, Testing Clients with Rogue Servers.

Text and Reference books:

1. Writing Secure Code, Michael Howard and David LeBlanc,Microsoft Press, 2nd Edition, 2004
2. Buffer Overflow Attacks: Detect, Exploit, Prevent by Jason Deckar,Syngress,1st Edition, 2005
3. Threat Modeling, Frank Swiderski and Window Snyder, Microsoft Professional, 1st Edition, 2004.
4. Secure Programming HOWTO by David A. Wheeler
5. Secure Coding: Principles & Practices by Mark G. Graff, Kenneth R. van Wyk

Course outcomes:
After the completion of course student will be able to:

- Have understanding of the various security attacks and knowledge to recognize and remove common coding errors that lead to vulnerabilities.
- It gives an outline of the techniques for developing a secure application.

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions

Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>ISR1C3: Advanced Computer Networks</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td><td>3</td><td>1</td><td>2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
</table>

Course Objective:

- Provide students with enhance base of knowledge of Computer Networks, Develop a comprehensive knowledge of Tools and Techniques used in Management of Computer Networks.
- Develop skills in independent managing Network Performance related issues Develop ability to carry out research in area of Computer Networks

COURSE CONTENT

Unit I : Foundation

Computer Networks and Internet, Structure of network software in an operating system, Packet Switching and Circuit Switching, Protocols Layers and Network Service Models, Implementing Network Software (Sockets), Network Performance - Delay, Loss , Throughput, and Bandwidth, Best-effort services and QoS guarantees for multimedia data.

Unit II : Link Layer, Access Networks and LANs

Services Provided by Link Layer, Link Layer Implementation, Multiple Access Protocols and Ethernet, Switched Local Area Networks, Link Layer Addressing (ARP), RARP, VLANS, Link Virtualization and MPLS, Data Center Networking

Unit III : Network Layer and Internetworking

Virtual Circuit and Datagram Networks, Internet Protocol, IPV4 -Class full and Classless Addressing, Subnetting, IPV6 Addressing, IP Datagram delivery and forwarding, Routing Algorithms- Distance Vector and RIP, Link State Routing and OSPF, Inter domain Routing - BGP, DHCP, ICMP, Router-switching, input/output processing, Routing Control Plane, Network Virtualization- VPN and NAT.

Unit IV : Transport Layer and End-to-End Protocols

Transport layer services in Internet, Multiplexing and De-multiplexing, Connectionless Transport: UDP segment format and checksum, Connection Oriented Transport: TCP-segment format, roundtrip estimation and Timeout, Reliable data Transfer, Flow control, TCP connection Management, TCP congestion control Additive Increase/Multiplicative Decrease, Slow start, Fast Retransmit and Fast Recovery, Fairness and Queuing Disciplines.

Unit V : Application Layer

Network Application Architecture and Process Communication, Web and HTTP, File Transfer FTP, Electronic Mail- SMTP, POP, IMAP, MIME, Internet Discovery Service-DNS, Network Management – SNMP, Advance topics - Software Defined Networking, Internet of Things

Text and Reference books:

1. Computer Networking, A Top-Down Approach, 6th Ed., J. Kurose and K. Ross, Pearson, 2013.

2. Computer Networks, A Systems Approach, 5th Edition, L. Peterson and B. Davie, Morgan Kaufman, 2012.

3. Internetworking with TCP/IP Volume I, 6th Ed., D. E. Comer, Pearson Education, 2013.

4. Internetworking with TCP/IP Volume II, 3rd, Ed., D. E. Comer and David L. Stevens, Pearson Education, 2003.

5. Data Communications and Networking, 4th Ed., Beharouz A. Forouzan, McGraw-Hill Education Private Ltd., 2006.

Course outcomes:

After the completion of course student will be able to:

- Enhance base of knowledge of Computer Networks, Develop a comprehensive knowledge of Tools and Techniques used in Management of Computer Networks.
- Develop skills in independent managing Network Performance related issues Develop ability to carry out research in area of Computer Networks

Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**ME I Year Information Technology (Sp. Information Security)** **Semester- A**			
Subject Code & Name	**Instructions** **Hours per Week**			**Credits**			
ISR1G1: Advanced Database **Management Systems**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**0**	**3**	**1**	**0**	**4**

Course Objective:

- To enhance the understanding of practical issues related to advance topics of Database systems.

COURSE CONTENT

Unit I : Introduction to Data Warehousing and Data Mining

Introduction to Knowledge discovery process, OLTP, OLAP, Data Mining: Functionalities, Process, Schemas and
Applications etc.; Data Warehouse : Construction and other issues.

Unit II : Transaction Processing and Concurrency Control

Introduction, Properties; Schedules, Types of Schedules, Characterizing Schedules, Serializability, Two-phase locking, Dealing with Deadlock and Starvation, Time Stamp Ordering and Multi version Concurrency control etc.

Unit III : Data Storage, Indexing and Physical Database Design

Types of Files, Introduction to Hashing, Multilevel Indexes, B-trees, B+ -trees, Indexes on Multiple Keys, Overview of Physical Database Design and Database Tuning in Relational Databases

Unit IV : Query Optimization

Introduction to Query Optimization, Overview of algorithms used in External Sorting and other SQL operations, Use of Heuristics, Cost Estimation and Selectivity used in Query Optimization, Semantic Query Optimization etc.

Unit V : Distributed Databases and Security

Concepts, Types and Query Processing in Distributed Databases, Data Fragmentation, Replication and Allocation Techniques, Introduction to Database Security Issues, Access Control Policy, Statistical Database Security etc.

Text and Reference books:

1. Fundamentals of Database Systems, Elmasri and Navathe, Pearson Education, 6th Edition, 2014.
2. Data Mining Concepts and Techniques, Han and Kamber, Morgan Kauffman, 3rd Edition, India, 2012.
3. Database System Concepts, Silberchatz, Korth, Sudarshan, Mcgraw Hill, 6th Edition, 2010.
4. Database Systems : A practical Approach to Design, Implementation, and Management, Connolly and Begg, Pearson Education, 6th Edition, 2014.

Course outcomes:

After the completion of course student will be able to:

- To enhance the understanding of practical issues related to advance topics of Database systems.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India

Institute of Engineering & Technology</td><td colspan="4">ME I Year Information Technology (Sp. Information Security)
Semester- A</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions

Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>ISR1E1: Data Security</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td><td>3</td><td>1</td><td>2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
</table>

Course Objective:

- To impart the knowledge of encryption and decryption techniques and their applications in managing the security of data.

COURSE CONTENT

Unit I : Foundation

Security Taxonomy, Domain of information security, security goals, security approaches, principles of security, security attacks, threats, vulnerabilities, malicious software's, virus, worms, Trojan, spy wares, Applets/Active X, cookies. Security services, mechanisms and security models. Types of attacks, packet sniffing, packet spoofing, IP sniffing, IP spoofing, DNS spoofing attack.

Unit II : Classical Cryptographic Techniques

Cryptography terminologies, classical cryptography: substitution techniques, transposition techniques, playfair cipher, Hill cipher. Mathematics of cryptography: Integer arithmetic, modular arithmetic, Elucid theorem, Concept of symmetric and asymmetric key cryptography, stenography, digital watermarking, key range and size, possible types of attacks. Stream ciphers and Block cipher. Algorithm type and modes. Key distribution, Deffie Hellman key exchange, Man in the middle attack.

Unit III : Symmetric Key Algorithms

Computer based symmetric key cryptographic algorithms: Data Encryption Standard (DES), Double DES, meet in the middle attack, Triple DES, International Data Encryption Algorithm (IDEA), RC5, Blowfish, Advance Encryption Standard (AES).

Unit IV : Asymmetric Key Algorithms

Random number generation, Prime numbers. Fermat's and Euler's theorem. Principles of public key crypto systems. Computer based asymmetric key cryptographic algorithms: RSA algorithm. Principles of public key cryptosystems, symmetric and asymmetric key cryptography together. Concept of Digital Envelope, Digital signatures, message digests and its requirements.

Unit V : Public Key Crptosystems

MD5 Message Digest Algorithm, Message authentic codes, Hash functions, Secure Hash Algorithms, Hash based message authentic code. Elliptical Curve Cryptography (ECC). Problems with the public key exchange.

Text and Reference books:

1. Douglas R. Stinson;"Cryptography Theory and Practice"; Chapman & Hall/CRC
2. Williams Stallings; "Cryptography & Network Security"; Pearson Education.
3. Mathew Bishop; Introduction to computer Security; Addison-Wisley
4. Atul Kahate; "Cryptography

Course outcomes:

After the completion of course student will be able to:

- Get the knowledge of encryption and decryption techniques and their applications in managing the security of data.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India

Institute of Engineering & Technology</td><td colspan="4">ME II Year Information Technology
(Sp. Information Security)
Semester- B</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions

Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">ISR2C1: Information Security

Management</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Course Objective:

- To study the methods of managing information systems in a secure way.

COURSE CONTENT

Unit I : Foundation

Computer Security, Threats to security, History of Computer security, Computer System Security and Access Controls (System access and data access). Threats - Viruses ,worms , Trojan horse, bombs, trap doors, spoofs, email virus, macro viruses, remedies, Intruders, Malicious software.

Unit II : Communication Security

Encryption, Public Key Infrastructure, Digital Signatures, Digital signatures.

Unit III : User Authentic Mechanisms

Passwords, Authentication tokens, Certificate based Authentication, Single Sign on (SSO), Kerberos, X.509, Cryptographic Solutions- A case study.

Unit IV : Information Security Protocols

Secure Socket Layer (SSL), Secure Hyper Text Transfer Protocol (SHTTP), Secure Electronic Transaction (SET), Electronic Money, Email Security.

Unit V : System and Application Security

Intrusion detection techniques, techniques to provide privacy in Internet Application and protecting digital contents(music, vedio, software) from unintended use, authentication. IP security, Web security. file System security, program and security, memory security, Sandboxing. Security threads protection intruders- Viruses-trusted system. Firewalls, vulnerabilities & threats, Network Denial of service attack, Contract Signing, Secret Splitting.

Text and Reference books:

[1] Dieter Gollman; Computer Security; John Wiley & Sons 1999
[2] Mathew Bishop; Computer Security; Art and Science; Addison-Wisley Oct. 2007
[3] Mathew Bishop; Introduction to computer Security; Addison-Wisley Oct 2004
[4] Kaufman, Perlman and Speciner; “Network security”; Pearson Education 1995.

Course outcomes:
After the completion of course student will be able to:

- Understand the various security algorithm.
- Encryption and decryption algorithm

Devi Ahilya University, Indore, India Institute of Engineering & Technology				ME II Year Information Technology (Sp. Information Security) Semester- B			
Subject Code & Name	**Instructions** **Hours per Week**			**Credits**			
ISR2C2: Digital Forensics and Security Audit	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**2**	**3**	**1**	**1**	**5**

Course Objective:

- At the completing of the course, students will be able to understand the fundamental concepts of forensic science and digital forensics principles.
- Learn to identify importance of digital evidence.

COURSE CONTENT

Unit I : Introduction of Digital Forensics:

Digital crime, current scenario of digital crime in India, Evidence and its role in IT Act, Digital Evidence, Digital Vs Physical Evidence, nature of Digital Evidence, precautions while dealing with Digital Evidence, challenging aspects of Digital Evidence, Digital Devices, evidential potential of digital devices, Digital Forensics, dimensions and principles of Digital Forensics, Digital Forensic Investigation, Investigation Models, Scientific method in Digital Investigation, Research potential and scope in digital forensics.

Unit II : Data and Evidence Recovery:

Seizure of digital information : Issues, methodology, factors limiting wholesale seizure, pulling the plug or not; data objects, Storage Media, Variety of data, Recovered data objects, electronic evidence: secure boot and write blockers, disk file organization ,disk and file imaging; forensic tools, forensic data carving, data recovering techniques.

Unit III : Mobile and Live Forensics Investigations:

Mobile phone forensics: mobile device characteristics, memory considerations, tools classification, flasher boxes, obstructed devices, forensics procedures: preservation, acquisition, examination and analysis, reporting; SIM Card Forensics.

Network Forensics: sources of network based evidences, procedure for applying network based forensics, digital evidence on internet, digital evidence on physical and data link layers, digital evidence at the network and transport layers.

Unit IV : Security Issues and Principles:

Risk Analysis: Terms and Definitions, Need, Methodology, Considerations and Approaches.

Security Models: IA-CMM,ISM3, SSE-CMM: Importance, Usage, Structure and Architecture, Process Areas; Security Engineering and its need.

Security Standards and frameworks: ISO 27001: Evolution, Organizational Context, ISMS Implementation in

Organizations; COBIT: Principles, Structure and Objectives.

Security Methodologies: IAM, IEM, OCTAVE, OSSTMM,SIPES.

Laws for Information Security: Introduction to The Indian IT Act, IPR, Patent law, Copyright Law.

Unit V : Security Audit/Assurance:

Security Audits : Need in Organizations, Auditor's responsibility, Types, Approaches, Technology- Based Audits :

Penetration Testing and Vulnerability Scanning; Phases, Budgeting for Security Audits.

Privacy : Organizational implications, Practices ,Policy, Audits: Framework and Approach, Standards, Phases,
Process : Design, Risk Analysis, Planning, Conducting, Reporting.

Text and Reference books:

1. Nina Godbole, Information Systems Security-Security Management, Metrics, Frameworks and Best Practices, Wiley, 2009.
2. Digital Forensics and Cyber Crime; Ibrahim Baggili; Springer.
3. Rick Ayers, Sam Brothers and Wayne Jansen : Guidelines on Mobile Device Forensics, NIST, 2014.

Course outcomes:
After the completion of course student will be able to:

- At the completing of the course, students will be able to understand the fundamental concepts of forensic science and digital forensics principles.
- Learn to identify importance of digital evidence.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				ME II Year Information Technology (Sp. Information Security) Semester- B			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
ISR2C3: Secure Wireless Networks	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**2**	**3**	**1**	**1**	**5**

Course Objective:

- Provide students with enhance base of knowledge of wireless networking.
- Learn Security Issues in different wireless networks and mitigation techniques
- Develop a comprehensive knowledge of Tools and Techniques used in Management of wireless Networks
- Develop ability to carry out research in area of security in wireless Networks

COURSE CONTENT

Unit I : Foundation

Review of wireless communication Technologies : Cellular Networks, Wireless LAN, Prersonal Area Networks,
Adhoc and Sensor Networks, Challenges in Adhoc and Sensor networks: Constrained Resources, Security, Mobility

Unit II :

Adaptability in Mobile computing, Mobility Management: Location Management Principles and Techniques, Data Dissemination and Management.

Unit III : Mobile and Wireless Security Issues, Approaches to security, Security in Wireless Personal Area Networks: Bluetooth Security Modes, Bluetooth Security Mechanisms, Authentication and Encryption in Bluetooth networks.

Unit IV :

Security in Wireless Local Area Networks: WEP, WPA, IEEE802.11i, Security in Metropolitan Area Networks:
IEEE 802.16 and Security.

Unit V :

Security in Wide Area Networks: GSM Security, Four Generations of Wireless: 1G-4G, limitations and Security.
Security in Ad hoc and Sensor networks.

Text and Reference books:

1. Fundamentals of Mobile and Pervasive Computing, Frank Adelstein, S.K. Gupta, G. Richard
2. III, L. Schwiebert, Mc Graw Hill, Ed.2005.
3. Hacking Exposed : Mobile Secrets & Solutions, N.Bergman, M.Stanfield, J.Rose, J. Scambray.
4. Building Secure Wireless Networks with 802.11, Jahanzeb Khan and Anis Khwaja, Wiley 2003.
5. Ad Hoc Wireless Networks - Architectures and Protocols, C.Siva Ram Murthy and B.S.Manoj., Prentice Hall, 2004
6. Technical Papers.

Course outcomes:

After the completion of course student will be able to:

- Have enhanced base of knowledge of wireless networking.
- Learn Security Issues in different wireless networks and mitigation techniques
- Develop a comprehensive knowledge of Tools and Techniques used in Management of wireless Networks
- Understand the various security algorithm.
- Encryption and decryption algorithm

Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**ME II Year Information Technology (Sp. Information Security) Semester- B**			
Subject Code & Name	**Instructions** **Hours per Week**			**Credits**			
ISR2G2: Applied Cryptography	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**0**	**3**	**1**	**0**	**4**

Course Objective:

- To impart the knowledge of encryption and decryption techniques and their applications in managing the security of data.

COURSE CONTENT

Unit I : Modular Arithmetic and Multiplicative Group

Modular Arithmetic for advanced cryptography, Multiplicative group of integers ,, order of an element in , generator of , extended Euclidean algorithm, Pohlig-Hellman and Pollard-Rho algorithm for computing DLP, Integer factorization problems, Pollard-Rho factoring algorithm.

Unit II : Tools for Symmetric key & Public key Cryptography

Shannon ciphers and perfect security, computational ciphers and semantic security, efficient adversaries and attack
games, trapdoor function schemes, trapdoor function pair schemes, ElGamal cryptographic system, ElGamal digital
signatures, fun applications.
.

Unit III : Block Ciphers and Their Attacks

Polynomial arithmetic, finite field GF(2^n), constructing block cipher in practice, sophisticated attacks on block ciphers, case study block cipher AES: AES structure, AES transformation functions, AES key expansions, AES Implementation, fun applications.

Unit IV : Cryptanalysis, IDS and Attacks

Intrusion detection system (IDS), cross site scripting attacks, SQL injection attacks, fault injection attacks, side channel attacks, algorithmic attacks.

Unit V : Asymmetric Key Cryptosystems

MD5 Message Digest Algorithm, Message authentic codes, Hash functions, Secure Hash Algorithms, Hash based message authentic code. Elliptical Curve Cryptography (ECC). Problems with the public key exchange.

Text and Reference books:

1. Douglas R. Stinson;"Cryptography Theory and Practice"; Chapman & Hall/CRC
2. Williams Stallings; "Cryptography & Network Security"; Pearson Education.
3. Mathew Bishop; Introduction to computer Security; Addison-Wisley
4. Atul Kahate; "Cryptography and Network Security"; Tata McGraw-Hill.

Course outcomes:
After the completion of course student will be able to:

- Will learn the concept of biometric methods.
- Will merge the software application with human body fetures
- Will learn the cocept of retina and figure prints association with biometric devices

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India

Institute of Engineering & Technology</td><td colspan="4">ME II Year Information Technology
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions

Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>ISR2E1: Biometric Systems & Security</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td><td>3</td><td>1</td><td>2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
</table>

Course Objective:

- To study the concepts of various biological based information security systems.

COURSE CONTENT

Unit I : Overview of Biometrics

Definitions, biometric modalities, course outline, Basic applications: access control, e-commerce, forensics.

Unit II : Design of a Biometric System

Building blocks, Modes of operation, Fingerprint verification: Minutiae Based Fingerprint Matching, Non-minutiae Based Representations, Fingerprint Enhancement, and Fingerprint Classification. Face Recognition:- Introduction, Authentication vs. Identification, Challenges in Face recognition, Algorithms for face recognitions. .

Unit III : Iris Recognition

Introduction, devices for capturing Iris, Iris representation schemes, Iris recognition algorithms. Biometrics based on hand geometry, signature, ear, palm, voice and DNA.

Unit IV : Multimodal Biometrics

Limitations of unimodal systems, multibiometric scenarios, levels of fusion, system design, score fusion techniques, score normalization, user-specific parameters, and soft biometrics.

Unit V : Case Study Presentations

Biometrics in Banking Industry, Biometrics in Computerized, Patient Records, Biometrics in Credit Cards, Biometrics in Mass Disaster Victim, Identification Forensic Odontology

Text and Reference books:

1. D. Maltoni, D. Maio, A. K. Jain, and S. Prabhakar; "Handbook of Fingerprint Recognition"; Springer Verlag, 2003.
2. A.K. Jain, R. Bolle, S. Pankanti (Eds.); "BIOMETRICS: Personal Identification in Networked Society", Kluwer Academic Publishers, 1999.
3. J. Wayman, A.K. Jain, D. Maltoni, and D. Maio (Eds.); Biometric Systems: Technology, "Design and

Course outcomes:

After the completion of course student will be able to:

- Will learn the concept of biometric methods.
- Will merge the software application with human body fetures
- Will learn the cocept of retina and figure prints association with biometric devices

M. E. Computer Engineering (FULL TIME) With Specialization in Software Engineering
Curriculum & Syllabus
Batch 2015– 2016 and Onwards

S. No.	Category	No. of Credits			
		SEM I	SEM II	SEM III	SEM IV
1.	Course Compulsory	15	15	-	-
2.	Generic Elective	4	4	-	-
3.	Programme Elective	5	5	-	-
4.	Skill development	2	2	-	-
5.	Seminar/ Workshop/ Research Tool	2	2	-	-
6.	Dissertation Phase	-	-	12	12
Actual Credits per Semester		**28**	**28**	**12**	**12**
Total actual Programme Credits					**80**
7.	Virtual Credited Comprehensive Viva	4	4	4	4
Total Credits per Semester		**32**	**32**	**16**	**16**
Total Programme Credits					**96**

M. E. Computer Engineering (FULL TIME) With Specialization in Software Engineering
Curriculum & Syllabus
Batch 2015– 2016 and Onwards

SEM I				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit L-T-P**	**Sub Type**
1.	SER1C1	Advanced Algorithms	3-1-1	PC1
2.	SER1C2	Object Oriented Analysis & Design	3-1-1	PC2
3.	SER1C3	Software Construction	3-1-1	PC3
4.	SER1Gx	Generic Elective I	3-1-0	GE1
5.	SER1Ex	Elective I	3-1-1	PE1
6.	ASR1S1	Soft Skills -1	2-0-0	
7.	SER1W1	Seminar/ Workshop/Research Tool	0-2-0	
8.	SER1V1	Comprehensive Viva I	0-0-4	
Total Credit for SEM I			**28 actual + 4 Virtual credits**	
		List of Generic Elective I	**L-T-P**	
1.	SER1G1	Soft Computing	3-1-0	
2.	SER1G2	Distributed Operating System	3-1-0	
3.	SER1G3	Advance Computer Architecture	3-1-0	
		List of Elective I	L-T-P	
1.	SER1E1	Database Engineering	3-1-1	
2.	SER1E2	Big Data Analytics	3-1-1	
3.	SER1E3	Secure Software Engineering	3-1-1	
SEM II			**L-T-P**	
1.	SER2C1	Software Project Planning and Management	3-1-1	PC4
2.	SER2C2	Design Pattern	3-1-1	PC5
3.	SER2C3	Software Testing and Quality Assurance	3-1-1	PC6
4.	SER2Gx	Generic Elective II	3-1-0	GE2
5.	SER2Ex	Elective II	3-1-1	PE2
6.	ASR2S2	Soft Skills -2	2-0-0	
7.	SER2W2	Seminar/ Workshop/ Research Tool	0-2-0	
8.	SER2V2	Comprehensive Viva II	0-0-4	
Total Credit for SEM II			**28 actual + 4 Virtual credits**	
		List of Generic Elective II	**L-T-P**	
1.	SER2G1	Data Mining & Warehousing	3-1-0	
2.	SER2G2	Cloud Computing	3-1-0	
3.	SER2G3	Simulation and Modelling	3-1-0	
		List of Elective II	L-T-P	
1.	SER2E1	Speech And Language Processing	3-1-1	
2.	SER2E2	Aspect Oriented Software Engineering	3-1-1	
3.	SER2E3	Machine Learning	3-1-1	

M. E. Computer Engineering (FULL TIME) With Specialization in Software Engineering

Curriculum & Syllabus

Batch 2015– 2016 and Onwards

SEM III			**L-T-P**	
1	SER3D1	Dissertation Phase I	0-0-12	
2	SER3V3	Comprehensive Viva III	0-0-4	
Total Credit for SEM III			**12 actual + 4 Virtual credits**	
SEM IV			**L-T-P**	
1	SER4D2	Dissertation Phase II	0-0-12	
2	SER4V4	Comprehensive Viva IV	0-0-4	
Total Credit for SEM IV			**12 actual + 4 Virtual credits**	
Total Credit			**80 actual + 16 Virtual credits=96**	

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<tr><td rowspan="2">SER1C1
Advanced Algorithms</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory
Paper: 3 Hours</td></tr>
</table>

Course Objectives: To introduce students a variety of advanced techniques, methods and results from the rapidly-developing field of algorithms to solve problems. To familiarise the state of the art in some areas of algorithmic research, including open problems.

Prerequisites: Data Structures and Algorithms.

COURSE CONTENTS

UNIT - I

Review of basic concepts; Worst case and average case analysis, Asymptotic notation, Solving recurrence equations, Medians and order statistics, Advanced data structures: Binomial Heaps, Fibonacci Heaps, Data Structures for Disjoint Sets – Disjoint-set operations, Linked-list representation of disjoint sets, Disjoint-set forests, analysis of union by rank with path compression.

UNIT - II

Advanced Design and Analysis techniques: Greedy and Dynamic Programming strategies, Backtracking, Branch and Bound. Algorithms for Knapsack problems, Matrix-Chain Multiplication problem, Traveling Salesperson Problem (TSP), etc.
Amortized analysis: the aggregate method, the accounting method, the potential method, Dynamic tables.

UNIT - III

Graph algorithms: Breadth-first search, Depth-first search, Topological sorting, Minimum Spanning Trees, Single-Source Shortest Paths, All-Pairs Shortest Paths, Maximum Flows:Augmenting Paths and Push-Relabel Methods, Minimum Cost Flows, Bipartite Matching.

UNIT - IV

Introduction to string matching problem, String matching algorithms: Naive algorithm, Rabin-Karp, Knuth-Morris-Pratt, Boyer-Moore, etc. Applications in Bioinformatics.
Computational Geometry: Convex Hull. Line-segment Intersection. Sweep Lines. Voronoi Diagrams. Range Trees. Seidel's Low-dimensional LP Algorithm.

UNIT - V

Theory of NP-Hard and NP-Complete Problems: P, NP and NP-Complete complexity classes; A few NP-Completeness proofs; other complexity classes.

Dealing with intractability: Introduction, Combinatorial Optimization, approximation factor, PTAS, FPTAS, Approximation algorithms for vertex cover, set cover, TSP, knapsack, bin packing, subset-sum problem etc. Analysis of the expected time complexity of the algorithms.

Learning Outcomes:

Upon Completing the Course, Student will have:

1. Skills to analyze algorithms
2. Comparative judgments of different design techniques
3. Ability to solve real world problems
4. Idea about the hardness of some well-known problems including TSP, vertex cover, network flow and combinatorial optimization problems.
5. Familiarity with active research areas in connection with the study of algorithms.

BOOKS RECOMMENDED:

1. T. Cormen, C. Leiserson, R. Rivest, and C. Stein. Introduction to Algorithms. (3rd Ed). MIT Press, McGraw-Hill, 2010.
2. M.T. Goodrich, R. Tamassia, “Algorithm design – Foundations, Analysis, and Internet Examples”, John Wiley, Second Edition.
3. V. V. Vazirani, Approximation Algorithms, Springer, 2001;
3. **Network Flows: Theory, Algorithms, And Applications**
3. Horowitz, Sahni, Rajasekaran, “Fundamentals of Computer Algorithms”, Second Edition, University Press, 2007.
4. Aho, A V Hopcraft Ullman JD, “The Design and analysis of computer Algorithms”, Pearson Education, 2007.

LIST OF PRACTICAL ASSIGNMENTS:

Practical assignments will be based on:

1. Performance analysis
2. Solving problems using design techniques discussed
3. Solution of network flow problems
4. Approximation algorithms
5. String matching algorithms
6. Combinatorial optimization problems
7. TSP problem
8. solving some real world problems using the skill gained in the course
9. study of NP-Complete, NP-Hard problems
10. Any other emerging/ active research problems in the area in consultation with the instructor.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SE1C2 Object Oriented Analysis and Design</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

This course offers the opportunity to students to become skilled at the object oriented analysis and design. This is essential as it is the core of the software development process. This course shall help the student to comprehend the principles of object orientation and apply them as the solution for the real life problems in the form of object oriented design. At the end of the course the students shall be able to design a solution which works and solves software development problems.

Pre requisites:

1. Programming knowledge in any of the object oriented languages like C++, Java.
2. Familiarity and ease with data structures.

Unit I: **Introduction to Modelling and UML 2.X**

Importance of Modelling, Principles of Modelling, Object Oriented Modelling, Conceptual model of the UML, Architecture, Software Development Life Cycle

Unit 2: **Basic and Advanced Structural Modelling**

Basic Structural Modelling: Classes, Relationships, Common Mechanisms and Diagrams. Advanced Structural Modelling: Advanced Classes, Advanced Relationships, Interfaces, Types and Roles, Packages

Unit 3: Class & Object Diagrams

Class & Object Diagrams: Terms, Concepts, Modelling Techniques for Class and Object Diagrams

Unit 4: **Basic Behavioural Modelling**

Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams, Events and Signals, State Machines, Processes and Threads, Time and Space Diagram, State Chart Diagrams

Unit 5: Architectural Modelling

Architectural Modelling: Component, Deployment, Component Diagrams and Deployment Diagrams, Case Study, Issues in OO Testing

TEXT BOOKS:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.

REFERENCE BOOKS:

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modelling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
3.AtulKahate Object Oriented Analysis & Design, The McGraw-Hill Companies.
4.Object-Oriented Analysis and Design with the Unified Process By John W. Satzinger, Robert B Jackson and Stephen D Burd, Cengage Learning.

Learning Outcomes

Students become skilled at the object oriented analysis and design. This is essential as it is the core of the software development process. Students will be comprehend the principles of object orientation and apply them as the solution for the real life problems in the form of object oriented design. Students shall be able to design a solution which works and solves software development problems.

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<tr><td rowspan="2">SER1C3
Software Construction</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Outcomes:

The aim of the course is to help the student be able to understand the real world problems. The student shall be able to solve the complexity of the problem and also depict the problem with the help of standard UML diagrams. In the process of software design the student shall be able to appreciate the application of diagrams, iterative approach which helps in improving the software quality.

Objective: To gain the knowledge for advance programming using JAVA

UNIT I

Object Oriented Concepts, Merits of Object Oriented Technology. Introduction to JAVA and its Applications on the Internet. Constructors & constructor overloading, Access modifiers: Class Attributes and methods. Introduction to object model of software development.

UNIT II

Introduction to Java classes and objects, Java features, data types data type conversions & control Statements Operators and their precedence. Introduction to Class, Instance members and member Functions.

UNIT III

String Handling, Wrapper classes Arrays and Vectors Inheritance and Polymorphism Class relationships Inheritance and its types Merits and Demerits of Inheritance Introduction to Association, inheritance Polymorphism Dynamic method dispatch Runtime polymorphism Abstract classes, Interfaces packages

UNIT IV

Java I/O, Basic concept I/O stream reader-writer Exceptions: Need for exceptions hecked exceptions Unchecked exceptions Creating exceptions Multithreading Introduction, Priorities and scheduling of Threads Thread Synchronization and its life cycle Applet and its Life Cycle.

UNIT V

Server side programming:- Java servlets, Java Server pages, Web application development using Java, Database handling with Java.

Text Books:

1. Herbert Schildt, Java: The Complete Reference, 8th Edition
2. Programming with java by e Balagurusamy

Learning Outcomes:

The aim of the course is to help the student be able to understand the real world problems. The student shall be able to solve the complexity of the problem and also depict the problem with the help of standard UML diagrams. In the process of software design the student shall be able to appreciate the application of diagrams, iterative approach which helps in improving the software quality.

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<tr><td rowspan="2">SER1G1
Soft Computing</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

1. To familiarize with neural networks and learning methods for neural networks.
2. To introduce basics of genetic algorithms and their applications in optimization and planning.
3. To introduce the ideas of fuzzy sets, fuzzy logic and fuzzy inference system.
4. To develop skills thorough understanding of the theoretical and practical aspects of Soft Computing.

Pre requisites: Analysis of Algorithm, Artificial Intelligence.

COURSE CONTENTS

UNIT-I

INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS

Evolution of Computing ,Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing, Machine Learning Basics and Fundamentals of Neural Networks and Application.

UNIT-II

NEURAL NETWORKS

Backpropagation Networks, Architecture: perceptron model, single layer artificial neural network, multilayer perception model; backpropagation learning methods, effect of learning rule coefficient, backpropagation algorithm, factors affecting backpropagation training, Associative memory, Adaptive Resonance Theory.

UNIT-III

GENETIC ALGORITHMS

Genetic Algorithm(GA) Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, probability of crossover and probability of mutation, convergence. The Scheme Theorem – Classification of Genetic Algorithm – Holland Classifier Systems. Simulated annealing and stochastic models, Boltzmann Machine, Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm, Image processing and pattern Recognition.

UNIT-IV

FUZZY LOGIC

Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzyfications&Defuzzificataions, Fuzzy Controller, Industrial applications Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT-V

NEURO, FUZZY MODELING

Adaptive Neuro, Fuzzy Inference Systems Coactive Neuro, Fuzzy Modeling, Classification and Regression Trees Data Clustering Algorithms, Rulebase Structure, Identification , Neuro Fu zzy Control , Case studies.

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Identify and describe soft computing techniques and their roles in building intelligent machines.
2. Apply neural networks to pattern classification and regression problems
3. Recognize the feasibility of applying a soft computing methodology for a particular problem
4. Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
5. Apply genetic algorithms to combinatorial optimization problems.

BOOKS RECOMMENDED:

[1] S. Rajasekaran and G.A.VijaylakshmiPai.. Neural Networks Fuzzy Logic, and Genetic Algorithms, Prentice Hall of India.

[2] Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.

[3] Neural Networks and Fuzzy Systems: Dynamical Systems Application to Machine Intelligence - Bart Kosko, Prentice Hall, 1992.

[4] Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998.

[5] David E. Goldberg, “Genetic Algorithms in search, Optimization & Machine Learning” ,Addison-Wesley, 1997.

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<tr><td rowspan="2">SER1G3
ADVANCE COMPUTER ARCHITECTURE</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

1. To familiarize with current trends in high performance computing.
2. To introduce quantitative analysis of computer architectures

Pre requisites: Computer organization

Unit 1: Introduction to Computer Architecture& Quantitative Analysis

Generations of Computers, Definition of Computer Architecture, General trends in technology, power and cost. Measuring, Reporting, and Summarizing performance. Quantitative principles of computer design.

Unit 2 : Pipelining & Instruction level Parallelism

Need of pipelining, Pipeline Hazards, Implementation issues, Overcoming Pipeline hazards, pipeline extension to support multicycle operations. Concepts and challenges in ILP, Compiler techniques for ILP, Dynamic Scheduling, and Hardware based Speculation, Combining dynamic scheduling, multiple issue and speculation.

Unit 3: Memory Hierarchy Design

Introduction, Optimizations for improving Cache performance, Memory technology and optimizations, Virtual Memory protection and performance issues, Virtual machines protection.

Unit 4: Data level Parallelism and Thread level Parallelism

Introduction, Vector architecture, Graphics Processing Units, Detecting and enhancing loop-level parallelism, Centralized shared memory architecture, Shared Memory multiprocessors performance, distributed shared memory and directory-based coherence, models of memory consistency.

Unit 5: Interconnection Networks

Introduction, Connecting two or more devices, network topology, network routing, arbitration, and switching, Examples of interconnection networks, internetworking issues.

Case Study: MIPS Processor

Books Recommended

1. J. Hennessy & D. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann Series, 5th Edition, 2011.
2. Kai Hwang, Advance Computer Architecture: Parallelism, Scalability, Programmability, Mcgraw Hill Computer Science Series, 1992.
3. D. Sima& T. Fountain & P. Kacsuk, Advance Computer Architectures: A Design Space Approach, 1st Edition, Pearson Education, 2002.
4. J. Hayes, Computer Architecture and Organization, Mcgraw Hill Education Series (India), 2012.

Learning Outcomes:
1.
Upon Completing the Course, Student will able to:

2. Learn the current trends in high performance computing.
3. Learn the quantitative analysis of computer architectures
4. Learn about Pipeline Hazards, Implementation issues, Overcoming Pipeline hazards
5. Pipeline Hazards, Implementation issues, Overcoming Pipeline hazards
6. Vector architecture, Graphics Processing Units, Detecting and enhancing loop-level parallelism,

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SER1E1
DATBASE ENGINEERING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To understand how transactions are executed and concurrency mechanisms are used in practice.
- To understand how DBMS process queries and how it estimates the cost of query optimization.
- To understand how DBMS maintains data records and access paths.
- To understand the need and use of distributed database systems in practice.
- To familiarize with the emerging technologies of databases.

Prerequisites: Introductory knowledge of Database Systems.

COURSE CONTENTS

Unit-I

Transaction Processing & Concurrency Control: Introduction to Transaction Processing, Transaction Properties, Transaction recoverability and serializability, Transaction Support in SQL, Introduction to Concurrency Control, Two-phase locking, Timestamp ordering, Validation and other issues.

Unit-II

Query Processing & Optimization: Introduction, Translating SQL queries, Algorithms – External Sorting, Select, Join and Project operations, Aggregate and Outer Joins, Heuristics for Query optimization, Estimating cost in query optimization, Semantic optimization, Optimization used in practice.

Unit-III

Data Storage and Querying: File organization, Organization of records, Indexing and Hashing – Basic concepts, B+-tree index files, Static and dynamic hashing, comparison of indexing and hashing etc.

Unit-IV

Distributed Databases: Concepts, Techniques for Distributed database design – Data fragmentation, replication, and allocation techniques; Types of Distributed Systems, Query processing in Distributed Databases, Concurrency control & Recovery in Distributed Databases, Distributed Databases in MySQL.

Unit-V

Advance Topics: Information Retrieval and XML data, Spatial data management, NoSQL – Diffrences from Relational Databases, Theory, Key-Value Databases, Graph Databases etc.

Books Recommended:

1. Fundamentals of Database Systems, By R. Elmasri and S. Navathe, 6^{th} Ed. Pearson Education, 2010.
2. Database Management Systems, R. Ramkrishnan and J. Gehrke, 3^{rd} Edition, McGraw Hill Education, 2014.
3. Database System Concepts, By A. Silberschatz, H. Korth and S. Sudarshan, 6^{th} Ed. McGraw Hill Education, 2013.
4. Database Systems, By T. Connolly and C. Begg, 4^{th} Edition, Pearson Education, 2008.

List of Assignments:

During the learning of course, students need to do assignments:

1. Solving intermediate SQL queries involving join expressions, views and transaction support.
2. Using PL/SQL constructs involving procedures, triggers, recursive queries etc.
5. Assignment on Query processing and indexing.
4. Using concurrency and transactions
6. Distributed database support in MySQL or PostgreSQL.

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Understand how transactions are executed and concurrency mechanisms are used in practice.
2. Understand how DBMS process queries and how it estimates the cost of query optimization.
3. Understand how DBMS maintains data records and access paths.
4. Understand the need and use of distributed database systems in practice.
5. Understand and familiarize with the emerging technologies of databases.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SER1E2
Big data analytics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

LEARNING OBJECTIVES:

1. To increase knowledge of the Big Data landscape.
2. Develop a comprehensive knowledge R and to use R for effective data analysis.
3. Develop skills in independent managing Big data projects and related issues.
4. Develop ability to carry out research in area of Big Data.

Pre requisites: Some programming experience (in any language) is recommended.

COURSE CONTENTS

UNIT-I

Introduction to Big Data: Overview of Big Data, Characteristics of Big Data, Sources of Big data, Five V's of Big Data, Examples of Big Data, Advantages of Big Data, Big Data Applications, Strategies of Big Data, challenges Process of Data Analysis.

UNIT II

Introduction R : Overview and History of R, R Console Input and Evaluation, Data Types - R Objects and Attributes, Vectors and Lists, Matrices, Factors, Missing Values, Data Frames, Names Attribute, Reading Tabular Data, Reading Large Tables, Textual Data Formats, Connections: Interfaces to the Outside World.

Unit III

Programming with R: Subsetting – Basics, Lists, Matrices, Partial Matching, Removing Missing Values, Vectorized Operations. Control Structures - If-else, For loops, While loops, Repeat, Next, Break, Functions, Scoping Rules - Symbol Binding, R Scoping Rules, Coding Standards, Dates and Times

Unit IV

Loop Functions and Debugging : Loop Functions – lapply, apply, mapply, tapply, split, Debugging Tools - Diagnosing the Problem, Basic Tools, Using the Tools

Unit V

Developing Data Products : Introduction to Data Products, Intro to rCharts and GoogleVis, rCharts introduction, rCharts examples, rCharts mapping, GoogleVis, plotly, Interactive graphics

LEARNING OUTCOMES:

Upon completing the course, students will be able to:

1. Apply Knowledge of Big Data to solve real world big data problems.
2. Understand the fundamentals of 'R' programming
3. Work on a real life Project, implementing R Analytics to create Business Insights.
4. Apply Data Visualization to create fancy plots
5. Undergo into further research in Big Data.

BOOKS RECOMMENDED:

1. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Todays Businesses, Michael Minelli, Michele Chambers, AmbigaDhira, Wiley India Pvt Ltd, 2013.
2. R for Everyone: Advanced Analytics and Graphics, 1st Ed., Jared P. Lander, Pearson Education, Inc., 2014.
3. Big Data Analytics with R and Hadoop, Vignesh Prajapati, Packt Publishing Ltd, 2013.
4. Big Data Analytics: Turning Big Data into Big Money, Frank J. Ohlhorst, Wiley, 2012.
5. Creating Value with Big Data Analytics: Making Smarter Marketing Decisions, Peter C. Verhoef, Edwin Kooge, Natasha Walk, Taylor & Francis, 2016.

List of Practical/ Programming Assignments: (if applicable)

During the learning of course, students need to do assignments:

1 To learn the R Programming language.

2 To explore Rstudio for solving the Big data problems.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				I Year M.E. (Computer Engineering Sp. in Software Engineering) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
SER2C1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Software Project Planning and Management	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

This course provides the knowledge for correct software development life cycle, create realistic project plans, and manage a software development team through each phase of the project.

The purpose of software project planning and management is to forecast many hazards and risks and problems as possible. The student shall be to plan, organize and control activities so that the project is completed as successfully as possible in spite of all the risks.

Pre-requisites:

A course on software engineering and practical experience of handling college projects.

COURSE CONTENTS

UNIT-I: Introduction to Software Project Management

Project Definition, Contract Management, Activities Covered by Software ProjectManagement, Overview of Project Planning, Stepwise Project Planning

UNIT-II: Project Evaluation

Strategic Assessment, Technical Assessment, Cost Benefit Analysis, Cash FlowForecasting, Cost Benefit Evaluation Techniques, Risk Evaluation

UNIT-III: Activity Planning

Objectives, Project Schedule, Sequencing and Scheduling Activities, NetworkPlanning Models, Forward Pass, Backward Pass , Activity Float, Shortening ProjectDuration , Activity on Arrow Networks , Risk Management , Nature of Risk , Types ofRisk , Managing Risk , Hazard Identification , Hazard Analysis , Risk Planning andControl.

UNIT-IV: Monitoring and Control

Creating Framework, Collecting the Data, Visualizing Progress, Cost Monitoring, Earned Value, Prioritizing Monitoring, Getting the Project Back to Target, Change Control, Managing Contracts, Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management , Acceptance**.**

UNIT-V:Managing People and Organizing Teams

Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation,The Oldman, Hackman Job

Characteristics Model, Working In Groups, Becominga Team, Decision Making, Leadership, Organizational Structures, Stress, Healthand safety, case studies.

Text Books:

1. Bob Hughes, Mikecotterell, “Software Project Management”, Third Edition, Tata McGraw Hill, 2004.

REFERENCE Books

1. Ramesh, Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2001.
2. Royce, “Software Project Management”, Pearson Education, 1999.
3. Jalote, “Software Project Management in Practice”, Pearson Education, 2002.

Learning Outcomes:

The aim of the course is to help the student to be a responsible member of the software development team. The student after completion of the course shall be able to comprehend project problems and apply the knowledge on projects and software development. The student also shall be aware of the conditions and constraints such as resources, time, cost and quality.

Learning Outcomes:

The aim of the course is to help the student to be a responsible member of the software development team. The student after completion of the course shall be able to comprehend project problems and apply the knowledge on projects and software development. The student also shall be aware of the conditions and constraints such as resources, time, cost and quality

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">I Year M.E. (Computer Engineering Sp. in Software Engineering)

(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SER2C2
Design Pattern</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives: To strengthen the knowledge of Object Oriented Design and Development by understanding various design patterns.

Pre requisites: Knowledge of object oriented system concepts, object oriented analysis and modeling and object oriented programming.

COURSE CONTENTS

UNIT-I

Introduction to Software Patterns, Overview of UML, Class Diagrams, Collaboration Diagrams, State chart Diagram, Deployment Diagram, Fundamental Design Patterns: Delegation, Interface, Abstract Super-class, Interface and Abstract class, Immutable, Marker Interface.

UNIT-II

Simple Factory pattern, Factory Method, Abstract Factory, Builder, Prototype, Singleton

UNIT-III

Adaptor, Bridge, Composite, Façade, Flyweight, Decorator, Proxy Pattern

UNIT-IV

Chain of Responsibility, Command, Interpreter, Mediator, Memento Pattern

UNIT-V

Observer, State, Strategy, Template Method, Visitor, Iterator Pattern.

Learning Outcomes: To learn Various Design Patterns and learn their application in real software development..

BOOKS RECOMMENDED:

[1]. Gamma, Helm, Johnson, Vlissides, Design Patterns. Elements of Reusable Software., Pearson Education 2006
[2]. Cooper, J. W., Java Design Patterns, A Tutorial, Pearson Education, 2000.
[3]. Freeman, Freeman, Head First Design Patterns, O'Reilly Pub. 2007
[4]. Mark Grand, Patterns in Java Vol. 1, Wiley 2002
[5]. Mark Grand, Patterns in Java Vol. 2, Wiley 2002
[6]. Mark Grand, Patterns in Java Vol. 3, Wiley 2002
[7]. Douglas Schmidt, Pattern Oriented Software Architecture Vol1, John Wiley 2000, also called as POSA

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">I Year M.E. (Computer Engineering Sp. in Software Engineering)

(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SER2C3
Software Testing & QA</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives: To develop a skill in developing good quality in the software product.

Pre requisites: Basic knowledge of software Engineering and programming.

COURSE CONTENTS

UNIT-I

SOFTWARE TESTING PRINCIPLES: Need for testing - Psychology of testing - Testing economics – Various software development Life cycles (SDLC) –Principles of testing.

UNIT-II

WHITE BOX TESTING White box testing techniques - Statement coverage - Branch Coverage - Condition coverage - Decision/Condition coverage - Multiple condition coverage - Dataflow coverage - Mutation testing - Automated code coverage analysis

UNIT-III

BLACK BOX TESTING: Black box testing techniques - Boundary value analysis - Robustness testing - Equivalence partitioning -Syntax testing - Finite state testing - Levels of testing – Unit testing- Integration Testing

UNIT-IV

TESTING STRETAGIES: System testing - Functional testing-non-Functional testing-acceptance testing-performance testing –Factors and Methodology for Performance testing, Regression testing-Methodology for Regression-testing.

UNIT-V

ADVANCE SOFTWARE TESTING METHOD (OBJECT ORIENTED TESTING): Syntax testing - Finite state testing - Levels of testing - Unit, Integration and System Testing. Challenges - Differences from testing non-OO Software - Class testing strategies - State-based Testing Software quality Assurance: ISO 9000; CMM and Test Management Issues; Quality Assurance personnel Issues.

Learning Outcomes: To learn to Software Testing & QA concepts and its approaches to software Testing and QA.

.

BOOKS RECOMMENDED:

[1]. Srinivasan Desikan&Gopalswamy Ramesh “Software testing Principles and Practices” Pearson education, 2006

[2]. R. Patton; Software Testing; Techmedia (SAMS) 2000

[3]. GlenfordJ.Myers, " The Art of Software Testing ", John Wiley & Sons, 1979.

[4]. Boris Beizer, Black-Box Testing: “Techniques for Functional Testing of Software and Systems ", John Wiley & Sons, 1995.

[5]. P.C.Jorgensen, “Software Testing - A Craftsman’s Approach ", CRC Press, 1995.

[6]. Robert V.Binder, " Testing Object-Oriented Systems: Models Patterns and Tools ", Addison Wesley, 2000.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				I Year M.E. (Computer Engineering Sp. in Software Engineering) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
SER2E1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Speech andLanguageProcessing	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Objective: To gain the knowledge for developing advanced technology of computer systems like speech recognition and machine translation.

Prerequisite: Discrete structures, Finite automata, information retrieval and Context-free Grammar

SPEECH ANDLANGUAGEPROCESSING

UNITI

Natural Language Processing, Applications, Ambiguity, Morphology, Parsing with Finite State Transducers, Regular Expressions, Stemmer, Spelling errors.

UNITII

Computational Phonology: speech sound, phonetic transcription, text to speech; Pronunciation Variations, Bayesian Method to spelling and pronunciations, Minimum Edit Distance, Weighted Automata, N-grams.

UNITIII

HMM and speech recognition, Viterbi algorithm, Acoustic processing of speech, Feature Extraction, Speech Synthesis; Part-of-Speech Tagging: rule based, stochastic, transformation based.

UNITIV

Syntax Processing: Parsing with CFG, CKY parsing and the Earley parser, Probabilistic parsing; Semantic Processing: Meaning representation, First Order Predicate Calculus. Lexical Semantics: Internal structure of words, thematic roles, Primitive decomposition, WordNet.

UNITV

Word sense disambiguation; Information Retrieval: Vector space model, improving user queries; Pragmatic Processing: Discourse; Natural Language Generation, Machine Translation.

TEXTBOOKS:

[1] D. Jurafsky and J.H. Martin; Speech and Language Processing; Processing; Prentice Hall; 2000.

[2] 2. C. Manning and H. Schutze, “Foundations of Statistical Natural Language Processing”,

[3] JamesAllen.“NaturalLanguage Understanding”, AddisonWesley, 1994.

Learning Outcomes:

1. Will able to solve Problem based on Stemming Algorithm.
2. Will able to solve Problem based on Part of Tagging.
3. Will able to solve Problem based on Parsing.
4. Will able to solve Problem based on Information Retrieval.
5. Will able to solve Case study on Different NLP Techniques
6. Can build Cricket Game Prediction application
7. Will able to solve Machine Translation from English-Hindi.
8. Will able to solve Query Expansion for Information Retrieval.
9. Will able to solve Emotion detection for texts.
10. Will able to solve Any other problem based on emerging trends in speech & language processing.

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SER2E3
Machine Learning</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:
The field of machine learning is concerned with the question of how to build computer programs able to construct new knowledge or to improve already possessed knowledge by using input information. The goal of this course is to introduce the theoretical foundations of machine learning, to provide practical experience of applying machine learning techniques and to investigate new problems where machine learning techniques can do better.

Pre requisites: Basic knowledge of a programming language and Basic knowledge of probabilities and statistics is required.

COURSE OF CONTENTS

Unit-I
Introduction: Definition, Applications of machine learning, Importance of machine learning, Aspects of developing a learning system: training data and test data, Issues in machine learning, Types of learning: supervised, unsupervised and Reinforcement learning, Concept learning, General-to-specific ordering of hypotheses. Version spaces and the candidate elimination algorithm.

Unit-II
Supervised Learning: Classification and Regression learning methods**,** Decision Tree Learning**:** Representing concepts as decision trees, ID3 algorithm. Picking the best splitting attribute, searching for simple trees and computational complexity. Regression and function approximation, linear regression and best fit, Order of polynomial, Polynomial regression, Cross validation.

Unit-III

Unsupervised Learning: Introduction to unsupervised learning -Clustering -Classification of clustering algorithms: K-Means and EM -Factor Analysis: PCA (Principal Components Analysis) and ICA (Independent Component Analysis) -Self-Organized Maps (SOM) and Multi-dimensional Scaling.

Unit-IV
Computational Learning theory, Introduction, PAC Learning, VC dimension, Support Vector Machines (SVM), Genetic Algorithm (GA), illustrative examples for SVM and GA.

Unit-V

Artificial Neural Networks Learning, Introduction, Neural Network Representation, Perceptron, Backpropagation algorithm, Examples of Neural Network Learning.

RECOMMENDED BOOKS

[1] Tom Mitchell, *Machine Learning*, McGraw-Hill, 1997.
[2] Richard O. Duda, Peter E. Hart & David G. Stork, *Pattern Classification*, Wiley & Sons, 2001.
[3] EthemAlpaydin, *Introduction to Machine Learning*, MIT Press, 2004.
[4] David E. Goldberg, *Genetic Algorithms in Search, Optimization and Machine Learning,* Kluwer Academic Publishers, Boston, MA, 1989.
[5] ZbigniewMichalewicz, *Genetic Algorithms + Data Structures = Evolution Programs*, Springer, 1999.

Learning Outcomes:

Upon Completing the Course, students will have knowledge of various machine learning techniques useful for solving the real world problems.

List of Assignment in Machine Learning Lab:

1. Problem based on different machine Learning algorithm
2. Works on different machine learning Tools
3. Case Study on different data sets

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">SER2E2 Aspect Oriented Software Engineering</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

The objective of this course is to master basics of aspect-oriented software development, which enables a higher degree of the separation of concerns through crosscutting concern modularization. The course provides an overview of aspect-oriented approaches to software development throughout all of its stages, as well as programming languages connected with these approaches. The course also covers the relationship of aspect-oriented software development and software product lines. Students will gain experience with AspectJ, which is the most important aspect-oriented programming language of today.

Pre-requisite:

Familiarity with Object oriented programming, Object oriented design, UML is essential.

COURSE CONTENTS

Unit 1: Introduction to AOSD

This module provides a broad overview of aspect orientation. It introduces students to the aspect-oriented paradigm's origins and foundations, providing a solid basis and a common terminology to be used in subsequent modules. The fundamental concepts include all major elements of the paradigm: separation of concerns, crosscutting concerns, modularization, aspects, join points, point cuts, advice, and aspectual composition. Module 1's only prerequisite is knowledge of software engineering in some existing, well known paradigm.

Unit 2: Aspect-oriented analysis and design

This module covers a broad spectrum of software development activities, from initial requirements definition to architecture derivation and detailed design production. Each of these life-cycle stages can be realized using various aspect-oriented approaches. This module underlines the problems of tangling and scattering caused by crosscutting concerns in non aspect-oriented analysis and design approaches. It also presents aspect-oriented approaches for aspect identification, modularization, and composition, using several case studies for illustration. An in-depth experience with a particular analysis and design technique and its related tools is a final important goal of the module. Students achieve hands-on experience of aspect-oriented analysis and design through exercises. The prerequisites are Module 1 and familiarity with some requirements engineering, architecture, and design approaches. Knowledge of object-oriented (OO) analysis and design techniques (including UML) is desirable.

Unit 3: Aspect-oriented programming

Several AOP languages exist today, and most are extensions of existing languages. This module focuses on hands-on experience, giving special care to programming practices in AOP. The module covers various aspect languages, highlighting their differences and commonalities to teach students to abstract from concrete languages and understand aspect orientation's essential mechanisms. It also touches on implementing aspect language execution models to help students better understand the impact of aspects on program execution (for example, in terms of performance).The prerequisites are Module 1 and experience in or knowledge about software implementation by means of contemporary languages, preferably in the OO paradigm.

Unit 4: Aspect-oriented applications

Module 5 illustrates the practical use of various aspect-oriented technologies, such as programming languages, aspect-oriented analysis and design, and more generally, any software engineering methodology that embraces aspects. It presents case studies of applications that benefit from AOSD, covering system level elements (such as middleware) and end-to-end user applications (such as e-banking or e-government applications). The module's main subject isn't technologies that create system-level elements and end-to-end user applications; Modules 2 and 3 will have covered these. The prerequisites are Module 1 and, depending on the instantiation, Module 2 and/or Module 3.

Unit 5: AOSD and other paradigms

Aspects are always used in a context. Therefore, to develop applications using aspect-oriented techniques, it's important to relate AOSD to the development paradigms, methodologies, and programming languages that you used to implement the underlying base application. AOSD's context is almost always class-based object orientation. However, as AOSD spreads to other contexts, this relationship will diversify and become more important. Also, other advanced development paradigms have been developed that can be related to AOSD, either because they're complementary or because they target the same problems as AOSD (albeit differently). This module provides insights into the relationship between AOSD and these other advanced development paradigms (for example, development methodologies other than the OO paradigm), different general-purpose programming languages for the base code, and component-oriented software engineering. The prerequisites are Module 1 and at least one other module.

Text Books:

1. Ivar Jacobson and Pan-Wei Ng. Aspect-Oriented Software Development with Use Cases. Addison-Wesley, 2004.
2. RamnivasLaddad. AspectJ in Action: Enterprise AOP with Spring Applications. Second edition, Manning, 2009.
3. Mastering AspectJ: Aspect-Oriented Programming in JavaBy Joseph D. Gradecki, Nicholas Lesiecki, Wiley 2003

Reference Books:

1. Robert E. Filman et al. Aspect-Oriented Software Development. Addison-Wesley, 2004.
2. Siobhan Clarke and Elisa Baniassad. Aspect-Oriented Analysis and Design: The Theme Approach. Addison-Wesley, 2005.
3. Aspect-oriented Programming with AspectJ. Ivan Kiselev, Sams, 2003

Learning Outcomes:

The students after completion of the course shall be having the knowledge of aspect-oriented software development, which enables a higher degree of the separation of concerns through crosscutting concern modularization. Students will be able to build solutions with AspectJ on completion of the course.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				I Year M.E. (Computer Engineering Sp. in Software Engineering) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
SER2G1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Data Mining & Warehousing	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Objectives:

· To develop the abilities of critical analysis to data mining systems and applications.
· To implement practical and theoretical understanding of the technologies for data mining
· To understand the strengths and limitations of various data mining models.

Unit-I

Data Mining -Introduction: Data Mining Primitives, Languages, and System Architectures: Data mining primitives, Query language, Designing GUI based on a data mining query language, Knowledge Discovery in Databases (KDD), KDD Process, Data Pre-processing, Data Cleaning, Data Transformation, Data Compression and Dimension Reduction, Principal Component Analysis, Binning Methods.

Unit-II

Data Warehousing –Introduction and Design: Overview and Concepts: Need for data warehousing, basic elements of data warehousing, Architecture and Infrastructure: Architectural components, Infrastructure and metadata. Data Design And Data Representation: Principles of dimensional modelling, Dimensional modelling, data extraction, transformation and loading, data quality. OLAP in data warehouse –ROLAP, MOLAP, HOLAP. OLTP Vs OLAP, Various Data Warehouse Schemas.

UNIT-III

Association & Classification Techniques: Introduction, Frequent itemset mining methods – Apriori, FP-Growth, Pattern evaluation methods, Basic concepts of classification, Decision tree induction, Bayes classification, Rule-based classification.

UNIT-IV

Clustering Techniques: Introduction, Clustering paradigms; Partitioning algorithms – K-Means, K-Medioid, CLARA; Partition based clustering – BIRCH; Density based clustering - DBSCAN; Categorical clustering algorithms, Evaluation of Clustering.

UNIT-V

Other DM techniques & Web Mining: Spatial Mining, Spatial Mining tasks, Spatial clustering, Spatial Trends. Web Mining : Introduction Web content mining, Web structure Mining, Web Usage Mining.

Temporal and spatial DM: Temporal association rules, Sequence Mining, GSP, SPADE, SPIRIT, and WUM algorithms, Episode Discovery, Event prediction, Time series analysis.

Reference Books:

1. Data Mining Techniques; ArunK.Pujari ; University Press.
2. Data Mining Concepts and Techniques, Jiawei Hang Micheline Kamber,Jianpei, Morgan Kaufmannn.
3. Data Mining; Adriaans&Zantinge; Pearson education.
4. Mastering Data Mining; Berry Linoff; Wiley.
5. PaulrajPonniah, “Data Warehousing Fundamentals”, John Wiley.
6. Text Mining Applications, Konchandy, Cengage

Learning Outcomes:

1. Will able to develop the abilities of critical analysis to data mining systems and applications.
2. Will able to develop practical and theoretical understanding of the technologies for data mining
3. Understand the strengths and limitations of various data mining models.

M. E. Electronics (Specialization in Digital Instrumentation) (FULL TIME)
Curriculum & Syllabus
Batch 2015– 2016 and onwards

S. No.	Category	No. of Credits			
		SEM I	SEM II	SEM III	SEM IV
1.	Course Compulsory	15	15	-	-
2.	Generic Elective	4	4	-	-
3.	Programme Elective	5	5	-	-
4.	Skill development	2	2	-	-
5.	Seminar/ Workshop	2	2	-	-
6.	Dissertation Phase	-	-	12	12
Actual Credits per Semester		**28**	**28**	**12**	**12**
Total actual Programme Credits					**80**
7.	Virtual Credit Comprehensive Viva	4	4	4	4
Total Credits per Semester		**32**	**32**	**16**	**16**
Total (Actual + Virtual) Credits					**96**

M.E Electronics (Specialization in Digital Instrumentation) (Full Time)
Proposed Scheme for CBCS

SEM I				
S.NO	Sub Code	Sub Name	Number of Credit L-T-I	Sub Type
1.	DIR1C1	Industrial Transducers & Smart Sensors	3-1-1	PC1
2.	DIR1C2	Embedded System using ARM Micro controller	3-1-1	PC2
3.	DIR1C3	Modern Control Systems	3-1-1	PC3
4.	DIR1GX	Generic Elective I	3-1-0	GE1
5.	DIR1EX	Elective I	3-1-1	PE1
6.	ASR1S1	Soft Skills -1	2-0-0	
7.	DIR1W1	Seminar / Workshop / Research Tool	0-2-0	
8.	DIR1V1	Comprehensive Viva I	0-0-4	
Total Credit for SEM I			**28 actual + 4 Virtual credits**	
		List of Generic Elective I		
1.	DIR1G1	Advance System Design	3-1-0	
2.	DIR1G2	Wireless Sensor Network	3-1-0	
3.	DIR1G3	Advanced Communication Networks	3-1-0	
4.	DIR1G4	Medical Instrumentation	3-1-0	
		List of Elective I		
1.	DIR1E1	Fuzzy Logic & Neural Network	3-1-1	
2.	DIR1E2	Object Oriented Programming	3-1-1	
3.	DIR1E3	Nano Devices and Nano sensors	3-1-1	
4.	DIR1E4	Advance Digital Signal Processing	3-1-1	
SEM II				
1.	DIR2C1	Digital Image Processing	3-1-1	PC4
2.	DIR2C2	Process Instrumentation & Industrial Control	3-1-1	PC5
3.	DIR2C3	System Design Using Verilog	3-1-1	PC6
4.	DIR2GX	Generic Elective II	3-1-0	GE2
5.	DIR2EX	Elective II	3-1-1	PE2
6.	ASR2S2	Soft Skills -2	2-0-0	
7.	DIR2W2	Seminar / Workshop / Research Tools	0-2-0	
8.	DIR2V2	Comprehensive Viva I	0-0-4	
Total Credit for SEM II			**28 actual + 4 Virtual credits**	
		List of Generic Elective II		
1.	DIR2G1	Software Engineering	3-1-0	
2.	DIR2G2	Embedded RTOS	3-1-0	
3.	DIR2G3	Modeling and Simulation	3-1-0	
4.	DIR2G4	Industrial Communication	3-1-0	
		List of Elective II		
1.	DIR2E1	Analog and Digital VLSI Circuit Design	3-1-1	
2.	DIR2E2	Analytical Instrumentation	3-1-1	
3.	DIR2E3	Optical and Laser Instrumentation	3-1-1	
4.	DIR2E4	Advanced Industrial Drives and Control	3-1-1	

Sem I

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">ME I Year Electronics
(Sp. Digital Instrumentation)
Semester- A</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>DIR1C1: Industrial Transducers and smart Sensors</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td><td>3</td><td>1</td><td>2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
</table>

Learning Objective:

- Acquire the knowledge of basic principles of sensing various parameters. Learn comparative methods of selection of sensors for typicalapplications

Prerequisite: Nil

COURSE CONTENT

Unit I

Temperature Measurement: Classification of temperature sensors, working principle, types, materials, Non electrical sensors (thermometer, thermostat), electrical sensors (RTD, thermocouple, thermistors), radiation sensors (pyrometers), temperature switch.

Pressure Measurement: Definition, working principle, types, materials, manometers, elastic pressure sensors, secondary pressure sensors, differential pressure sensors, force balance type, motion balance type, capacitive (delta cell), ring balance, vibrating cylinder type, high-pressure sensors, low-pressure sensors, pressure switch.

Unit II

Level Measurement: Working principle, types, materials, float, displacers, bubbler, and DP- cell, ultrasonic, capacitive, microwave, radar, radioactive type, laser type transducers, level gages, resistance, thermal, TDR/ PDS type, solid level detectors, fiber optic level detectors, level switch.

Flow Measurement: Working principle, types, materials, primary or quantity meters (positive displacement flow meter), secondary or rate meter (obstruction type, variable area type), electrical flow sensors (turbine type, electromagnetic type, and ultrasonic type), Flow switch.

Unit III

Force and Torque Measurement: Basic methods of force measurement, elastic force traducers, strain gauge, load cells, shear web, piezoelectric force transducers, vibrating wire force transducers, strain gauge torque meter, Inductive torque meter, magneto-strictive transducers, torsion bar dynamometer, etc. Dynamometer (servo control and absorption) instantaneous power measurement and alternator power measurement.

Unit IV

Allied Sensors: Standards, working principle, types, materials, design criterion: Lleak detector, flame detector, smoke detector, humidity, density, viscosity sensors, and digital transducers, sound sensors, and proximity sensors.

Advanced sensors: Working Principle, types, materials: Smart sensors, MEMS, nano sensors IC sensors, optical fiber sensors.

Unit V

Industrial Communication Systems: Introduction to interface, fieldbus, PROFIBUS-PA, foundation fieldbus.

Leaning Outcomes:

After the completion of Course student will be able to:

- They can perform the analysis on pressure measurement and temperature measurement.
- They can make industry oriented research on the various topics covered in the various topics

Reference books:

[1] B. C. Nakra and K. K. Choudhari, “Instrumentation Measurements and Analysis”, Tata McGraw Hill Education, Second ed.,2004.
[2] SabrieSoloman, “Sensors Handbook”, McGraw Hill Publication, First ed., 1998.
[3] A. K. Sawhney, “Electrical & Electronic Instruments & Measurement”, DhanpatRai and Sons, Eleventh ed., 2000.
[4] Dr. D. S. Kumar, “Mechanical Measurements and Control”, 3/e, Reprint-2004, Metropolitan Book Co. Private

Ltd.,2004.
[5] B. E. Noltingk, “Instrumentation Reference Book”, 2nd Edition, Butterworth Heinemann, 1995.
[6] B. G. Liptak, “Process software and digital networks”, 3rd Edition, CRC press,Florida.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				ME I Year Electronics (Sp. Digital Instrumentation) Semester- A			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DIR1C2: Embedded System using ARM Microcontroller	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3Hours	**3**	**1**	**2**	**3**	**1**	**1**	**5**

Learning Objectives:

- The objective of this course is to teach students design and interfacing of ARM microcontroller- based embedded systems. High-level languages are used to interface the ARM microcontrollers to various applications. There are extensive hands-onlabs/projects.

Prerequisite: Knowledge of Microprocessor and C++ Programming

COURSE CONTENTS

Unit I

Introduction: Definition of embedded system, embedded systems vsgeneral computing systems, major application areas, purpose of embedded systems, characteristics and quality attributes of embedded systems, core of the embedded system: general purpose and domain specific processors, embedded system architecture: RISC and CISC, RISC: Introduction of ARM processors, evolution of ARM, ARM design philosophy, ARM processor fundamentals: data flow model, registers, program status register, pipeline, interrupts and vector table, ARM processor families andnomenclature.

Unit II

ARM Basic Instruction Set: Introduction to 32 bit programming, instruction set, architecture of ARM, addressing modes, data processing instructions, branch instructions, load and store instructions, conditional instructions, PSR instructions, stack instructions.

Unit III

ARM Thumb Instruction Set: Overview, branch instructions, data processing instructions, status register access instructions, single register load and store instructions, multiple register load and store instructions, semaphore instructions, coprocessor instructions, stack instructions, interrupt instructions.

UNIT IV

ARM Programming: Assembly language programming: Directives-AREA, ENTRY, END etc., Assembly code using instruction scheduling, register allocation, conditional execution and loops. C programming for ARM: Simple C program using function, pointers, structures, etc, exception handling, interrupts, interrupt handling schemes.

Unit V

Interfacing and Applications: Programs for LCD display, PWM, ADC, DAC application, measurement and control of physical parameter as temperature, stepper motor control, DC motor control etc.

Learning Outcomes:

After the completion of Course student will be able to:

- They can perform the analysis on different types of application development process like LCD display etc.
- They can make industry oriented research on the various topics with the help ofAssembly language programming and other technology used in the syllabus. Well understanding of architecture of ARM will be developed that will be help full in future development of the application

Reference Books:

[1] Andrew N. Sloss , "ARM System Developer's Guide Designing and Optimizing System Software", Elsevier publication,2004.

[2] Par Furber, "Arm System-On-Chip Architecture", 2/E , Pearson Education Limited,2000.

[3] Par SantanuChatttopadhyay, "EMBEDDED SYSTEM DESIGN", PHI Learning Private Ltd.,2013.

[4] Jonathan W. Valvano, "Embedded Microcomputer Systems, Real Time Interfacing, Brookes /Cole, 1999.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				ME I Year Electronics (Sp. Digital Instrumentation) Semester- A			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DIR1C3: Modern Control Systems	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3Hours	**3**	**1**	**2**	**3**	**1**	**1**	**5**

Learning Objective: The objective is to give students a clear understanding on characteristics of digital control systems from both frequency and time domain viewpoints. Also to give students the basic knowledge of nonlinear, optimal and adaptive controlsystems.

Prerequisite: Knowledge of classical control methods, Z-tansform, mapping of s-plane to z-plane, & MATLAB control system toolbox

COURSE CONTENTS

Unit I

Data conversion & quantization, Sampling process, mathematical analysis of sampling process, Reconstruction of sampled signal, zero order, first order hold pulse transfer function, Block diagram reduction for systems interconnected through samplers, Sampled Signal flow graphs, Stability definition, Jury's test of stability, extension of Routh-Hurwitz criterion to discrete time systems, steady state error analysis.

Unit II

Root Loci, Frequency domain analysis, Bode plots, Nyquist plots, Gain margin & phase margin, Digital implementation of analog controllers: Digital controller Design: Classical methods, digital PID's, digital lead-lags, dead-beatcontroller.

Unit III

State space representation of discrete time systems, Solution of state equation, Pulse transfer function from state equation, Response between sampling instant using state model, observability, controllability, useful transformation in state space, pole placement methods, controller implementations, State observers.

Unit IV

Non Linear Control Design: Introduction, General properties of linear and nonlinear systems, describing function analysis: Definition, limitations, use of describing function for stability analysis, describing function of ideal relay, relay with hystersis, dead zone, saturation, coulomb friction and backlash, Phase Plane Analysis, phase portrait of second order nonlinear systems, limit cycle, Equilibrium finding, Stability of Nonlinear Systems: Liapunov Theorems, An Overview of Kalman FilterTheory.

Unit V

Adaptive control: Model reference control. Identification, convergence and stability. Adaptive control of linear systems via state feedback and via output feedback. Adaptive control of nonlinear systems.

Optimal Control Design : Quadratic Optimal Control and Quadratic performance index, Optimal state regulator through the matrix riccati equations, Steady State Quadratic Optimal Control, Calculus of Variations: An Overview, Optimal Control forrmulation using Calculus of Variations, Classical Numerical Methods for Optimal Control, Linear Quadratic Regulator (LQR) Design – I, Linear Quadratic Regulator (LQR) Design –II

Learning Outcomes:

After the completion of Course student will be able to:

- They can perform the analysis on different types of application based on the optimal control design pattern ..
- They can make industry oriented research that will be helpful in making future required products with the help of programming and other technology used in the syllabus.
- Well understanding of Frequency domain analysis will be developed that will be help full in future development of the application.

Reference Books:

[1] Kuo, Digital Control System, 2/e Oxford Press,1992.
[2] Ogata, Discrete – Time Control System, 2/e PHI,1995.
[3] M Gopal, Digital Control System, TMH,1997.

[4] H. K. Khalil, Nonlinear Systems, 3/e, Prentice Hall,2002.
[5] JasbirArrora, Introduction to Optimum Design, third edition, Elsevier.2003
[6] N Andreasson , A Evgrafov , M Patriksson , An Introduction to Continuous Optimization, OverseasPress, India Pvt. Ltd. 2006
[7] D. S. Naidu, Optimal Control System, CRC Press,2003
[8] Arturo Locatelli, Optimal control: An introduction ,BirkhauserVerlag,2001.
[9] K.S. Narendra and A.M. Annaswamy, Stable Adaptive Systems, Prentice-Hall,1989.
[10] P. A. Ioannou and J. Sun, Robust Adaptive Control, Prentice-Hall, 1995 (available now at http://www.rcf.usc.edu/~ioannou/RobustAdaptiveBook95pdf/Robust_Adaptive_Control.pdf)

List of Generic Elective I

Devi Ahilya University, Indore, India Institute of Engineering & Technology				ME I Year Electronics (Sp. Digital Instrumentation) Semester- A			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DIR1G1: Advance System Design	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**0**	**3**	**1**	**0**	**4**

Learning Objective:
To provide an in-depth knowledge regarding designing of advance digital system. To emphasizeon system design for timing and performance trade off.

Prerequisite:
Knowledge of basic digital electronics, state diagrams and graph theory.

COURSE CONTENTS

Unit I
Introduction to digital IC design – full Custom and semi-custom design flow and comparison,
Combinational Logic Design, Synchronous State Machine Design and Analysis, Asynchronous State Machine Design and Analysis, Synthesis and Optimization of Digital Circuit (AREA, POWER AND DELAY). LOW and High Level Synthesis process, optimization of hardware. combinational logic synthesis – Technology independent and technology dependent optimization –Logicsynthesis

Unit II
High level synthesis- Scheduling and allocation-ASAP and ALAP scheduling-Register allocation-Functional Unit allocation-Interconnect path allocation-Hardware description languages-synthesis-register transfer design-Event driven simulation. Low power issues in high level synthesis and logic synthesis.

Unit III
Resource Sharing and Binding, Sharing and Binding for Resource-Dominated Circuits, Resource Sharing in Non-Hierarchical Sequencing Graphs, Resource Sharing in Hierarchical Sequencing Graphs, Register Sharing, Multi-Port Memory Binding, Bus Sharing and Binding, Sharing and Binding for General Circuits, Unconstrained Minimum-AreaBinding.

Unit IV
Subsystem design principles pipelining - Data paths in processor architecture – Standard cell design considerations of adder and multiplier- Timing -Slack delay model – Effect of skew and jitter on timing, Sources of skew and jitter- Clocking disciplines -Wire model- Technology scaling effect on interconnect and -Noise ininterconnects.

Unit V
FPGAs Introduction to FPGA, FPGA Programming technologies, Static SRAM, Anti Fuse, EPROM, EEPROM, Xilinx FPGA (XC2000, XC3000, XC4000 and XC5000), Logic block Architecture. Field Programmable Logic Sequencer, application of FPLS Devices. Programmable Array Logic Series 20, Combinational PAL Devices, Sequential PAL Devices, Arithmetic PAL Devices.

Learning Outcomes:
After the completion of Course student will be able to:

- FPGA Programming technologies will be help full in research and development as per the industry requirement.
- They will performthe high level synthesis on different types of application like Scheduling and allocation-ASAP and ALAP etc.
- They can make industry oriented research that will be helpful in making future required products with the help of programming and other technology used in the syllabus.
- Well understanding of subsystem design principles will be developed that will be help full in development of the application

Reference Books:
[1] John M Yarbrough, “Digital Logic Applications and Design”, Thomsonlearning
[2] Synthesis and optimization of Digital Circuits , Giovanni De Micheli , Tata McGraw HillEdition

[3] Jan M Rabaey, Digital Integrated Circuits - A Design Perspective, Prentice Hall, Second Edition,2005.
[4] NaveedA. Sherwani, Algorithms for VLSI Physical Design Automation, Springer,Thirdedition,1999.

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Devi Ahilya University, Indore, India Institute of Engineering & Technology				ME I Year Electronics (Sp. Digital Instrumentation) Semester- A			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DIR1G2: Wireless Sensor Networks	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**0**	**3**	**1**	**0**	**4**

Learning Objectives: To list various applications of wireless sensor networks, describe the concepts, protocols, and differences underlying the design, implementation, and use of wireless sensor networks, and propose, implement, and evaluate new ideas for solving wireless sensor network design issues.

Prerequisite(s): Computer Networks

COURSE CONTENTS

Unit I

Introduction and Overview of Wireless Sensor Networks: Introduction, Brief Historical Survey of Sensor Networks, and Background of SensorNetwork Technology, AhHoc Networks, Applications of Wireless Sensor Networks:Sensor and Robots, Reconfigurable Sensor Networks, Highway Monitoring, MilitaryApplications,Civil and Environmental Engineering Applications, WildfireInstrumentation, Habitat Monitoring, Nanoscopic Sensor Applications, AnotherTaxonomy of WSN Technology, Basic Sensor Network Architectural Elements, HomeControl, Medical Applications, Basic Wireless Sensor Technology : Introduction,Sensor Node Technology, Sensor Taxonomy, WN Operating Environment, WN Trends,Wireless Network Standards: IEEE 802.15.4, ZigBee, IEE 1451

Unit II

Medium Access Control Protocols for Wireless Sensor Networks: Introduction, Background, Fundamentals of MAC Protocols, MAC Protocols for WSNs:Schedule-Based Protocols, Random Access-Based Protocols, Coordination, ScheduleSynchronization, Adaptive Listening, Access Control and Data Exchange (B -MAC,Box-MAC, Bit-MAC,H-MAC, I-MAC, O-MAC, S-MAC. Ri-MAC, T-MAC, Q-MAC (Querry MAC), Q-MAC (QoS MAC), X-MAC

Unit III

Routing Protocols for Wireless Sensor Networks: Introduction, Data Dissemination and Gathering, Routing Challenges and Design Issuesin Wireless Sensor Networks Network Scale and Time-Varying Characteristics,Resource Constraints, Sensor Applications Data Models, Routing Strategies in WirelessSensor Networks: WSN Routing Techniques, Flooding and Its Variants, SensorProtocols for Information via Negotiation, Low-Energy Adaptive Clustering Hierarchy,Power-Efficient Gathering in Sensor Information Systems, Directed Diffusion,Geographical Routing

Unit IV

Transport Control Protocols and Middle wares for Wireless Sensor Networks: Traditional Transport Control Protocols: TCP (RFC 793), UDP (RFC 768), MobileIP, Introduction, WSN Middleware Principles, Middleware Architecture: ExistingMiddleware: MiLAN (Middleware Linking Applications and Networks), IrisNet(Internet-Scale Resource-Intensive Sensor Networks Services)

Unit V

OperatingSystems for Wireless Sensor Networks: Introduction, Examples of Operating Systems: TinyOS,Mate, MagnetOS

Learning Outcomes:

After the completion of Course student will be able to:

- Deep study of wireless Sensor Networks technologies will be help full in research and development as per the industry requirement.
- Student will have deep knowledge of Medium Access Control Protocols for Wireless Sensor Networks protocol as per the research and analysis requirement.

Reference Books:

[1] Wireless Sensor Network by KazemSohraby, Daniel Minoli, TaiebZnati Pub:Wiley.

[2] Wireless Sensor Networks Signal Processing andCommunications by Ananthram Swami, Qing Zhao, Yao-Win Hong, Lang Tong Pub: John Wiley &Sons.
[3] Ad Hoc Wireless Networks: Architectures And Protocols By Murthy Pub: PearsonEducation
[4] Wireless sensor networks Edited by C. S. Raghavendra Pub:Springer
[5] Fundamentals of Sensor Network Programming: Applications and Technology By Sridhar S.Iyengar, NandanParameshwaran, VirV. Phoha, N. Balakrishnan, Chuka D. Okoye,Wiley

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">ME I Year Electronics
(Sp. Digital Instrumentation)
Semester- A</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DIR1G3: Advanced Communication Networks</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives: To list various applications of WDM networks, describe the concepts, protocols, and differences underlying the design, implementation, and use of optical sensor networks, and propose, implement, and evaluate new ideas for solving optical sensor network design issues.

Prerequisite(s): Optical communication

COURSE CONTENTS

Unit I

Fundamentals of communication Networks: Basics of optical communication and computer networking: services, switching, multiplexing schemes, telecom network overview and architecture, optical networks, WDM optical networks, WDM network evolution, WDM network construction, broadcast and select optical WDM network, Challenges of optical WDM network.

Unit II

Optical network Components: Optical transmitters, semiconductor laser diode, tunable and fixed laser, laser characteristics, photodectors, tunable and fixed optical filters, optical amplifiers and its characteristics, semiconductor laser amplifier, Raman amplifier, doped fiber amplifier, various switching elements, OADM, OXC, architecture, MEMS, wavelength convertors, Couplers, isolators, circulators, optical line terminals, all optical cross connect configurations.

Unit III

Optical network architecture: Synchronous optical network/ synchronous digital heirarchy- elements, multiplexing, layers, SONET physical layer, frame structure, WDM network architectures, QoS parameters for optical networks, wavelength routed networks, routing and wavelength assignment (RWA), optical multicast routing, access networks.

Unit IV

Wavelength routing and Survivability: Classification of RWA algorithms, Problem formulation, routing sub-problem: fixed routing, fixed alternate routing, adaptive routing, fault tolerant routing, wavelength assignment sub-problem, wavelength reuse and conversion criterions, algorithms: flow deviation algorithm, fairness and admission control, restoration schemes, multiplexing schemes, provisioning restorable single fiber networks.

Unit V

Wireless adhocnetworks: Introduction to ad-hoc networks, MAC Protocols for ad hoc networks, routing protocols, Transport layer, Cross layer design for ad hoc networks. Wireless sensor networks (WSN), MAC protocol for WSN, routing protocol, data management and security, applications

Learning Outcomes:
After the completion of course student will be able to:

- Well understanding of the concept of Basics of optical communication and computer networking for research and analysis will be developed.
- Application development using Optical network Components like Optical transmitters, semiconductor laser diode etc will be developed
- Concept of Wavelength routing and Survivability help in research and analysis.

Reference Books:

[1] Optical networks – Apracticalprespective : Rajiv Ramaswami and K N Sivarajan, Morgan Kaufmann Publishers,2002.

[2] WDM optical Networks: Concepts, Design and algorithms , C. Siva Ram Murthy and Mohan Gurusamy, PHI,2011.

[3] Mukherjee, B- Optical communication networks", Mc-Graw Hill, NewYork,1997.

[4] C. Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocols, 2nd edition, Pearson Education, 2007.

[5] C.S.Raghavendra Krishna, M.Sivalingam and Taribznati, "Wireless Sensor Networks", Springer publication,2004.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DIR1G4: Medical Instrumentation</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
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Learning Objective:

- To understand the advanced biomedical instruments used in hospitals. To review the basic concept of medical Imaging systems. To understand the concept of various biomedical instruments and technologies.

Prerequisite(s): Nil

COURSE CONTENT

Unit I

Basic Medical Instrumentation system, General Constraints in design of medical instrumentation system, Patient Safety, Automated Drug Delivery Systems, Blood and its composition and function, Blood Cell Counters, Pulse Oximetry, Introduction to telemetry & Telemedicine .

Unit II

X-ray machines, Dental X-ray machines, Digital Radiography, Principles and, System components of Tomography, Principles of NMR, its components and biological effects. Ultrasonic & Thermal imaging systems. CT Scanning, basic CT scanning system, Types of gantries, image reconstruction techniques in tomography, image artefacts, EEG andECG

Unit III

Pacemaker – general description and instrumentation details,Typesof pacemakers: External & Internal, Defibrillators: AC &DC Defibrillator, Heart Lung Machine. Diathermy: Electro surgical diathermy (ESU), Short wave, Microwave. Artificial Kidney, Dialyzers, Haemodialysis machine. Stone disease problem, lithotriptor systems, Anesthesia machine, Mechanism of artificial ventilation, Types ofVentilator

Unit IV

Interaction of Lasers with Tissues -Thermal and Non thermal, Basic Endoscopes system & its characteristics, Laser Applications in ophthalmology- Diabetic Retinopathy , Glaucoma and Retinal hole and detachment treatment , Dermatology- Tattoo, port wine treatment.

Unit V

Orthrotics& Prosthetic devices, overview of various orthrotics& prosthetic devices along with its materials. Wheelchair Types, Materials used in wheelchair.

Learning Outcomes:

After the completion of course student will be able to:

- Well understanding of the concept of advanced biomedical instruments used in different industries.
- Knowledge development of Interaction of Lasers with Tissues will provide a base for research in field of cancer fighting equipment's.

Reference Books:

[1] Medicine and Clinical Engineering By Jacobsons& Webster,PHI
[2] Introduction to Biomedical Equipment Technology By Carr &Brown
[3] Biomedical Instrumentation and Measurements By Cromwell,PHI
[4] Handbook of Biomedical Instrumentation By R. S. Khandpur,TMH
[5] The Biomedical Engineering Handbook, Bronzino, IEEEPress
[6] Applied Chemical EngineeringFeenberg,
[7] Principles of Medical Imaging.-By: K. Kirk Shung, Michael B. Smith, BenjaminTsui.-Pub: Academic Press.
[8] Medical Laser Applications -ByCarruth
[9] Medical Lasers &their safe Use By Sliney&Trokal

List of Elective I

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DIR1E1:Fuzzy Logic and Neural Network</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective:

- To list various applications of nueral networks, describe the concepts, protocols, and differences underlying the design, implementation, and use of Artificial Neural networks, and propose, implement, and evaluate new ideas for solving Fuzzy neural network design issues.

Prerequisite(s): Nil

COURSE CONTENT

Unit I

Introduction to Neural Networks: Mathematical models of a Neuron, Network Architectures, Perceptron and MLP, Back-Propagation Algorithm, Characterizing Neural Network Architectures, Learning in Artificial Neural Networks; Supervised, Unsupervised and Competitive Learning paradigms; Learning rules and Functions, Hebbian Learning, Associative Memories, Self Organizing Maps, Computing with Artificial Neural Networks, Applications of Artificial Neural Networks, RBF and RCE neural networks LVQ, Solving optimization problems using neural networks. Stochastic neural networks, Boltzmannmachine

Unit II

Fuzzy sets, fuzzy logic and fuzzy inference, Rough sets.

Crisp set and Fuzzy set, Basic concepts of fuzzy sets, membership functions. Basic operations on fuzzy sets, Properties of fuzzy sets, Fuzzy relations. Propositional logic and Predicatelogic, fuzzy If – Then rules, fuzzy mapping rules and fuzzy implication functions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic

Unit III

Fuzzy neural networks Integration of fuzzy logic and neural networks, Fuzzy Hybrid neural, Computation of fuzzy logic inferences by hybrid neural net, Tuning fuzzy control parameters by neural nets, Fuzzy rule extraction from numerical data, Neuro-fuzzy classifiers, ANFIS, Applications of fuzzy neural systems, MATLAB based problems

Unit IV

Genetic algorithm : Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional method

Unit V

Fuzzy controllers, Fuzzification and DefuzzificationMethods , Fuzzy Inference Techniques, Computer vision, applications of fuzzy logic in pattern recognition and image processing. Applications of Neural networks in pattern recognitionproblems

Learning Outcomes:

After the completion of course student will be able to:

- Pattern identification and image pattern learning skills development.

- Speech and language processing can be more optimized after learning this course.
- Image based classification can be done in various fields for optimized results

References Books

[1] G J Klirand B Yuan, "Fuzzy Sets and Fuzzy Logic - Theory and Applications", Prentice-Hall,1995.
[2] Neural Networks, Fuzzy logic and Genetic Algorithms, Synthesis and applicationsbyS. Rajsekharan, VijayalaxmiPai
[3] C. Bishop, “Neural Networks for Pattern Recognition”, Oxford University Press,1995.
[4] D. Driankov, H. Hellendoorn and M Reinfrank, "An introduction to fuzzy control", Springer-Verlag,1993
[5] S. Haykin, “Neural Networks: A Comprehensive Foundation”, Prentice Hall,1999

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>DIR1E2:Object Oriented Programming</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td><td>3</td><td>1</td><td>2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
</table>

Learning Objectives:

- The aim of the course is to give a thorough grounding in object-oriented techniques for Java, as well as to examine the major uses of Java – internet programming, design pattern, user interfaces and Networking.

Prerequisite(s): Knowledge Object Oriented Programming concept using object oriented languages such as C++, Objective C.

COURSE CONTENTS

Unit I

Introduction: The History of Java, Java's Key Features, The Java Virtual Machine, The First Application. Basic Syntax - Identifiers, Comments, Keywords, The Eight Primitives, Using Objects. Expression and Arrays : Using Operators, The 'If-Else' Statements, Using 'While' Loop, Selecting with 'Switch' statement, Dealing with Primitive Casts. Using Arrays - Creating an Array, Array Initialization, Working with Arrays, Using Multi-dimensional Arrays.Classpath&JARs: The 'Classpath' in Java, JavaArchives.

Unit II

Classes: Classes & Packages, The 'import' Statement, The Importance of Encapsulation, Java Constructors, Access Modifiers (private, default and public), Method Overloading. Polymorphism and Inheritance: The 'Protected' Modifier, Using 'this' and 'super', The 'final' keyword, Static Members & Methods. Interfaces & Abstract Classes, The Complete Construction Process, The Class 'Object', Nested Classes, Enums in Java.

Unit III

Basic Design Patterns:

Basic Concepts of Design Patterns, Iterators, The Pattern Concept, The OBSERVER Pattern, Layout Managers and the STRATEGY Pattern, components, Containers, and the COMPOSITE Pattern, Scroll Bars and the DECORATOR Pattern. The Java Object Model: The Java Type System, Type Inquiry, the Object Class, Shallow and Deep Copy, Serialization,Reflection

Unit IV

Exception, Collections and IO

Exceptions & Assertions: Types of Program Errors, The Exception Model, Checked and Unchecked Exceptions, Defining Custom Exceptions, Assertions. Working with Common Classes: java.lang.String, java.lang.System, java.util.Calendar. The Java Collection Framework & Generics: List Basics, Using Lists Wisely, Other Collection Classes. Java IO: Input Stream/Output Stream, JavaSerialization, Readers & Writers, Working with Files.

Unit V

Thread and Applet

Threads: The Java Thread Model, Thread Priorities, Synchronization, Messaging, Thread Class, Runnable Interface. Applet Architecture – Skeleton- Simple Applet Display Methods- HTML APPLET tag – Passing Parameters to the Applet- AudioClip and AppletStub Interface - Delegation Event Model – Event Classes. Networking: Overview, TCP/IP Sockets, Writing Your Own Web Server.

Learning Outcomes:

After the completion of course student will be able to:

- Develop live projects which will help in their research work.
- Various IOT based application are developed by students in order to make ease of doing.

References Books:

[1] Herbert Schildt, “Java The Complete Reference”, Eighth Edition, Tata McGraw-Hill Edition India,2011.
[2] Cay Horstmann, “Object Oriented Design & Patterns”, John Wiley & Sons,2004.
[3] Bruce Eckel, “Thinking in Java”, 4th edition, Pearson Education,2006.
[4] Ramesh Vasappanavaraet al, “Object-oriented Programming Using C++andJava”, First Impression, Pearson,2011.
[5] Cay Horstmann, "Big Java 4e for Java 7 and 8", John Wiley & Sons,2010.

<table>
<tr><td colspan="4">0Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>DIR1E3:Nanodevices&Nanosensors</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td><td>3</td><td>1</td><td>2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
</table>

Learning Objectives:

- this course will focus on understanding of the basic structure principals of Nano-devices andsensors.

Prerequisite(s): Introduce the quantum mechanical concepts needed to understand the operation

COURSE CONTENTS

Unit I

Quantum Devices: Quantum Electronic devices – Electrons in mesocopic structures – Short channel, MOS Transistor – split Gate Transistor – Electron wave transistor – Electron spin transistor – Quantum Dot array – Quantum computer- Bit and Qubit. Carbon Nanotube based logic gates, optical devices. . Connection with quantum dots, quantum wires, and quantum wells

Unit II

Tunneling Devices: Tunnelling element – Tunnel Effect and Tunneling Elements-Tunnelling Diode – Resonant Tunnelling Diode – Three -Terminal Resonate Tunnelling Devices-Technology of RTD-Digital circuits design based on RTDs - Basics Logic Circuits – Single Electron Transistor(SET) – Principle – Coulomb Blockade-Performance – Technology- Circuit Design- Logic and Memory Circuits – SET adder as an Example of a Distributed Circuit.

Unit III

Nanosensors I: Micro and nano-sensors, Fundamentals of sensors, biosensor, micro fluids, Packaging and characterization of sensors, Method of packaging at zero level, dye level and first level. Sensors for aerospace and defense: Accelerometer, Pressure Sensor, Night Vision System, Nano tweezers, nano-cutting tools, Integration of sensor with actuators and electronic circuitry,

Unit IV

Nanosensors II: Sensor for bio-medical applications: Cardiology, Neurology and as diagnostic tool, Forother civil applications: metrology, bridges etc. Biosensors. Clinical Diagnostics, generation of biosensors, immobilization, characteristics, applications, conducting Polymer based sensor, DNA Biosensors, optical sensors. Biochips. Metal Insulator Semiconductor devices, molecular electronics, information storage, molecular switching, Schottkydevices,

Unit V

NEMS: Inertial sensors – accelerometer – gyroscope - micromechanical pressure sensors – pizoresistive – capacitive - microrobotics – micro channel heat sinks – optical MEMS – visual display – precision optical platform – optical data switching – RF MEMS – MEMS variable capacitors – MEMS switches – Resonators.

LearningOutcomes:

After the completion of course student will be able to:

- Learning of Quantum Devices will provide a base for research work.
- Various IOT based application are developed by students using the concepts of various sensors.

Reference Books:

[1] K. Goser, P. Glosekotter and J. Dienstuhl, “Nanoelectronics and Nanosystems-From Transistors to Molecular Quantum Devices” , Springer,2004.

[2] HerveRigneault, Jean-Michel Lourtioz, Claude Delalande, ArielLevenson, “Nanophotonics”,ISTE.

[3] W.R.Fahrner, “Nanotechnology and Nanoelectronics – Materials, Devices and MeasurementTechniques” Springer, 2006 13

[4] Sensors: Micro &Nanosensors, Sensor Market trends (Part 1&2) by H. Meixner.

[5] Nanoscience& Technology: Novel structure and phenomena by Ping Sheng(Editor)
[6] Nano Engineering in Science &Technology : An introduction to the world of nano design
by MichaelRieth.
[7] Tai –Ran Hsu, “MEMS & Microsystems Design and Manufacture”, Tata McGraw-Hill publication,2001.
[8] P. Rai-Choudhury, “MEMS and MOEMS technology and applications”, PHI learning private Ltd,2009.
[9] Mohamed Gad-el-Hak, “The MEMS Handbook”, CRC Press,2002.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">ME I Year Electronics
(Sp. Digital Instrumentation)
Semester- A</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DIR1E4: Advance Digital Signal Processing</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective:
- To provide clear conceptual knowledge of different DSP algorithms and to introduce speech, multimedia and other signal processing applications.

Prerequisite(s): A basic course in Digital signal processing.

COURSE CONTENTS

Unit I

Overview of DSP,FIR filters, IIR filters, design techniques of linear phase FIR filters, IIR filters by impulse invariance, bilinear transformation, Linear prediction & optimum linear filters stationary random process, forward-backward filters linear prediction, solution of normal equation.

Unit II

Multi rate DSP, Sampling rate conversion, poly phase filters, multistage decimator & interpolator, QMF, digital filter banks, DFT in spectral estimation, Adaptive filters & spectral estimation.

Unit III

Minimum mean square criterion, , LMS algorithm, Recursive least square algorithm, Application of DSP& Multi rate DSP Application to Radar, introduction to wavelets, application to image processing, design of phase shifters, DSP in speech processing & other applications.

Unit IV

Image representation: Gray scale and color images , image sampling a nd quantization. Image enhancement: Filter in spatial and frequency domains , histogram based processing and homomorphic filtering. Edge Detection edge linking, boundary descriptors. Image Segmantation :Thresholding, region based segmentation Image Compression: lossy and lossless compression techniques.

Unit V

Entropy coding, lossy and lossless predictive coding, uniform and non uniformquantizers, transform based compression, JPEG, Image reconstruction from projections: Principles, mathematical basis of tomography. Projections, The Fourier Slice Theorem, Reconstruction Algorithms for Parallel Projections, Three dimensional projections. Computer visualization of 3D data :Rendering techniques: Surface based and volume based techniques. Direct Volume rendering: Ray casting, opacity function. Maximum Intensity Projection

Learning Outcomes:

After the completion of course student will be able to:
- Various speech and language processing enhancement will be done and research will be more refined.
- Three dimension projection process can be optimized by learning three dimension projection and many more research can be performed using the same concept.

Reference Books:

[1] Gonzalez and Woods :Digital Image Processing, Pearson Education 3rdEdition
[2] A.K.Jain : Fundamentals of Digital image processing ,PHI

Sem II

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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Semester- B</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DIR2C1: Digital Image Processing</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective:

- To provide clear conceptual knowledge of different Image Transforms and Digital Image Processing System and to introduce Image Enhancement and segmentation and other image processing algorithm.

Prerequisite(s): A basic course in Digital signal processing.

COURSE CINTENTS

UnitI

Introduction: Background, Digital Image Representation, Elements of a Digital Image Processing System. Data Acquisition Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, machband effect, Color image fundamentals RGB, HSI models, Image sampling, Quantization, dither.

Image Transforms: Geometric and spatial transforms Introduction to the Fourier Transform, The Discrete Fourier Transform, Properties of the Two-Dimensional Fourier Transform, Other Separable Image Transforms.

Unit II

Morphological Image Processing: Dilation and Erosion, Labelling connected components, Morphological reconstruction, Gray-scale morphology, Image descriptors: Region and boundary extraction, Image representation: Chain code, boundary, skeletons, signature descriptors: shape numbers, Fourier descriptors, statistical moments, corner, Regional descriptors, PCA

Unit III

Image Enhancement and segmentation: Spatial Domain Methods, Frequency Domain Methods, Some Simple Intensity Transformations, Histogram Processing, Image Subtraction, Image Averaging, Background, Smoothing Filters, Sharpening Filters, Low-pass Filtering, High-pass Filtering, Generation of Spatial Masks from Frequency Domain Specifications. point, line, Edge detection, line detection using Hough transform, Thresholding, Region based segmentation, Region growing, Region splitting and Merging, Segmentation by morphologicalwatersheds.

Unit IV

Image Restoring: Degradations Model - Definitions, Noise Models, Diagonalizationof Circulant and Block-Circulant Matrices, Circulant Matrices, Block Circulant Matrices, Effects of Diagonalization on the Degradation Model, Restoration approach, Unconstrained Restoration, Constrained Restoration, Inverse Filtering – Formulation, Removal of Blur Caused by Uniform Linear Motion, Restoration in the Spatial Domain, GeometricTransformation.

Unit V

Image Compression: Fundamentals, Types of Redundancy, Fidelity Criteria. Image Compression Models, The Source Encoder and Decoder, The Channel Encoder and Decoder. Elements of Information Theory Error-Free Compression, Variable-Length Coding, Bit-Plane Coding, Lossless Predictive Coding. Lossy Compression, Lossy Predictive Coding, Transform Coding.

Learning Outcomes:

After the completion of course student will be able to:

- Various Image Enhancement and segmentation algorithm will help students in developing the applications which will help in different organization mainly working on the concept of image inputs.
  Image Compression technique provides a way by which image size can be reduce and optimized.

Reference Books:

[1] Rafael. C. Gonzalez & Richard E.Woods.- Digital Image Processing, 2/e Pearson Education, New Delhi - 2006

[2] W.K.Pratt.-Digital Image Processing ,3/e Edn., John Wiley & sons, Inc.2006
[3] A.K. Jain-Fundamentals of Digital Image processing- PHI, NewDelhi(1995)
[4] M. Sonka et.al Image Processing, Analysis and Machine Vision, 2/e, Thomson, Learning, India Edition, 2007.

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<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DIR2C2: Process Instrumentation and Industrial Control</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of paper: 3 Hours</td></tr>
</table>

Learning Objective: To enable students to understand the basic concept of process instrumentation applicable in various industries. It will also give in depth knowledge regarding different type of control strategies instrumentation and controller used in processing industries.

Prerequisite(s): A basic course in Control system.

COURSE CONTENT

Unit I

Fundamentals of Process Control

Elements of process control loop, concept of process variables, set point, controlled variable, manipulated variable, load variable. Need for standardization of signals, current, voltage and pneumatic signal standards, concept of live & dead zero, Difference between converter & transmitter, Pneumatic to current converter, Current to pneumatic converter.

Unit II

Types of Control Actions:

Discontinuous: ON/OFF, Continuous: Proportional, integral, derivative, proportional-Integral, Proportional-Derivative, Proportional-Derivative-Integral

Tuning of Controller:

Quarter Amplitude Decay Ratio, Loop disturbance, optimum control, Measure of quality, stability criteria, Tuning methods: Process Reaction Curve (open loop), Ziegler Nichols (closed loop), set point tuning Vsload disturbancetuning.

Unit III

Programmable Logic Controller (PLC):

Continuous versus Discrete Process Control, ladder diagram using standard symbols, Architecture of PLC, PLC ladder diagram and instructions, PLC Programming for process applications.

Complex Control Systems:

Introduction, cascade, feed forward, Ratio Control, Anti Reset, Selector & Multivariable control scanners.

Unit IV

Control Valve:

Classification of control valves based on: Valve body. Construction, type of actuation, application etc. Control valve terminology: Range ability, turndown, valve capacity, Air to open, Air to close, valve gain etc. Control valve characteristics: Inherent & installed Control valve accessories. Types of actuators. Positioners: Application/Need, Types, Effect on performance of controlvalves.

Unit V

Safety and Hazards:

Explosion Proof Housing, Encapsulation, Sealing, & Immersion, intrinsic safety, Concept of safety cycle.

DCS and SCADA:

DCS architecture, system elements of DCS. Definition of SCADA, Application area of SCADA, Major elements of SCADA, Advantages and disadvantages of SCADA, Comparison of SCADA, DCS, PLC and Smart Instrumentation.

Learning Outcomes:

After the completion of course student will be able to:

- Develop more results using Research work based on Complex Control Systems

References Books:

[1] CurtisJohnson,“ProcessControlandInstrumentationTechnology”,Prentice-HallofIndia Seventh ed., 2005.
[2] B. G. Liptak, “Process Control, Instrument Engineering Hand book”, Chilton Book Company, Third ed.,1995
[3] Patranabies , “Principles of Process control”, Tata McGraw Hill Pub,2006
[4] P. Harriott , “Process control”, McGraw-Hill: New York,1964

Devi Ahilya University, Indore, India Institute of Engineering & Technology				ME I Year Electronics (Sp. Digital Instrumentation) Semester- B			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DIR2C3: System Design using Verilog	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**2**	**3**	**1**	**1**	**5**

Learning Objectives:

- To enable the students to translate a functional system description into appropriate digital blocks coded in Verilog. Perform synthesis, place, and route of a digital design into a targetFPGA
-

Prerequisite(s): Digital Design, Microprocessor architecture, C++ language.

COURSE CONTENTS

Unit I

Overview of Digital Design with Verilog HDL: Evolution of CAD, emergence of HDLs, typical HDL-based design flow, why Verilog HDL?, trends in HDLs.
Hierarchical Modeling Concepts: Top-down and bottom-up design methodology, differences between modules and module instances, parts of a simulation, design block, stimulus block.
Basic Concepts: Lexical conventions, data types, system tasks, compiler directives.

Unit II

Modules and Ports: Module definition, port declaration, connecting ports, hierarchical name referencing.
Gate-Level Modeling: Modeling using basic Verilog gate primitives, description of andlor and buflnottype gates, rise, fall and turn-off delays, min, max, and typical delays.
Dataflow Modeling: Continuous assignments, delay specification, expressions, operators, operands, operator types.

Unit III

Behavioral Modeling: Structured procedures, initial and always, blocking'andno blocking statements, delay control, event control, conditional statements, multiday branching, loops, sequential and parallel blocks.
Tasks and Functions -Differences between tasks and functions, declaration, invocation.
Useful Modeling Techniques: Procedural continuous assignments, overriding parameters, conditional compilation and execution, useful system tasks.

Unit IV

Timing and Delays: Distributed, lumped and pin-to-pin delays, specify blocks, parallel and full connection, timing checks, delay back-annotation.
Switch-Level Modeling: MOS and CMOS switches, bidirectional switches, modeling of power and ground, resistive switches, delay specification on switches.

Unit-V

Logic Synthesis with Verilog HDL: Introduction to logic synthesis, impact of logic synthesis, Verilog HDL constructs and operators for logic synthesis, synthesis design flow, verification of synthesized circuits, modeling tips, design partitioning.

Learning Outcomes:
After the completion of course student will be able to:

- More understanding of Evolution of CAD will be developed which will make the development process of the models easy.
- Power consumption can be optimized by learning the concept of MOS and CMOS switches, bidirectional switches etc.

References Books:

[1] Samir Palnitkar , "Verilog HDL-A guige to Digital Design and Synthesis " 2nd Edition, Pearson ,2006.
[2] J. Bhaskar, "A Verilog HDL Primer", B.SPublications,
[3]Douglas J. Smith, "Hdl Chip Design : A Practical Guide for Designing, Synthesizing & Simulating ASICs

&FPGAs Using VHDL or Verilog".DoonePubns,1998.
[4] Blaine Readler , "Verilog by Example: A Concise Introduction for FPGA Design", Full Arc Press,2011

List of Generic Elective II

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DIR2G1: Software Engineering</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- The main purpose of this course is to impart knowledge on the basic principles of software development life cycle.
-

Prerequisites: Knowledge of Basic Data Types - Lists, Stacks, Queues, Hash Tables ,Trees - Binary Trees, Tree Traversal, Memory Management - Storage Allocation, Garbage Collection, Algorithms - Divide and Conquer, Backtracking, Iterative Techniques, Searching and Sorting, Complexity -O-Notation

COURSE CONTENTS

Unit I - Introduction

Software Engineering-Software Process- Generic process model-Prescriptive process model-specialized, unified process-Agile development-Agile Process- Extreme Programming- Other agile Process models-Software engineering Knowledge-core Principles-Principles that guide each framework Activity.

Unit II-Requirements

Requirements Engineering-Establishing the Groundwork-Eliciting Requirements- Developing use cases-Building the requirements model-Negotiating, validating Requirements-Requirements Analysis-Requirements Modeling Strategies.

Unit III-Design modeling with UML

Modeling Concepts and Diagrams - Use Case Diagrams - Class Diagrams - Interaction Diagrams - State chart Diagrams – Activity Diagrams - Package Diagrams - Component Diagrams – Deployment Diagrams - Diagram Organization- Diagram Extensions. Design Process- Design concepts: Abstraction, Architecture, patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Refinement, Aspects, Refactoring, Object Oriented Design Concepts, Design Classes- Design Model: Data, Architectural, Interface, Component, Deployment Level Design Elements .

Unit IV-Software implementation

Structured coding Techniques-Coding Styles-Standards and Guidelines- Documentation Guidelines-Modern Programming Language Features: Type checking-User defined data types-Data Abstraction-Exception Handling- ConcurrencyMechanism.

Unit V-Testing and Maintenance

Testing: Software Quality- Software Quality Dilemma- Achieving Software Quality- Testing: Strategic Approach to software Testing- Strategic Issues- Testing: Strategies for Conventional Software, Object oriented software, Web Apps-Validating Testing- System Testing- Art of Debugging.

Maintenance: Software Maintenance-Software Supportability- Reengineering- Business Process Reengineering- Software Reengineering- Reverse Engineering- Restructuring- Forward Engineering-Economics ofReengineering

Learning Outcomes:

After the completion of course student will be able to:

- Understand the process of software development.
- Learn the concept of change of request
- Better understanding of the layering architecture

Reference Books:

[1] Roger S, “Software Engineering – A Practitioner’s Approach”, seventh edition, Pressman,2010.
[2] Pearson Edu, “Software Engineering by Ian sommerville”, 9th edition,2010.

[3] Hans Van Vliet, “Software Engineering: Principles and Practices”,2008.
[4] Richard Fairley, “Software Engineering Concepts”,2008.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DIR2G2:Embedded Real Time Operating Systems(RTOS)</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective:

- provide an understanding of general embedded system concept, Embedded Software development, RTOS essentials, advantages and trade-offs. It will provide practical experience necessary to use an RTOS in an embedded system development
-

Prerequisites: Operating system, Microcontrollers and C Programming

COURSE CONTENTS

Unit I
Introduction
Introduction to UNIX/LINUX, Overview of Commands, File I/O (open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

Unit II
Real Time Operating Systems
Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, Tasks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

Unit III
Objects, Services and I/O
Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

Unit IV
Exceptions, Interrupts and Timers
Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

Embedded Firmware:
Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

Unit V
Case Studies of RTOS
RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, Tiny OS, and Basic Concepts of Android OS.

Learning Outcomes:
After the completion of course student will be able to:

- Understand the Real time concept for Embedded system.
- Develop various hardware and software merged applications.
- Better understanding of Interrupts, timers, component configurations for research and development.

References Books

[1] Real Time Concepts for Embedded Systems – Qing Li, Elsevier,2011
[2] Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007,TMH.
[3] Advanced UNIX Programming, RichardStevens
[4] Embedded Linux: Hardware, Software and Interfacing – Dr. CraigHollabaug

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<tr><td rowspan="2">DIR2G3:Modelling and Simulation</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To give exposure of stochastic processes and to show their importance in engineering education and research.
- To develop skills to identify a process, its inputs and outputs. Then to develop a model and quantify the results.
- To give hands on experience in MATLAB to be used as a simulation tool for the stochastic processes. To develop an orientation towards research in electronics and computerengineering.

Prerequisite(s): Fundamental knowledge of probability theory.

COURSE CONTENTS

Unit I

Introduction to Probability Theory -Relative Frequency and Classical Definitions, Sample Space and Events, Conditional Probabilities, Independent Events, Bayes Formula, Bernoulli Trials.

Unit II

Random Variables- Definition, Discrete Random Variables, Probability mass Function , Distrribution Functions: Bernoulipmf, Bionomialpmf, Geometric pmf, Poisson pmf, ContinuousRandom Variables, Cumulative Distribution Function(CDF), Probability Density Function (PDF), Exponential Distribution, Reliability and failure rate, Normal Distribution, Uniform Distribution. Mean, Variance and Moments of Random Variables, Function of a Random Variable and it's Expectation, Jointly Distributed Random Variable.

Unit III

Markov Chains- Classification of stochastic process, Introduction to Markov chains, Classification of States, Transition Probabilities, Limiting State Probabilities, Higher Transition Probabilities, Concept of Transient States and Absorption Probabilities, Solution of Problems Based on MarkovChains.

Unit IV

Markov Processes -Introduction to Continues Time Markov Chains, Birthand Death Processes, The Transition Probability Function, Limiting Probabilities, Exponential Distribution & Poison Process. Solution ofProblems Based on Continuous Time Markov Chains, Introduction to Queuing Theory and M/M/1 QueuingSystems.

Unit V

Simulation- Simulation of Queues, Statistical Inference and FewExamples on Simulation
Estimation of Mean and Variance, Confidence Interval, Regression and Correlation analysis

Learning Outcomes:
After the completion of course student will be able to:

- Develop application based on the research work using MATLAB.
- Enhance research oriented work.
- Better understanding of Markov Chains for research and development.

Reference Books:

[1] S.M. Ross, "Introduction to Probability Models, 9th Edition,ElsevierPublication", 2007.
[2] K.S.Trivedi, "Probability and Statistics with Reliability, QueuingandComputer Science Applications", 2nd Edition , A Wiley-IntersciencePublication.
[3]AverillM.Law,W.DavidKelton, "SimulationModelingandAnalysis",3rdEdition, Tata McGraw-Hill Publication.

[4] A Papoulis, S.V Pillai, “Probability Random Variables and Stochastic Processes”, 4th Edition, TMH Publication, 2002.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DIR2G4: Industrial Communication</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective:

- The focus of the course is on the protocols, algorithms and tools needed to support the development and delivery of advanced Industrial network for Control and communication

Prerequisites: Programming ability and an understanding of basic networking, OS, and architecture issues.

COURSE CONTENTS

Unit I

Historical Overview of Industrial Automation and Communication Networks, Hierarchical Levels in Industrial, Communication Networks, Transmission Methods, Industrial Network Components, Network Topology.

Serial Communication Standards: Standards organizations, Serial data communication interface standards, Balanced and unbalanced transmission lines, Synchronous & asynchronous communication, RS 232,422,485 interface standards and Troubleshooting.

Parallel Communication Standards : Parallel data communications interface standards - General purpose interface bus (GPIB) or IEEE - 488, The Centronics interface standard, The universal serial bus (USB), Different configuration modes - two wire & four wire point - to -point &multidrop connections.

Unit II

HART Communication protocol - Evolution of signal standards, features of HART protocol, Communication modes, HART networks, HART Data format or telegram structure, field device & Control system interface to HART bus, HART cabling considerations, HART commands and types, HART field controller implementation, 3 layers of HART-OSI model, DDL and compatibility, Advantages and applications of HART protocol.

Unit III

Field Bus: Basics, Architecture, OSI -model, FF/Foundation FB segments, interconnection type -distributed and Chicken foot, FFB types -H1 & HSE, Network design and system configuration, General considerations, advantages of FB & Foundation FB and their comparison.

Unit-IV

Controller Area Network DeviceNet, CANopen, Interbus, Actuator Sensor Interface (AS-I), ControlNet.

Unit-V

An Introduction to Industrial Ethernet Ethernet's Roots',Ethernet Physical Layer, Data Link Layer, The Ethernet Frame, Hubs and Switches, Higher Level Network Functions, Ethernet and Industrial Systems, Industrial Ethernet communication protocols

Learning Outcomes:

After the completion of course student will be able to:

- Develop algorithms and tools based on the research work for various industry.
- Enhance research oriented work.
- Better understanding of Basics, Architecture, OSI -modelfor research and development work

References Books:

[1] SteveMackay,JohnParkandEdwinWright,"PracticalDataCommunicationfor Instrumentation and Control", Newnes Elsevier,2002.
[2] David Bailey and Edwin wright , "Practical SCADA for industry", NewnesElsevier.
[3] Romilly Bowden, 'HART application Guide', HART Communication Foundation,1999.

List of Elective II

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<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
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<tr><td rowspan="2">DIR2E1: Analog and Digital VLSI Circuit Design</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
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Learning Objectives:

- This course presents the fundamental of CMOS VLSI design with different VLSI design methodologies and combinational, sequential and semiconductor memory circuit design. It also covers the limitations of CMOS in NANO technology with introduction to the NANO Technology
-

Prerequisite(s): Knowledge of semiconductor devices is required.

COURSE CONTENTS

UNIT I

Introduction: VLSI design flow, VLSI design style, Fabrication process Flow: basic Steps, the CMOS n-well Process. Metal oxide semiconductor (MOS) structure, Types of MOSFET: Enhancement and Depletion. Structure and operation of MOS transistor. MOSFET process simulation.

UNIT II

MOS Transistor: threshold voltage of MOSFET, controlling of threshold voltage, MOSFET current – Voltage Characteristics. Transconductance, Drain conduction. Aspect ratio, process parameters, second order effects, MOS small signal and Large signal model, MOS capacitances.

UNIT III

CMOS Inverter: Analysis of different types of inverter circuit, CMOS inverter, transfer characteristic, calculation of propagation delay, rise time, fall time, noise margin and power dissipation for CMOS Inverter. Effect of threshold voltage and supply voltage on delay and power dissipation.

UNIT IV

CMOS Circuit Design: CMOS logic**,** pseudo NMOS logic, pass transistor logic, Transmission Gate logic and Dynamic logic circuit design. Designing of Combinational logic circuit, sequential logic circuit design and semiconductor memory circuit.

Unit V

CMOS Analog Circuit Design: Large signal models, small signal models, current sources, single stage amplifiers, differential amplifiers, operational amplifiers, frequency response, frequency response of amplifiers, frequency response of operational amplifiers, stability and frequency compensation, frequency compensation

Learning Outcomes:

After the completion of course student will be able to:

- Develop algorithms and tools based on the research work for various industry.
- Enhance research oriented work.
- Better understanding of Basics, Architecture, NMOS & CMOS technologies for research and development work

Reference Books:

[1] Sung-mo Kang and Yusuf Leblebici, CMOS Digital Integrated Circuit analysis and Design, 3rd Edition, TataMcGraw-Hill.
[2] Neil H.E. Weste and Kamran Esharhian, Principal of CMOS VLSI design,2nd Edition, PHI,.anded), AW/Pearson,2001.
[3] CMOS mixed-signal circuit design by R. Jacob BakerWiley India, IEEE press, reprint2008.
[4] Design of analog CMOS integrated circuits by BehadRazaviMcGraw-Hill,2003.

List of Experiment:

Note : Use the BSIM3v3 (T-SPICE Level 49) model to characterize a 0.18µm CMOS process (TSMC).

1. Determine the threshold voltage V_{TH},for the NMOS and PMOS devices (for V_{BS}=0, L=0.18µm and W= 1µm), by extrapolating from the I_D-V_{GS}curve at low V_{DS}. Explain your circuit setup. How does this result compare to values reported in the model file? Also, determine the body-effectparameter.

2. Determine the subthreshold slope factor S for the NMOS and PMOS devices (at V_{DS} =1.8V, room temperature). Determine the leakage currents at V_{GS} =0 V. Repeatit at a lower temperatureT=77k.

3. Determine the effects of channel length L on the threshold voltage V_{Th} between 0.18 µm to 2.0µm. Draw V_{Th} of the NMOS and PMOS as a function of L (for V_{DS}=1.8 and 1.2V).
4. Determine the effects of drain-source voltage $V_{DS,}$ on the threshold voltage V_{Th} between and1.8V.Draw V_{Th} as a function of V_{DS} (for L=0.18µm). What is the measured DIBL factor?
5. With the given CMOS inverter Circuit calculate and estimate the static Characteristics
   Determine the VTC of CMOS Inverter
   Obtain the $NM_{H,}$ NM_L, and V_M for the inverter
   Dynamic Characteristics
   Measure the t_{pHL}, t_{pLH}, t_P,t_r,t_f
   Power Consumption with varying load capacitances from 100fF to 500fF. And compute the powe Delay Product (PDP) foe the 0.18 Microntechnologies.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">ME I Year Electronics
(Sp. Digital Instrumentation)
Semester- B</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DIR2E2: Analytical Instrumentation</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective:

- This course exposes the students to various instruments and techniques used in the analysis andIdentification of elements and compounds

Prerequisite: Knowledge of basic Electronics and Fundamentals of Chemistry

COURSE CONTENTS

Unit I

Colorimeters, Visible-Ultraviolet Spectrometers (single beam, Direct reading), **Infrared Spectrometers**: Basic components, Types of IR spectroscopy, **Atomic Absorption Spectrometers:** Flame photometer (principal and constructional details), principle of AAS, radiation sources, Burners and Flames, Plasma Excitation sources.

Unit II

Flourimeters: Principle of Fluorescence, Measurementof florescence,Phosphorimeters, **Raman Spectrometer:** TheRaman effect**,** Source, sample chamber, spectrometer and detector, Photo Acoustic, Photo thermal Spectrometers **MassSpectrometers:** Principle of operation, Types of MS, Components of MS, ICP-MS

Unit III

Nuclear Magnetic Resonance Spectrometers: Principle of NMR**,** Types of NMR, Constructional details of NMR, **Electron Spin Resonance Spectrometers:** Basis ESR spectrometer and constructional details**,** Electron and Ion Spectroscopy, Basic X-ray Spectrometers

Unit IV

Gas Chromatographs, Liquid Chromatography, Thermo Analytical Methods

Unit V

PH Meters, Blood Gas Analyzer, Industrial Gas Analyzers, Environmental Pollution Monitoring Instruments

Learning Outcomes:

After the completion of course student will be able to:

- Develop algorithms and tools based on the research work for various industry.
- Enhance research oriented work.

Reference Books:

[1] H. H. Williard, L. L. Merrit, J. A. Dean, and F. A. Settle, Instrumental Methods of Analysis, 7/e, CBS Publishers and Distributors, India,1988
[2] D. A. Skoog, F. J. Holler, and T. A. Nieman, Principles of Instrumental Analysis, 6/e., Thomson Learning, 1998
[3] R. S. Khandpur, Handbook of Analytical Instruments, Tata McGraw Hill, NewDelhi
[4] R. K. Jain, Mechanical and Industrial Measurements, Khanna Publishers, Delhi,1985
[5] G. W. Ewing, Instrumental Methods of Chemical Analysis, 5/e., McGraw Hill, Singapore,1992.
[6] R. E. Sherman and L. J. Rhodes (Eds), Analytical Instrumentation, ISA Press, New York,1996.
[7] B. G. Liptak, Process Measurement and Analysis, 3rd ed., Chilton Book Company, Pennsylvania,1995
[8] BehrouzA.Forouzan , Data Communications and Networking ,4/ETataMcGraw-Hill, 2000.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				ME I Year Electronics (Sp. Digital Instrumentation) Semester- B			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DIR2E3: Optical and Laser Instrumentation	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**2**	**3**	**1**	**1**	**5**

Learning Objective:

- This course exposes the students to various instruments and techniques used in the analysis and Identification of elements and compounds

Prerequisite: Knowledge of basic Electronics and Fundamentals of Chemistry

CONTENTS

Unit I

Laser Fundamentals: coherence; Spatial and Temporal, Laser theory; absorption, Spontaneous and Stimulated emission, Population inversion, pumping, Einstein coefficient, Resonators, mirrors and modes, Laser output, Q switching, modulation of output by different techniques.

Unit II

Laser Systems & Instrumentation: Principle and construction of different Laser sources-solid state, gas, He-Ne Gas laser, Ruby Laser, CO2 laser, semiconductor and free electron lasers. Tunable lasers etc., Lengths, displacement and shape measurement; laser heterodyne, Laser Doppler and particle image velocimetry

Unit III

Laser applications: LIDARs (Light Detection And Ranging), Laser alignment, gauging inspection and Laser machine vision, laser material processing, Laser applications to chemical and environmental Analysis, Laser-induced fluorescence, Temperature measurement techniques, Laser Tweezers: Single-dual-and multiple-beam tweezers, and applications.

Unit IV

Holography and Speckle based NDT: Principle of Holography, Holographic Interferometry; Double exposure, Time averaged, Real time H.I., Laser speckle techniques; speckle photography/ interferometry, and digital speckle pattern interferometry and applications of laser speckles, Lengths, displacement, Velocity, slope and shape measurement etc., Optical coherence tomography: biomedical applications.

Unit V

Fiber Optic Sensors: Basics of Optical fiber as sensing device, classification of fiber sensors, intensity, phase, frequency, wavelength modulated sensors, measurement of temperature, pressure, liquid level, displacement, flow, electric and magnetic fields.

Learning Outcomes:

After the completion of course student will be able to:

- Develop algorithms and tools based on the research work for biomedical applications development.
- Enhance research oriented work based on Holography and Speckle based NDT.

Recommended Books:

[1] Optical Electronics : Ghatak&Thygarajan, Cambridge UniversityPress
[2] Basics of Holography : P. Hariharan, Cambridge UniversityPress
[3] Optical Metrology: Kjell J. Gåsvik, John Wiley & Sons, Ltd,2013
[4] Optics: Eugene Hecht, Pearson Education Ltd.,2014
[5] Fiber Optic Sensors, Second Edition, ShizhuoYin, Paul B. Ruffin, Francis T.S. Yu, CRC Press,2008

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions
Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DIR2E4: Advanced Industrial Drives and Control</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective:

- To study the different motors used in industry and their driving circuits.

Prerequisite: Power Electronics

COURSE CONTENTS

Unit I

Introduction to Power Devices: Construction, Working, Characteristics, Specifications and applications of SCR, TRIAC, DIAC, Power MOSFET, IGBT and UJT. SCR gate triggering and commutation circuits. Series andparallel connection of SCR and its triggering arrangement. Choppers: Principle, Working, Classification, Thyristorised Choppers- Jones Chopper, Morgan Chopper ,Single Phase and Three Phase Controlled rectifiers, (Half wave, full wave and bridge configuration with resistive and Inductive Load. Inverters and choppers, Single- phase rectifiers and single phase controlled Inverters: Classification, Single Phase half bridge and full bridge Inverters, PWMInverters

Unit II

Motors Fundamentals and Mechanical Systems: DC motor - Types, induced emf, speed-torque relations; Speed control – Armature and field control; Ward Leonard control – Constant torque and constant horse power operations. Review of Induction Motor operation – Equivalent circuit – Performance of the machine with variable voltage, rotor resistance variation, pole changing and cascaded induction machines, slip power recovery – Static Kramer Drive. Synchronous, Brush less DC and Switched Reluctance Drives

Unit III

Converter and Chopper Control: Principle of phase control – Series and separately excited DC motor with single phase and three phase converters – waveforms, performance parameters, performance characteristics - Operation with free wheeling diode schemes; Drive employing dual converter. Introduction to time ratio control and frequency modulation; Class A, B, C, D and E chopper controlled DC motor – performance analysis, multi-quadrantcontrol.

Unit IV

VSI and CSI Fed Induction Motor Control: AC voltage controller fed induction machine operation – Energy conservation issues – V/f operation theory – requirement for slip and stator voltage compensation. CSI fed induction machine – Operation and characteristics - PWM controls. Field oriented control of induction machines – Theory – DC drive analogy – Direct or Feed back vector control - Indirect or Feed forward vector control – Flux vector estimation - Space Vector Modulation control, Direct torque control of Induction Machines – Torque expression with stator and rotor fluxes, DTC control strategy – optimum switching vector selection – reduction of torque ripplemethods

Unit V

Special purpose Machines and control: Stepper motor: Working principle, construction, types, application and characteristics. Half and full step sequence, driving circuit using L297, L298Servo motor: Working principle, construction, types, application and characteristics, Universal Motor: Working principle, construction, types, application and characteristics

Learning Outcomes:

After the completion of course student will be able to:

- Different technology for Chopper, Morgan Chopper ,Single Phase and Three Phase Controlled rectifiers etc.

Reference Books:

[1] Gopal K Dubey, “Power Semiconductor controlled Drives”, Prentice Hall Inc., New Jersey,1989.
[2] Bimal K Bose, “Modern Power Electronics and AC Drives”, Pearson Education Asia2002.
[3] VedamSubramanyam, “Electric Drives – Concepts and Applications”, Tata McGraw Hill,2000.
[4] R.Krishnan, “Electric Motor Drives – Modeling, Analysis and Control”, Prentice- Hall of India Pvt. Ltd., New Delhi,2003.
[5] Austin Hughes, “Electric Motors and Drives – Fundamentals, Types and Applications”, Elsevier – a division of Reed Elsevier India private Limited, New Delhi,2006.

M.E Electronics (Specialization in Digital Instrumentation) (Full Time)

Proposed Scheme for CBCS

SEM III	DIR3D1	Dissertation Phase I	0-0-12	
	DIR3V3	Comprehensive Viva III	0-0-4	
Total Credit for SEM III			**12 actual + 4 Virtual credits**	
SEM IV	DIR4D2	Dissertation Phase II	0-0-12	
	DIR4V4	Comprehensive Viva IV	0-0-4	
Total Credit for SEM IV			**12 actual + 4 Virtual credits**	
Total Credit			**80 actual + 16 Virtual credits**	

M.E Mechanical Engineering (Design & Thermal) (Full Time)
Proposed Scheme for CBCS

SEM I				
S.NO	***Sub Code***	***Sub Name***	***Number of Credit***	***Sub Type***
1.	DTR1C1	Tribology	3-1-1 =5	PC1
2.	DTR1C2	Design of Internal Combustion Engine Systems	3-1-1 =5	PC2
3.	DTR1C3	Advanced Machine Design	3-1-1 =5	PC3
4.		***Generic Elective I***	3-1-0 =4	GE1
5.		***Elective I***	3-1-1 =5	PE1
6.	ASR1S1	Soft Skills -1	2-0-0 =2	
7.	DTR1W1	Seminar/ Res. Tool/Work Shop-1	0-2-0=2	
8.	DTR1V1	Comprehensive Viva I	0-0-4=4	
Total Credit for SEM I			**28 actual + 4 Virtual credits**	
List of Generic Elective I				
1.	**DTR1G1**	**Advanced Thermodynamics**		
2.	DTR1G2	Non Conventional Energy Systems		
3.	DTR1G3	Management Information System		
4.	DTR1G4	Finite Element Analysis		
List of Elective I				
1.	**DTR1E1**	**Advanced Mechanics of Solids**		
2.	DTR1E2	Fatigue Creep and Fracture		
3.	DTR1E3	Mechanism and Robot Kinematics		
4.	DTR1E4	Thermal Systems : Simulation and Design		
SEM II				
1.	DTR2C1	Machinery Fault Diagnosis and Signal Processing	3-1-1 =5	PC4
2.	DTR2C2	Advanced Refrigeration and Air Conditioning	3-1-1 =5	PC5
3.	DTR2C3	Computer Aided Modeling and Simulation	3-1-1 =5	PC6
4.		***Generic Elective II***	3-1-0 =4	GE2
5.		***Elective II***	3-1-1 =5	PE2
6.	ASR2S2	Soft Skills -2	2-0-0 =2	
7.	DTR2W2	Seminar/ Res. Tool/Work Shop-2	0-2-0=2	
8.	DTR2V2	Comprehensive Viva II	0-0-4=4	
Total Credit for SEM II			**28 actual + 4 Virtual credits**	
List of Generic Elective II				
1.	**DTR2G1**	**Advanced Heat Transfer**		
2.	DTR2G2	Rapid Prototyping		
3.	DTR2G3	Cogeneration and Waste Heat Recovery		
4.	DTR2G4	Mechatronics in Manufacturing Systems		
List of Elective II				
1.	**DTR2E1**	**Machine Vibrations Analysis**		
2.	DTR2E2	Experimental Stress Analysis		
3.	DTR2E3	Applied Elasticity and Plasticity		
4.	DTR2E4	Automotive Systems: Analysis and Design		
SEM III	DTR3D1	Dissertation Phase I	0-0-12=12	
	DTR3V3	Comprehensive Viva III	0-0-4=4	
Total Credit for SEM III			**12 actual + 4 Virtual credits**	
SEM IV	DTR4D2	Dissertation Phase II	0-0-12=12	
	DTR4V4	Comprehensive Viva IV	0-0-4=4	
Total Credit for SEM IV			**12 actual + 4 Virtual credits**	
		Total Credits	**80 actual + 16 Virtual credits**	

SEMESTER - 1

Devi Ahilya University, Indore, India Institute of Engineering & Technology				M.E.(Design & Thermal) Semester A Full Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTR1C1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Tribology	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Objectives & Pre requisites:
The basic objective of the subject is to deal fundamentals of friction, wear and lubrication. The subject is useful in understanding the nature of surfaces of engineering materials. The Pre requisites are material science and machine design.

UNIT- 1
Fundamentals of Tribology:
Introduction to tribology and its historical background, Industrial importance, factors influencing Tribological phenomenon. Engineering surfaces- surface characterization, computation of surface parameters. Surface measurement techniques.

UNIT- 2
Friction:
Genesis of friction, friction in contacting rough surfaces, sliding and rolling friction, various laws and theory of friction, friction of elastomers, friction of various materials, friction measurement methods.

UNIT- 3
Wear:
Introduction, types of wear, wear mechanism, minor forms of wear, wear debris analysis, wear testing method, wear of metals, ceramics, polymers, system approach for wear reduction.
UNIT-4
Lubrication:
Basic principal of lubrication, choice of lubricant type, selection of lubrication oils, oil changing and oil conservation, oil feed system, Greece and anti seizes, gas bearing, lubricating sealing, lubricating testing and specifications, lubrication monitoring.

UNIT- 5
Design for Tribological Elements:
An overview of engineering materials having potential for tribological application, characterization and evaluation of ferrous materials for tribological requirements/application, selection of ferrous materials for rolling element bearings, Boundary lubrication, Hydrodynamic lubrication, elastohydrodynamic lubrication, Design of hydrodynamically loaded journal bearing, externally pressurized bearing, rolling element bearing, performance analysis of bearing.

BOOKS RECOMMENDED

[1] Moore F Desmond ,*Principals and application of Tribology*, ,Pergamon press,1975
[2] Sahoo Prashant *Engineering Tribology*, Prentice-Hall of India, New Delhi, 2005
[3] Lansdown A R ,*Lubrication, A practical Guide to Lubricant selection*, Pergamon Press1982
[4]Majumdar BC, *Introduction to Tribology of Bearings*, Wheeler Publishing, New Delhi,1999

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO HAVE

The knowledge of the subject and fundamentals of friction, wear and lubrication. The subject is useful in understanding the nature of surfaces of engineering materials. The Pre requisites are material science and machine design.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				M.E.(Design & Thermal) Full Time			
Subject Code & Name	Instructions Hours per Week			Credits			
DTR1C2 Design of Internal Combustion Engine Systems	L	T	P	L	T	P	Total
	3	1	2	3	1	1	5
Duration of Theory Paper: 3 Hours							

Learning Objectives: To impart the knowledge of Internal combustion engine from systems design perspective.

Pre requisites: Fundamentals of thermodynamics, Combustion process, Theory of Internal combustion Engines

UNIT-1

Genesis

Evolution: Limitation of Steam Engines, Hot Air Engine, Internal Combustion Engines, Atmospheric Engines, Lenoir Engines, Otto-Langen Engine; Engine Cycles; Flow chart of typical Internal Combustion engine processes; Classification; Configurations; Operational and performance parameters; Fuels for engines: composition, characteristics.

UNIT-2

Induction and Exhaustion Systems

Gas exchange; Intake system: Air-filter, Carburetor, Injectors: throttle body, port, direct injection; Diesel Injection: Low and High pressure Common Rail Systems, Jerk pump systems, Electronically controlled; Manifolds; Superchargers and turbochargers; Exhaust Systems; Exhaust manifold, Exhaust Pipe, Catalytic Converter, Muffler; Valves Flows:Flow Patterns, Discharge Coefficient, Performance, Timing and its Effects; Scavenging: Performance parameters; Volumetric Efficiency.

UNIT-3

In-cylinder flows and Combustion Thermochemistry

In-cylinder flows: Measurement; Swirl: Induction Swirl, Swirl Coefficient, Swirl Ratio; Swish; Tumble; Squish; Prechamber flows;Stoichiometry Relations: Air required for Complete Combustion based on Fuels, Incomplete Combustion, Calculation of Dry Flue Gases for known fuel composition, Estimating Fuel Composition and Excess Air quantity from Exhaust Gas Analysis, Flue Gas Analysis (O_2, CO_2, CO, NO_x, SOx); Combustion Terminology: Adiabatic Flame temperature, Combustion Rates, Equilibrium Coefficient, First Law applied to Chemical Reactions Combustion Efficiency.

UNIT-4

IC Engines Sub Systems

Starting and Charging systems; Ignition Systems; Engine Heat transfer and Cooling systems; Engine friction and lubrication systems; Mechanisms for system operations.

UNIT-5

Pollutant Formation and Control

Emission Formation in SI Engines: Constituents, Formation Mechanisms: Hydrocarbon, Carbon Monoxide, Oxides of Nitrogen, Carbon dioxide, Aldehydes; Control Techniques; Fuel Injection Technologies, Heated Oxygen Sensors, Emission formation in CI Engines: Constituents, formation Mechanisms: Carbon Monoxide, Unburned Hydrocarbons, Oxides of Nitrogen, Compounds of Sulpher, Particulate Matter, Control Techniques: Fuel Injection Technology, Electronically Controlled Distribution, Electronic Unit injector System, After Treatment Devices.

Text Books:

[1] Engineering Fundamentals of internal Combustion Engines, Willard W. Pulkrabek, Printice Hall New Jersey.
[2] Internal Combustion Engine Fundamentals, John B Heywood, McGraw-Hill Book Company, New York, 1988.

[3] Internal Combustion Engines Applied Thermosciences, Colin R. Ferguson and Allan T. Kirkpatrick, John Wiley & Sons, 2e, 2004
[4] Internal Combustion Engines, V. Ganesan, Tata McGrraw-Hill, New-Delhi, 1990
[5] An Introduction to Combustion: Concept and Applications, Stephen R. Turns, McGraw-Hill Education (India), New-Delhi, 2011

List of Experiments

1. Study of various IC engine Components and Sub-systems.
2. Study of Induction and Exhaustion Systems
3. Study of Ignition Systems, Cooling systems, lubrication systems for IC engine systems
4. Simulation and Modeling of Spark Ignition engines
4.Simulation and Modeling of Compression Ignition engines
5. Emission measurement in Spark Ignition and Compression Ignition Engines.

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO HAVE

The knowledge of Internal combustion engine from systems design perspective.
Fundamentals of thermodynamics, Combustion process, Theory of Internal combustion Engines

Devi Ahilya University, Indore, India Institute of Engineering & Technology				M.E.(Design & Thermal) Full Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTR1C3 **Advanced Machine Design**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Course Objectives: The objective of the subject is to deal with failure analysis and advanced areas of design of machine elements based on reliability, fatigue, creep. Also deals with the fracture mechanics approach to design.

Prerequisite(s): Pre requisites are Material science, Machine Design I and Machine Design II.

COURSE OF CONTENTS

Unit-I

Introduction to Advanced Mechanical Engineering Design:
Review of materials and processes for machine elements. Case studies of mechanical engineering design failures. Review of static strength failure analysis – theories of failure.

Unit-II

Reliability and Optimum based Design :
Introduction to optimum design, analysis of simple machine members based on optimum design. Fundamentals of reliability ,System concepts in Reliability engineering. Failure distributions, Statistical analysis of failure data, Weibull analysis, dimensioning.

Unit-III

Design for Dynamic Loading:
High cycle and low cycle fatigue, Fatigue strength. Design of Mechanical Equipment Elements. Exercises of fatigue design of shafting and gears. Exercises of surface fatigue design of rolling contact bearings including linear bearings.

Unit-IV

Design for Creep:
Introduction to Design for creep. Combined creep and fatigue failure prevention. Design for low temperature (Brittle failure). Design for corrosion, wear, hydrogen embrittlement, fretting fatigue and other combined modes of mechanical failure.

Unit-V

Fracture mechanics:
Introduction: Fracture mechanics approach to design, the energy criterion, the stress intensity approach, effect of material properties on fracture, dimensional analysis in fracture mechanics.
Fundamental concepts: Stress concentration effect of flaws, the Grifith energy balance, the energy release rate, instability and the R curve, stress analysis of cracks, K as a failure criterion. Fracture toughness testing of metals

Note: Only Mechanical Engineer's Handbook, Data-books and certified notes are allowed in the examination hall.

Text Books:

[1] Shingley J.E., *Mechanical Engineering Design*, McGraw-Hill 2003
[2] Dieter G.E., *Engineering Design*, McGraw-Hill 2000.
[3] Mubeen., Machin*e Design*, , Khanna Publications(P) Ltd.,2004

Reference Books:

[1] Spotts M.F.,Shoup T.E., Hrnberger L.E., *Design of Machine Elements*, Pearson Education ,8e,2006
[2] Shariff A.,*Design of Machine Elements*,Dhanpat Rai Publications(P) Ltd.,3e,1995

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO HAVE

The failure analysis and advanced areas of design of machine elements based on reliability, fatigue, creep. Also deals with the fracture mechanics approach to design.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				1 Year M.E.(Design &Thermal Engg.) Full Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTR1G1 **Advanced Thermodynamics**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**-**	**3**	**1**	**-**	**4**
Duration of Theory Paper: 3 Hours							

Objective: The basic objective of the subject is to deal fundamentals of Thermodynamics, Compressible Fluid Flow properties, Thermodynamics relations & Exergy.

Prerequisite: Basic Engineering Thermodynamics.

COURSE CONTENT

UNIT 1
Mass And Energy Analysis Of Control Volume
Control Volume, Steady Flow Process, Mass Balance and Energy Balance in a Simple Steady Flow Processes, Variable Flow Processes, Comparison of SFEE with Euler and Bernoulli Equations, Examples of a Variable Flow Problems. Illustrative Problems.

UNIT 2
Thermodynamic Property Relations
Mathematic Theorems, Maxwell,s Relations, TdS Equations, Heat Capacities, Joule Kelvin Effects, Claussius Clapeyron Equation, Gibb's Phase Rule, General Thermodynamic considerations on an Equation of State. Illustrative Problems

UNIT 3

Exergy
Work Potential of Energy, Reversible work and Irreversibility, Second Law Efficiency, Exergy Change of System, Exergy of a Closed System, Exergy of a Steady Flow System, Maximum Work Obtainable Conditions, Illustrative Problems

UNIT 4
Vapour Power Cycles
General Aspects, Simple Steam Power Cycle, Rankine Cycle, Reheat Cycle, Ideal Regenerative Cycle, Feedwater Heaters, Exergy Analysis of Vapour Power Cycles, Illustrative Problems

UNIT 5
Finite Time Thermodynamics
General Aspects, Application of principles on Reversible and Irreversible Cycles, Maximum Power Output conditions, Effect of Cycle Irreversibility Parameter on the performance of the Cycles, Performance of Engines working under Maximum Power and Maximum Power Density conditions, Entropy Generation Minimization, Concepts of Virtual Entropy, Illustrative Problems.

Books Recommended:
[1.] Y.A Cengel, *Thermodynamics-An Engineering Approach* , McGraw Hill Companies,2006.
[2.] P.K Nag, *Engineering Thermodynamics* , The McGraw Hill Companies, Third Edition

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO :

- Perform Comparison of SFEE with Euler and Bernoulli Equations,
- Mathematic Theorems, Maxwell,s Relations, TdS Equations, Heat Capacities
- Work Potential of Energy, Reversible work and Irreversibility, Second Law Efficiency
- General Aspects, Application of principles on Reversible and Irreversible Cycles

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">1 Year M.E.(Design & Thermal Engg.)
Full Time</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTR1G2
Non Conventional Energy Systems</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td></tr>
</table>

[3.] G.E Myers, *Engineering Thermodynamics* ,Prentice Hall, Third Edition

Objective: The objective of the subject to acquaint the students the renewable energy technological systems, its principle ,working, system design and analysis of present systems, to analysis the environmental and cost economics of using renewable energy sources compared to fossil fuels.

Pre requisites: Thermal Engineering, Heat and Mass transfer, fluid mechanics, steam engineering, combustion technology.

COURSE CONTENT

UNIT-1

Solar Energy

Solar radiation its measurements and prediction - solar thermal flat plate collectors concentrating collectors – applications - heating, cooling, desalination, power generation, drying, cooking etc - principle of photovoltaic conversion of solar energy, types of solar cells and fabrication. Photovoltaic applications: battery charger, domestic lighting, street lighting, and water pumping, power generation schemes. Design and Thermal analysis.

UNIT-2

Wind Energy

Atmospheric circulations – classification - factors influencing wind - wind shear – turbulence - wind speed monitoring - Betz limit - Aerodynamics of wind turbine rotor- site selection - wind resource assessment - wind energy conversion devices - classification, characteristics, and applications. Hybrid systems - safety and environmental aspects.

UNIT-3

Bio-Energy

Biomass resources and their classification - chemical constituents and physicochemical characteristics of biomass - Biomass conversion processes - Thermo chemical conversion: direct combustion, gasification, pyrolysis and liquefaction - biochemical conversion: anaerobic digestion, alcohol production from biomass - chemical conversion process: hydrolysis and hydrogenation. Biogas - generation - types of biogas Plants- applications Design of bio gas digesters, landfill gas systems and gasifiers.

UNIT-4

Hydrogen and Fuel Cells

Thermodynamics and electrochemical principles - basic design, types, and applications - production methods - Bio photolysis: Hydrogen generation from algae biological pathways - Storage gaseous, cryogenic and metal hydride and transportation. Fuel cell – performance characteristics ,principle of working- various types - construction and applications.

UNIT-5

Other Types of Energy

Ocean energy resources - principles of ocean thermal energy conversion systems - ocean thermal power plants - principles of ocean wave energy conversion and tidal energy conversion – hydropower – site selection, construction, environmental issues - geothermal energy - types of geothermal energy sites, site selection, and geothermal power plants, MHD, Thermal analysis

Note: HMT Data-books and certified notes are allowed in the examination hall.

BOOKS RECOMMENDED:

[1] Sukhatme, S.P., Solar Energy, Tata McGraw Hill, 1984**.**
[2] Twidell, J.W. and Weir, A., Renewable Energy Sources, EFN Spon Ltd., 1986.
[3] Kreith, F and Kreider, J. F., Principles of Solar Engineering, McGraw-Hill, 1978.

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO :

- Perform Comparison of SFEE with Euler and Bernoulli Equations,
- Mathematic Theorems, Maxwell,s Relations, TdS Equations, Heat Capacities
- Work Potential of Energy, Reversible work and Irreversibility, Second Law Efficiency
- General Aspects, Application of principles on Reversible and Irreversible Cycles

Devi Ahilya University, Indore, India Institute of Engineering & Technology				I Year ME (Design & Thermal Engg.) Full Time				
Subject Code & Name	**Instructions Hours per Week**			**Credits**				
DTR1G3 Management Information System	**L**	**T**	**P**		**L**	**T**	**P**	**Total**
	3	**1**	**0**		**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours								

Objectives & Pre requisites:

The basic objective of the subject is to deal fundamentals of Management Information System. The subject is useful in understanding the various information sources and database structures.

COURSE OF CONTENTS

Unit-1

Introduction to Management Information Systems

An Overview of Management Information Systems, Structure of a Management information System.

Survey of Information Systems Technology

Hardware, Software, and Communication technology for Information Systems, Storage and Retrieval of Data, Transaction Processing, Office Automation and Information processing Control Functions.

Unit-2

Conceptual Foundations

The Decision Making Process, Concepts of Information, Humans as information Processors, System Concepts, Concepts of Planing and Control, Organizational Structures and Management Concepts.

Unit-3

Information Based Support System

Support Systems for Planing, Control and Decision Making, Support Systems for Management of Knowledge Work.

Unit-4

Information System Requirements

Developing a Long Range Information System Plan, Strategies for the Determination of Information Requirements, Database Requirements, User Interface Requirements.

Unit-5

Development, Implementation and Management of Information System Resources

Developing and Implementing Application Systems, Quality Assurance and Evaluation of Information Systems, Organizational and Management of the Information Resources Functions, Future Development and Their Organizational and Social Implications.

Text Books

[1] Gordan B. Davis and Margrethe H. Olson, “Management Information Systems - Conceptual Foundations, Structures and Development, Mcgeaw Hills International Editions.

Reference Books

[1] Laudon, Kenneth C., and Laudon, Jane P., Management Information Systems-Managing Digital Firm, Tenth Edition, Prentice Hall, 2007

[2] Management Information Systems, Loudon and Loudon, 10th edition, Pearsons Educations

[3] Management Information System, Oz Thomson Learning 5th edition

[4] Management Information System, W.S.Jawadekar, 3rd edition, TMH

[5] Management Information System, James O‘Brien, 7th edition, TMH

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO :

- Structure of a Management information System.
- , Transaction Processing, Office Automation and Information processing Control Functions.
- Organizational Structures and Management Concepts.
- Developing a Long Range Information System Plan

Devi Ahilya University, Indore, India Institute of Engineering & Technology				I Year ME (Design & Thermal Engg.) Full Time				
Subject Code & Name	**Instructions Hours per Week**			**Credits**				
DTR1G4 **Finite Element Analysis**	**L**	**T**	**P**		**L**	**T**	**P**	**Total**
	3	**1**	**0**		**3**	**1**	**0**	**4**
Duration of Theory Paper: **3 Hours**								

Objectives & Pre requisites:
The basic objective of the subject is to deal with the fundamentals of Finite Element Methods. The subject is useful in understanding the concept of Solving problems using finite element approach.

COURSE OF CONTENTS

Unit-1
Introduction
Introduction, Approximate Methods of Analysis, Finite Element Method-An Introduction, Different Approaches in FEM.

Unit-2
Finite Elements and Interpolation Functions
Interpolation Functions, One Dimensional Elements, Two Dimensional Elements, Three Dimensional Elements.

Unit-3
One Dimensional Finite Element Analysis
Linear Spring, Truss Element, 1D Torsion of a Circular Shaft, 1D Steady State Heat Conduction, 1D Flow Through Porous Media, 1D Ideal Fluid Flow Through Pipes, Beam Element, Analysis of Plane Frames and Grids.

Unit-4
Two Dimensional Finite Element Analysis
2D Flow through Porous Media, 2D Stress Analysis, Iso-Parametric Formulation, Finite Element Solution of Partial Differential Equations by Method of Weighted Residual, FEM Formulation Based on Variational Principle, Finite Element Solution of Stokes Flow Equations.

Unit-5
Three Dimensional Finite Element Analysis
Axi-Symmetric Solids, 8 Node Isoparametric Element for 3D Stress Analysis, Computer Implementation of FEM, Applications of Finite Element Method.

Text Books
[1] Y. M. Desai, T. L. Eldho, A. H. Shah, "Finite Element Method with Applications in Engineering", Pearson Publication.
[2] Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, "Concepts and Applications of Finite Element Analysis", Wiley India (P) Ltd.
[3] Chennakesava R. Alavala, "Finite Element Methods Basic Concepts and Applications", PHI Learning Private Limited.

Reference Books
[1] Daryl L. Logan, "A First Course in the Finite Element Method", Cengage Learning India.
[2] V. Ramamurti, "Finite Element Method in Machine Design", Narosa Publishing House.
[3] Klaus Jurgen Bathe, "Finite Element Procedures", PHI Learning India.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="5">I Year ME (Design & Thermal Engg.)
Full Time</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="5">Credits</td></tr>
<tr><td rowspan="2">DTR1E1
Advanced Mechanics of Solids</td><td>L</td><td>T</td><td>P</td><td></td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>2</td><td></td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Course Objectives:

• To develop the analytical methods for solving problems in mechanics of solid those are generally considered beyond the scope of basic course in the discipline. As such, the developments tend to evolve from fundamentals principles such as equilibrium and conservation of energy.

• To understand fundamentals of linear elasticity and energy methods for solving torsion, bending problems.

• To gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures using Finite Element Analysis

Prerequisites: Mechanics of Solids

COURSE OF CONTENTS

Unit-1

3D Analysis of Stresses and strains

Concept of stress at a point, stress tensor, stress on inclined plane, stress components on a rectangular parallelepiped in Cartesian coordinate system, derivation of stress equilibrium equations, transformation of stresses, strains. The state of strain at a point, strain displacement relations, strain compatibility condition and stress compatibility conditions, Relations between Elastic Constants.

Unit-2

Unsymmetrical Bending

Stresses and deflections in beams subjected to unsymmetrical loading-Kern of section, Deflection of Beams, Shear Center.

Unit-3

Bending of Curved Beams

Bending Stresses and Deflections of Curved Beams.

Unit-4

Introduction to the Finite Element Method

Introduction, Node and Element Notations, The Truss Element, Beam and Frame Elements, Two Dimensional Elastic Elements, Higher Order and Three Dimensional Elastic Elements.

Unit-5

Finite Element Modeling Techniques

Planing and Creating the Finite Element Model (Preprocessing), Element Selection and Mesh Strategy, Load Application, Constraints, Preprocessing Checks, Processing the Model and Postprocessing.

Text Books

[1] Richard G. Budynas, Advanced Strength and Applied Stress Analysis, Mc Graw Hill Education (India), Second Edition, 2014

[2] L. S. Shreenath, Advanced Mechanics of Solids, Tata McGraw Hill Publication, 2014

Reference Books

[1] G H Ryder, Strength of Materials, McMillan India Ltd., Third Edition, 1969.

[2] Timoshenko, *Elements of Strength of Materials*, 5/e,Wadsworth Publishing;1968

[3] Kamal Kumar and R. C. Ghai, Advanced Mechanics of Materials, Khanna Publishers, 2010.

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO

- Develop the analytical methods for solving problems in mechanics of solid those are generally considered beyond the scope of basic course in the discipline. As such, the developments tend to evolve from fundamentals principles such as equilibrium and conservation of energy.
- Understand fundamentals of linear elasticity and energy methods for solving torsion, bending problems.
- Gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures using Finite Element Analysis
- Prerequisites: Mechanics of Solids

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">1 Year M.E. (Design &Thermal Engg.)
Full Time</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTR1E2
Fatigue Creep and Fracture</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td></tr>
</table>

Objective of the subject

The objectives of this course will be achieved by learning the phenomenon of fatigue creep & fracture Mechanism inside the metallic bodies also the behavior of the material can be understand under these states.

Prerequisites

Strength of Material, Machine Design & Material Science.

COURSE CONTENTS

UNIT-1

Introduction

Introduction & types of fatigue creep & Fracture phenomenon. Stress Analysis under fatigue, creep & Fracture. Material selection under the given conditions.

UNIT -2

Fatigue

Types of fatigue leading and failure, Fatigue test, endurance limit, S-N diagram; Various failure relations, Viz., Soderberg, Modified Goodman-, Gerber parabolic-, Elliptical-relations; Factors influencing fatigue strength; Influence of stress concentration on fatigue test; Fretting corrosion; Effect of environment-corrosion fatigue; Increased fatigue life due to surface protection.

UNIT -3

Creep

Mechanics of creep, inter-granular, trans-granular creep, Creep test, Creep strain rate-time curves, Deformation mechanism map; High temperature properties of materials; Long time creep-stress-time relations; Creep contribution to the fracture mechanism; Creep contribution to the fracture mechanism; DVM, DVL German-standard, Hatifield time yield test.

UNIT -4

Fracture

Damage tolerance analysis, residual strength in presence of cracks; Mechanisms of crack growth and fracture; Basic modes of fracture; Stress Concentration factor, state of stress at a stress concentration, load-flow-times; Measurement of Collapse strength; Griffith's theory of brittle fracture; Irwin's theory of fracture in elastic-plastic materials; Theories of linear elastic plastic fracture mechanics (LEFM); Stress intensity fracture, toughness, stress distribution at crack tip: plane stress, plane strain cases; Theories of elastic plastic fracture mechanics (EPFM); Crack opening displacement (COD) Criterion, COD tests, crack tip opening displacement (CTOD) measurement; Crack arresters; Implementation of fracture control.

UNIT -5

Design against Creep

Types of creep, Introduction to Design against creep. Combined creep and fatigue failure prevention.Shearby Dorn Parameter, Larson Miller Parameter, Menson- Haferd Parameter.

BOOKS RECOMMENDED:

[1]. Norman E. Dowling, "*Mechanical Behavior of Materials: Engineering Methods for Deformation, Fracture, and Fatigue*," 3rd edition, *Pearson Prentice Hall,* 2007.
[2] Shigley J.E. , "*Mechanical Engineering Design*"McGraw Hill 2003.
[3] Mubeen A. , "*Machine Design* "Khanna Publications (P) Ltd

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO

Have the phenomenon of fatigue creep & fracture Mechanism inside the metallic bodies also the behavior of the material can be understand under these states.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				1 Year M.E.(Design &Thermal Engg.) Full Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTR1E3 **Mechanism and Robot Kinematics**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: *3 Hours*							

Objective and Pre requisites: The objective of the subject is to introduce the students about the basic analytical techniques and fundamental principles of Robot Kinematics. The Pre requisites are knowledge of the basic course in theory of machines, matrix theory, probability, computer programming and mathematical analysis.

COURSE CONTENT

UNIT-1
Introduction to Robotics & Mechanisms
Introduction, Automation and Robotics, Robot anatomy and Robot configurations, Links and joints notations, End effectors, Work volume and Obstacles, Overview of Robot drive systems and Control systems, Robot sensing, Dynamic performance and Precision of movement, Applications in Robotics.

UNIT-2
Robot Arm Kinematics
Introduction, Forward or direct Kinematics Problem, Matrix Representations, Robot arm coordinates and Transformation matrix, Composite homogeneous transformation matrix, Denavit-Hartenberg representation, Kinematic equations, Location of end effector, Inverse kinematic problem, Geometric approach for solution of inverse kinematic problem.

UNIT-3
Trajectory Planning
Introduction, Constraints and Path specifications, Basic algorithm for generation of joint trajectory, joint interpolated trajectories, Cartesian path trajectory planning.

UNIT-4
Robot Arm Control.
Fundamentals of control system theory, Joint motion controls: Servo mechanism, Computed torque technique, Minimum time control, Variable structure control. Adaptive control modes.

UNIT-5
Robot Programming and Task Planning
Introduction, Characteristics of robotic programming languages, position and motion specification,

development and debugging facilities, task-level programming and robot program synthesis, Robot intelligence and task planning.

BOOKS RECOMMENDED:

[1] Mikell P.Groover, *Industrial Robotics*, McGraw Hill Pvt. Ltd., New Delhi.
[2] K. S. Fu, R. C. Gonzalez, C. S.G. Lee, *Robotics: Control, Sensing, Vision and Intelligence*, McGraw Hill Book Company, Singapore, International Edition 1987.
[3] Robert J. Schilling, *Fundamentals of Robotics: Analysis & Control*, Prentice-Hall of India Private Limited, New Delhi, 5th Reprint, 2003

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO HAVE:

- Techniques and fundamental principles of Robot Kinematics
- Robot anatomy and Robot configurations, Links and joints notations, End effectors, Work volume and Obstacles
- Constraints and Path specifications, Basic algorithm for generation of joint trajectory

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**1 Year M.E.(Design & Thermal Engg.) Full Time**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTR1E4 Thermal Systems : Simulation and Design	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: *3 Hours*							

COURSE CONTENTS

Objective of the Subject:
The basic objective of the subject is to have goal of achieving a workable system and of designing an optimum system. The possibility of optimization represents one of the few facets of this subject.

Pre requsites: Thermodynamics, Heat & Mass Transfer.

UNIT- 1
Designing a Workable System and its Economics:
Steps in Arriving at a Workable System, Creativity in Concept Selection, Design of any Thermal Process Plant, Preliminaries to the Study of Optimization.

UNIT- 2
Dynamic Behaviour of Thermal Systems:
Dynamic Analysis, One Dynamic Element in a Steady State Simulation, Laplace Transformers, Inversion of Laplace Transforms, Feedback Control Loops, Time Constants Blocks, Cascaded Time Constant Blocks, Stability Analysis..

UNIT- 3
Modelling Thermal Equipment:
Using Physical Insight, Selecting vs Simulating a Heat Exchanger, Evaporators and Condensers, Condensation of a Binary Mixture, Overview of Search Methods, Assessment of Single Variable Searches.

UNIT-4
System Simulation:
Description of System Simulation, Uses of Simulation, Information Flow Diagrams, Sequential and Simultaneous Calculations, Taylor Series Expansion, Newton Raphson Method with Multiple Equations .

UNIT- 5
Optimization:
Levels of Otimization, Mathematical Representation of Optimization Problems, Linear Programming, Setting up the Mathematical Statement, Calculus Methods of Optimization, Expansion of Lagrange Multiplier Equations, Unconstrained Optimization.

BOOKS RECOMMENDED

[1] Cengel YA.,*Heat Transfer-A Practical Approach*, Tata McGraw Hill, New Delhi 2e,2002.
[2] Stoecker, WF. *Design of Thermal Systems* ,McGraw Hill International Editions, New Delhi, 2007
[3] Woodson,TT. *Introduction to Engineering Design*, McGraw Hill, New York, 1996.
[4] Rudd, DF. *Strategy of Process Design*, McGraw Hill, New York, 1996

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO :

- Understand concept of Design of any Thermal Process Plant, Preliminaries to the Study of Optimization.
- Can Selecting vs Simulating a Heat Exchanger, Evaporators and Condensers, Condensation of a Binary Mixture, Overview of Search Methods
- Uses of Simulation, Information Flow Diagrams, Sequential and Simultaneous Calculations, Taylor Series Expansion

SEMESTER - 2

Devi Ahilya University, Indore, India Institute of Engineering & Technology				M.E.(Design & Thermal) Full Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTR2C1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
MACHINERY FAULT DIAGNOSIS & SIGNAL PROCESSING	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Objective & Pre requisites:

The basic objective of the subject is to deal with the analysis of faults generated inside the machine during the operations. The subject provides the basic knowledge of the methods used for the prevention of the faults and also the approach for analyzing the signals generated during the faulty condition of the machine. The Pre requisites are Tribology and Vibration.

UNIT- 1

Introduction to Diagnostic Maintenance and Condition Monitoring:

Introduction to condition based maintenance, applications and economic benefits, signature analysis-online & offline technique, various condition monitoring techniques, levels condition monitoring, fault detection and diagnosis.

UNIT- 2

Fault Diagnosis using Vibration Monitoring:

Vibration monitoring and analysis, shock pulse methods, noise monitoring, envelope detection technique, types of vibration test, field balancing, case studies on vibration based condition monitoring.

UNIT- 3

Noise Monitoring & Control:

Introduction to noise, properties of noise, loudness and weighting networks, octave and FFT analysis, impulsive noise, instrumentation for noise measurement and analysis, sound power, sound intensity, noise source location, noise diagnostics, noise monitoring of machines with example, cepstrum analysis, noise control methods, maintenance and noise reduction, vehicle and machinery noise, noise standards, case studies.

UNIT-4

Advanced Methods of Condition Monitoring:

Oil analysis including wear debris and contaminant monitoring, performance monitoring, non-destructive techniques, IR-Thermography, ultrasonic monitoring, reliability centred maintenance, higher order spectrum/advanced signal processing.

UNIT- 5

Computer Aided Monitoring:

Application and choice of the methods, computer aided monitoring including experts system like artificial neural network, fuzzy logic and other optimizing techniques, practical applications and case studies on computer based condition monitoring.

BOOKS RECOMMENDED

[1] Ramamurthy V.,*Mechanical Vibration Practice with Basic Theory* ,Narosa Publication House, New Delhi 1e,2002.

[2] Rao J S & Gupta K. *Introductory Course on Theory and Practice of Mechanical Vibration* ,New

Age Publisher, New Delhi, 2e, 2002
[3] Rao J S, *Vibratory Condition Monitoring of Machine*, Narosa Publishing House, New Delhi, 1e,2002.
[4] Mishra R C & Pathak K., *Maintenance Engineering & Management*, Printice Hall of India, New Delhi, 1e , 2002.
[5] Gopalkrishnan P. & Banerji AB, *Maintenance & Spare Part Management*, Printice Hall of India, New Delhi, 3e,2002.
[6] Hand Book of Condition Monitoring by BKN Rao, UK.

LABORATORY EXPERIMENTS:

1. Case studies based on vibration based condition monitoring.
2. Experimental analysis of Noise based condition monitoring.
3. Experimental analysis of faults using IR-Thermography .
4. Experimental analysis of faults using Non- Destructive methods.
5. Case studies on computer aided fault diagnosis.

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO :

- Approximate Methods of Analysis,
- Fluid Flow Through Pipes, Beam Element, Analysis of Plane Frames and Grids.
- 2D Flow through Porous Media, 2D Stress Analysis
- Axi-Symmetric Solids, 8 Node Isoparametric Element for 3D Stress Analysis
- One Dimensional Elements, Two Dimensional Elements

Devi Ahilya University, Indore, India Institute of Engineering & Technology				I Year M.E.(Design &Thermal Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTR2C2 Advanced Refrigeration and Air Conditioning	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Duration of Theory Paper: 3 Hours	**3**	**1**	**2**	**3**	**1**	**1**	**5**

Objectives & Prerequisites: Advancements in Refrigeration and Air Conditioning Technologies. Fundamentals of Thermodynamics, Heat transfer, Refrigeration cycles, Psychrometry

COURSE CONTENT

UNIT-1
Advanced Vapour Compression Technologies:
Single Stage System; Multistage Refrigeration: Two-stage with given Intermediate Pressure, Optimum Interstage Pressure, Cascade Refrigeration System; Liquefaction of Gases: Linde–Hampson Cycle: Precooled Linde–Hampson Cycle; Claude's Cycle; Energy and Exergy analyses.

UNIT-2
Advanced Vapour Absorption and other Technologies
Vapor Absorption Systems: Ammonia-Water, Three fluid, Water-Lithium bromide; Solar-Powered Absorption Refrigeration System, Multi Stage Absorption Systems, Energy and Exergy analyses of Vapour Absorption Systems.

UNIT-3
Load Estimation and Air Conditioning Systems
Psychrometry, Psychrometric Processes, Load Estimation, Air-conditioning Systems: Classification- All Air, Air and water, All water Systems; Decentralized Cooling and Heating; Individual systems; Evaporative; Dessicant; Thermal storage; Clean room; Space systems; Packaged; Central systems

UNIT-4
Fans and Duct Design
Fans: Classification, Performance Characteristics and selection; Flow basics: Continuity Equation, Bernoulli's Equation, Flow head loss; Ducts: Types, pressure characteristics, system pressure loss; Duct design: Equal-friction, Constant-velocity method, Static regain method

UNIT-5
Controls
Control Loop and Control Methods; Control Modes: Two-position, Step and Modulating, Floating, Proportional; Proportional plus Integral (PI), Proportional-Integral-Derivative (PID); Controllers: Direct / Reverse acting, Pneumatic, electric, digital; Valves and actuator; Dampers

BOOKS RECOMMENDED:

1. W.F. Stoecker, *Refrigeration and Air conditioning*, McGraw-Hill Book Company, 4e, 1985
2. Prasad M, *Refrigeration and Air conditioning*, New Age International, 2e, 2011
3. Arora C P *Refrigeration and Air conditioning*, McGraw-Hill Book Company, 1e, 1985
4. W.F. Stoecker, *Refrigeration and Air conditioning*, McGraw-Hill Book Company, 1e, 1985
5. Shan Wang, *Handbook of Air-Conditioning and. Refrigeration,* McGraw-Hill Book Company, 2e, 2000
6. McQuiston F C., Parker J.D. and Spitler J. D., *Heating, Ventilating, and Air-Conditioning Analysis and Design*, John Wiley& Sons, 6e, 200
7.
8. **LABORATORY EXPERIMENTS:**

1. To calculate actual and ideal Coefficient of Performance of vapour compression trainer.
2. To calculate actual and ideal Coefficient of Performance of vapour Absorption System
3. To carry out various psychrometric process in Air-conditioning trainer.
4. To estimate the Heating and cooling load of an enclosure
5. To design a duct network for a given plan

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO :

- Student will able to deal with the analysis of faults generated inside the machine during the operations. And will have knowledge of the methods used for the prevention of the faults and also the approach for

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">II Year M.E.(Design &Thermal Engg.)
(Part Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTP3C2
Advanced Refrigeration and Air Conditioning</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Objectives & Prerequisites:
Advancements in Refrigeration and Air Conditioning Technologies. Fundamentals of Thermodynamics, Heat transfer, Refrigeration cycles, Psychrometry

COURSE CONTENT

UNIT-1
Advanced Vapour Compression Technologies:
Single Stage System; Multistage Refrigeration: Two-stage with given Intermediate Pressure, Optimum Interstage Pressure, Cascade Refrigeration System; Liquefaction of Gases: Linde–Hampson Cycle: Precooled Linde–Hampson Cycle; Claude's Cycle; Energy and Exergy analyses.

UNIT-2
Advanced Vapour Absorption and other Technologies
Vapor Absorption Systems: Ammonia-Water, Three fluid, Water-Lithium bromide; Solar-Powered Absorption Refrigeration System, Multi Stage Absorption Systems, Energy and Exergy analyses of Vapour Absorption Systems.

UNIT-3
Load Estimation and Air Conditioning Systems
Psychrometry, Psychrometric Processes, Load Estimation, Air-conditioning Systems: Classification-All Air, Air and water, All water Systems; Decentralized Cooling and Heating; Individual systems; Evaporative; Dessicant; Thermal storage; Clean room; Space systems; Packaged; Central systems

UNIT-4
Fans and Duct Design
Fans: Classification, Performance Characteristics and selection; Flow basics: Continuity Equation, Bernoulli's Equation, Flow head loss; Ducts: Types, pressure characteristics, system pressure loss; Duct design: Equal-friction, Constant-velocity method, Static regain method

UNIT-5
Controls
Control Loop and Control Methods; Control Modes: Two-position, Step and Modulating, Floating, Proportional; Proportional plus Integral (PI), Proportional-Integral-Derivative (PID); Controllers: Direct / Reverse acting, Pneumatic, electric, digital; Valves and actuator; Dampers

BOOKS RECOMMENDED:

1. W.F. Stoecker, *Refrigeration and Air conditioning*, McGraw-Hill Book Company, 4e, 1985
2. Prasad M, *Refrigeration and Air conditioning*, New Age International, 2e, 2011
3. Arora C P *Refrigeration and Air conditioning*, McGraw-Hill Book Company, 1e, 1985

4. W.F. Stoecker, *Refrigeration and Air conditioning*, McGraw-Hill Book Company, 1e, 1985
5. Shan Wang, *Handbook of Air-Conditioning and. Refrigeration,* McGraw-Hill Book Company, 2e, 2000
6. McQuiston F C., Parker J.D. and Spitler J. D., *Heating, Ventilating, and Air-Conditioning Analysis and Design,* John Wiley& Sons, 6e, 2005
7.
8. **LABORATORY EXPERIMENTS:**

1. To calculate actual and ideal Coefficient of Performance of vapour compression trainer.
2. To calculate actual and ideal Coefficient of Performance of vapour Absorption System
3. To carry out various psychrometric process in Air-conditioning trainer.
4. To estimate the Heating and cooling load of an enclosure
5. To design a duct network for a given plan

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO :

- Understand Cascade Refrigeration System; Liquefaction of Gases
- Understand Vapor Absorption Systems: Ammonia-Water, Three fluid, Water-Lithium bromide
- Understand Decentralized Cooling and Heating; Individual systems; Evaporative; Dessicant; Thermal storage;
- Understand Control Loop and Control Methods; Control Modes

Devi Ahilya University, Indore, India Institute of Engineering & Technology				1 Year M.E. (Design & Thermal Engg.) Full Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTR2C3 Computer Aided Modeling and Simulation	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: *3 Hours*							

Objectives:

To understand the basic analytical fundamentals that are used to create and manipulate geometric models in a computer program.

To model complex shapes including freeform curves and surfaces.

To understand various graphics standard for CAD data exchange (such as IGES, PARA etc).

To understand the application of Computers in Analysis and Design of Machine Elements.

Prerequisite:

COURSE CONTENT

UNIT - 1

INTRODUCTION

Fundamentals of CAD: Introduction: Design Process: Application of computers in design: Benefits of CAD. Computer Hardware: Graphic input devices; display devices; Graphic output devices; Central processing unit (CPU), Workstations.

UNIT- 2

COMPUTER GRAPHICS

CAD software and Database: Software configuration of a graphics system, Output primitives frame buffer – Bresenham's Algorithm – Line – Circle – function of graphics software - 2D & 3D transformation – Translation – scaling – Rotation – Homogeneous coordinate – Concatenation, clipping algorithm.

UNIT - 3

TECHNIQUES FOR GEOMETRIC MODELING

Geometric Modelling: Curves And Surfaces- Representation, Wire Frame models, Intrinsic and parametric representations, analytic and parametric curves and surfaces, Manipulations of curves and surfaces.

UNIT- 4

TECHNIQUES FOR GEOMETRIC MODELING AND DATA EXCHANGE STANDARDS

Geometric Modeling: Solids- Solid models, Fundamentals of Solid Modeling, Half -spaces, Boundary Representation (B-rep), Constructive Solid Geometry (CSG), Sweep Representation, Analytic Solid Modeling, Solid Manipulations.

Graphics standards – GKS, Data exchanger standards – IGES – STEP - DXF – Concept of data storage for solid models.

UNIT - 5

VISUAL REALISM

Introduction, Model Clean-up, Hidden Line Removal, Hidden Surface Removal, Hidden Solid Removal, Shading, Coloring and User Interface for Shading and Coloring, Introduction to CAD Modeling Systems. Tolerance and Interference Analysis

Text Book:

[1.] Zeid Ibrahim and R Sivasubramanian, *CAD / CAM Theory and Practice,* 2nd Edition, 3rd Reprint,
2010, Tata McGraw Hill Education Private Limited, New Delhi.
[2.] P N Rao, CAD/CAM Principles and Applications, 3rd Edition, 4th Reprint, 2011, Tata McGraw Hill Education Private Limited, New Delhi.
[3.] M Groover and E Zimmers, CAD/CAM Computer Aided Design and Manufacturing, 10th Impression, Pearson Education.
[4.] Krishnamoorathy C.S. and J.S. Rajeev, *Computer Aided Design* (Software and Analysis Tools), Narosa Pub House, New Delhi

List of Practicals:

1. To draw the basic geometrical shapes such as line, triangle, rectangle etc using programming language Autolisp/C++/etc.
2. To perform the various geometrical transformations on the geometrical shapes drawn in practical 1 using programming language Autolisp/C++/etc.
3. To model the simple machine elements like gear, shaft, pulleys, cams etc parametrically using CAD/CAM software.
4. To obtain the 2d drawings from the 3d object created in practical 3.
5. To create the assembly of machine elements using CAD/CAM software.
6. To perform the finite element analysis of machine elements using CAD/CAM Software.

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Understand the basic analytical fundamentals that are used to create and manipulate geometric models in a computer program.
- Can model complex shapes including freeform curves and surfaces.
- Understand various graphics standard for CAD data exchange (such as IGES, PARA etc).
- Understand the application of Computers in Analysis and Design of Machine Elements.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">I Year M.E.(Design& Thermal)
(Full Time)</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTR2G1
Advanced Heat Transfer</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Objectives & Pre requisites:
Advancements in the topics on Heat Transfer Engineering. Fundamentals of Thermodynamics, Heat transfer at Undergraduate level

COURSE CONTENT

UNIT-1
Steady State Unidirectional Heat Conduction with Heat Generation:
Heat flow through slab with heat generation, Heat flow through cylinder with heat generation, Dielectric heating, Heat conduction with heat generation when generation is a function of position, Heat conduction with heat generation when generation is a function of temperature, Steady state two dimensional heat conduction, Purpose of Insulation, Critical Radius of Insulation.

UNIT-2
Unsteady State Unidirectional Heat Conduction:
Unsteady state heating or cooling, Unsteady state heat conduction through finite slab with negligible thermal resistance, Unsteady state heat conduction through finite slab with thermal resistance, Heisler charts, Periodic heat flow.

UNIT-3
Thermodynamic Analysis of Heat Exchangers:
Introduction, Temperature distribution and heat flow, Overall heat transfer coefficient, Fouling of Heat Exchangers, Effectiveness method (NTU) to study the performance of Heat Exchangers, Second Law analyses of Counter and Parallel flow type Heat Exchangers (Exergy Analysis), Finite Time Thermodynamic (FTT) analyses of Heat Exchangers.

UNIT-4
Advanced Convection Principles
Conservation principles; Differential and Integral Equations of momentum and Energy for Laminar and Turbulent Boundary Layers; Heat Transfer in Laminar Internal and External Flows: Axial Variations of Surface temperature and Heat flux; Heat Transfer in Turbulent internal and External Flows.

UNIT-5
Advanced Radiation
Review of fundamentals; View factors: Definition and Evaluation, Area Integration, Contour Integration, View factor algebra, Inside sphere method, unit sphere method, Radiative Heat exchange between gray diffuse surfaces; solution methods for governing integral methods, Partially specular gray and nonideal sufaces.

BOOKS RECOMMENDED:

1. Bergman T.L., Lavine A. S., Incropera F. P. and Dewitt D. P. , *Fundamentals of Heat And Mass Transfer,* John Wiley & Sons, 7e, 2011

2. Kreith F., Manglik R. M., and Bohn M. S., *Principles of Heat Transfer*, Cengage Learning, 7e 2011
3. Kays W., Crawford M., Weigand B., *Convective Heat and Mass Transfer,* McGraw-Hill Book Company, 4e, 2005
4. Modest M. F., *Radiative Heat Transfer,* McGraw-Hill, Inc. 1993
5. Bejan A, *Convective Heat Transfer,* McGraw-Hill Book Company, 4e, 2005

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Apply the concept of heat conduction with heat generation
- Basic understanding of Unsteady state heat conduction through finite slab with thermal resistance
- Learn the Effectiveness method (NTU) to study the performance of Heat Exchangers
- Learn Heat Transfer in Laminar Internal and External Flows

Devi Ahilya University, Indore, India Institute of Engineering & Technology				I Year ME (Design & Thermal Engg.) Full Time				
Subject Code & Name	**Instructions Hours per Week**			**Credits**				
DTR2G2 RAPID PROTOTYPING	**L**	**T**	**P**		**L**	**T**	**P**	**Total**
	3	**1**	**0**		**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours								

Objective: To understand the basics of non-conventional prototyping processes.

COURSE OF CONTENT

UNIT-1

Basic operation, Role of Rapid Prototyping and tooling in product development and simultaneous engineering, Applications.

Rapid Prototyping Processes

Principles of RP processes, Classification, Laminated object manufacturing, Fused deposition modeling, Sterolithography, Solid ground curing, Selective laser sintering - 3D printing.

UNIT-2

CAD Requirements in RP

Introduction, Data requirements, Solid modeling, Surface modeling, Geometric processing, Interface formats, Model preparation, Slicing, Support structures and machine instructions

UNIT-3

Materials for Rapid Prototyping

Plastics, Resins, Metals, Ceramics, Selection of Materials for suitable processes, Advantages and limitations.

UNIT-4

Rapid Tooling Techniques

Rapid tooling techniques such as Silicone rubber molding, Epoxy molding, Electroforming, Vacuum casting, Vacuum forming, Laminated metallic tooling, Direct metal laser sintering.

UNIT-5

Rapid Manufacture

Introduction, Material and process controls for Rapid manufacture, Production economics, Implementation, Applications, automotive, aeronautical, space applications, additive manufacturing for construction industry, retail industry

Text Books

[1.] Pham, D.T., Dimov, S.S. (2001) Rapid Manufacturing, Springer-Verlag London Limited.

[2.] Neil Hopkinson, Richard Hague, Philip Dickens (Editors) Rapid Manufacturing: An Industrial Revolution for the Digital Age, Wiley Publication, 2005.

[3.] Rafiq I. Noorani, Rapid Prototyping: Principles and Applications, Wiley Publication, 2005.

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Learn Prototyping and tooling in product development and simultaneous engineering
- Learn modeling, Surface modeling, Geometric processing
- Learn Rapid tooling techniques such as Silicone rubber molding

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTR2G3
COGENERATION AND WASTE HEAT RECOVERY</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td>3</td><td>1</td><td>-</td><td>4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td></tr>
</table>

Objective & Pre requisites:
The objective of the subject is to provide an understanding of energy conservation in various thermal engineering applications. The Pre requisites are Thermodynamics, Fluid Mechanics and Heat Transfer.

UNIT- 1
Energy Usage and Conservation
Energy: forms and Conversion; Patterns of energy use; potential for energy conservation; optimum use of energy resources; total energy approach.

UNIT- 2
Thermodynamic Cycles and Cogeneration
Review of Various Thermodynamic cycles; Coupled cycles; Systems approach to a thermal engineering application based plants; combined plants and cogeneration systems.

UNIT- 3
Energy Storage
Energy Storage Systems: thermal electrical, magnetic and chemical energy storage systems, Need for energy storage; Utilization of industrial waste heat: gas-to-gas, gas-to-liquid and liquid-to-liquid heat recovery systems.

UNIT-4
Waste Heat Recovery
Heat Recovery systems; Recuperators and regenerators; heat pipes; waste heat boilers; fluidized bed heat recovery; shell and tube heat exchangers

UNIT- 5
Heat Recovery Sources
Sources of heat recovery; Prime mover exhausts; incineration plants; heat pump systems; thermoelectric devices. Utilization of low grade rejected heat from power plants.

BOOKS RECOMMENDED
[1] Reay, D. A., *Heat Recovery Systems*, London, 1979.
[2] Boyce, M, P,. *Handbook for Cogeneration and Combined Cycle Power Plants*, ASME 2002
[3] Fin David, Cogeneration: A Users Guide, IET
[4] Daiment, *Energy Systems*, Longman, UK

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Potential for energy conservation; optimum use of energy resources;
- Coupled cycles; Systems approach to a thermal engineering application based plants
- Utilization of industrial waste heat: gas-to-gas, gas-to-liquid and liquid-to-liquid heat recovery systems.
- Heat Recovery systems;

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTR2E1
MACHINE VIBRATIONS ANALYSIS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td></tr>
</table>

COURSE CONTENTS

Objective of the subject: The objective of the subject is to deal with machine vibration analysis techniques and advanced areas of vibrations of machine elements based on Undamped and Damped Free Vibrations for single degree of freedom systems, Multi-degree of Freedom and Continuous Systems . Pre requisites are Theory of vibrations , Machine Design I and Machine Design II.

UNIT-1
Review: Fundamentals of Vibration
Main causes, Advantages and Disadvantages. Vector method of representing Harmonic motion. Characteristics of vibration. Harmonic analysis. Beats Phenomenon. Work done by harmonic forces on harmonic motion. Periodic, non-harmonic functions: Fourier Series analysis, Evaluation of coefficients of Fourier series. Elements of vibratory system. Lumped and distributed parameter systems.

UNIT -2
Systems with single and two Degrees of Freedom
Forced harmonic vibration: vector representation of forces. Excitation due to Rotating and Reciprocating unbalance. Vibration isolation, Force transmissibility. Motion transmissibility: absolute motion of mass and relative motion of mass.
Undamped free vibrations and Principal Modes of vibration. Torsional vibrations. Forced Undamped vibrations with harmonic excitation.

UNIT -3
Systems with Multi-degree of Freedom and Continuous Systems.
Equations of motion.The Matrix method : Eigen values and eigen vectors. Vibration of Strings. Longitudinal vibrations of bars. Torsional vibrations of Circular Members. Transverse Vibrations of Beams.

UNIT -4
Determination of Natural Frequencies
Approximate methods of determining fundamental frequencies: Dunkerleys lower bound approximation and Rayleighs Method. Stodolas Method. The Holzers Method. The Method of Matrix Iteration, Envelop Analysis.

UNIT -5
Numerical Integration methods in Vibration Analysis
Introduction, Finite Difference Method, Runge-Kutta Method for single degrees of freedom systems, Houbolt method ,Finite Difference method for continuous systems.

BOOKS RECOMMENDED: Reference books:

[1] Thomson W.T., *Theory of Vibration with Applications*, CBS Pub. And Distributors.
[2] Morse T., and Hinkle, *Mechanical Vibration*, Prentice Hall of India Pvt. Ltd.
[3] Singiresu S. Rao, *Mechanical Vibrations*, Pearson Education.,2005
[4] Ambekar A. G., *Mechanical Vibrations and Noise Engineering* , Prentice Hall of India Pvt. Ltd.,2006

[5] G. K. Grover, *Mechanical Vibrations*, Nem Chand and Bros., Roorkee.

LABORATORY EXPERIMENTS:

6. Performance Analysis of single degree of systems.
7. Performance Analysis of two degree of systems.
8. Performance Analysis of multi degree of systems.
9. Study of vibration signature analysis methods
10. Study of vibration measuring instruments

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Learn various Fourier Series analysis, Evaluation of coefficients of Fourier series. Elements of vibratory system. Lumped and distributed parameter systems.
- Understand the concept of Undamped free vibrations and Principal Modes of vibration. Torsional vibrations
- Learn Finite Difference method for continuous systems.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTR2E2
EXPERIMENTAL STRESS ANALYSIS</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td></tr>
</table>

COURSE CONTENTS

Objective & Pre requisites:
The basic objective of the subject is to deal fundamentals of stress analysis techniques. The subject is useful in understanding the behavior of material under the load and distribution of stress inside the material. The Pre requisites are material science, machine design and measurement and control.

UNIT- 1
Introduction:
Introduction to theory of elasticity. General principles governing the approach to experimental stress analysis technique. Principal of measurements. Accuracy, Sensitivity and range of measurement.

UNIT- 2
Polariscope & Extensometer:
Plain polariscope, circular polariscope, white light illumination, analysis of photoelastic data, Moira Method, Mechanism of formation of Moira fringe-geometrical approach to Moire fringe analysis-displacement field approach to Moire fringe analysis., Mechanical , Optical , Acoustical and Electrical extensometer and their uses, advantages and disadvantages.

UNIT- 3
Electrical Resistance Strain Gauge:
Principal of operation and requirement, types and their uses, Material of strain gauge, Calibration and temperature compensation, cross sensitivity, Rosette analysis, Wheatstone bridge and potentiometer circuits for static and dynamic strain measurements, strain indicators, strain gauge adhesive and mounting methods.

UNIT-4
Photoelasticity:
Two dimensional photoelasticity. Concepts of light-photo-elastic effects, stress optic law, Interpretation of fringe pattern, compensation and separation technique, photoelastic material, Introduction to three dimensional photoelasticity, digital photoelasticity, Effects of stressed model in a plane polariscope.

UNIT- 5
Non Destructive Testing:
Fundamentals of NDT, Radiography, Ultrasonic, Magnetic particle inspection, Fluorescent penetrate technique, Eddy current testing, Acoustic Emission Technique, Fundamentals of brittle coating methods, Holography, Ultrasonic, C-Scan, Thermography, Fibre optic Sensors.

BOOKS RECOMMENDED

[1] Dally J.W. and Riley, W.F. "*Experimental Stress Anaysis*" Mc Graw Hill Inc., New York, 1978

[2] Hetyenyi M " *Hand Book of Experimental Stress Analysis*" John Wiley and Sons Inc. New York,
1972.

[3] Srinath L.S., Raghava M.R.,Lingaiah, K.Gargesha G, Pant B, Ramchendra K., " *Experimental Stress Analysis*" Tata Mc Graw Hill, New Delhi., 1984

[4] Singh S. "*Experimental Stress Analysis*" Khanna Publication, 2001.

[5] Mubeen., Machin*e Design*, , Khanna Publications(P) Ltd.,2004.

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Learn the concept of Principal of measurements. Accuracy, Sensitivity and range of measurement.
- Learn the concept of temperature compensation, cross sensitivity, Rosette analysis
- Apply Material of strain gauge, Calibration and temperature compensation, cross sensitivity concept
- Learn the concept of three dimensional photo elasticity, digital photo elasticity, Effects of stressed model in a plane polariscope.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				M.E.(Design & Thermal) Full Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTR2E3 **APPLIED ELASTICITY AND PLASTICITY**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Objective of the subject:

With this subject, the students get knowledge of the various Mechanical engineering materials property as well as behavior of material under Elastic & Plastic zone with different plane of surface.

Prerequisite(s): Strenght of Maerial, Material Science**.**

COURSE CONTENTS

UNIT - 1

Elasticity

Analysis of stress and strain relationship – Generalized Hook's law, Plane stress and plane strain problems, The state of strain at a point, Basic equations of elasticity, Methods of solution of elasticity problems.

UNIT- 2

Two-Dimensional Problems in Cartesian Co-Ordinates

Two dimensional problems in Cartesian and polar co-ordinates for simple problems, Airy's stress function, Bi harmonic equation, Saint Venant's Principle, Thick cylinder, Bending of curve bars , Simply supported rectangular beam under a triangular load, Fourier series, Complex potentials, Cauchy integral method , Fourier Transform Method, Real potential methods.

UNIT-3

Torsion of Non Circular Section

Methods of analysis, Membrane analogy, Torsion of thin rectangular section and hollow thin walled section, St. Venant's theory, Torsion of hollow cross-sections, Torsion of thin – walled tubes, Torsion of hollow bars, Analogous methods, Torsion of bars of variable diameter.

UNIT-4

Numerical and Energy Methods

Principle of Virtual Work-Energy theorem, Rayleigh Ritz method, Deflection of beams problems, Finite difference method, Rayleigh's method, Finite element method.

UNIT-5

Plasticity

Physical assumption , Mechanical models, Kelvin and Maxwell model, Viscous elasticity, Friction and Coulomb models, Parallel and Hybrid models, Applications, Criterion of Yielding, Yield surface, Flow rule, Elastic – Plastic problem in bending, Torsion and Thick cylinders, Introduction to Fracture mechanics, Wave propagation in plastic materials. Theory and application of slip line field, Bound theorem, Plastic anisotropic large deformation.

BOOKS RECOMMENDED:

[1] Timoshenko S., *Theory of Elasticity*, Mc Graw Hill Book Co., Newyork1988.
[2]. Singh S, *Theory of Elasticity*, Khanna Publishers, New Delhi.1988.
[3] Singh S., *Theory of Plasticity*, Khanna Publishers, New Delhi.1988.
[4] Chakrabarty J., *"Applied Plasticity",* Springer New Yark, 1st ed. 2000.
[5] Hoffman, *"Theory of Plasticity",* Mc Graw Hill, 2nd ed. 1985.
[6] Johnson, *"Engineering plasticity",* Van Nostrand, 1st ed. 1983.

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Perform Analysis of stress and strain relationship
- Saint Venant's Principle, Thick cylinder, Bending of curve bars , Simply supported rectangular beam under a triangular load, Fourier series, Complex potentials,
- Apply Torsion of thin – walled tubes, Torsion of hollow bars, Analogous methods, Torsion of bars of variable diameter.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTR2E4
AUTOMOTIVE SYSTEM ANALYSIS & DESIGN</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td></tr>
</table>

Objective: The objective is to understand the principles and working of different systems of Automobiles & design principal & its applications.

Pre requisites: Machine Design and Strength of Material**.**

COURSE CONTENT

UNIT-1

Design for Tool Drive

Design of machine tools, machine tools motions, transmission-rotation in to rotation, rotation in to translation, kinematic-structures of machine tools: elementary, complex and compound structure elementary, complex and compound structure, kinematic-features of gear shapers and gear hobbing machine.

UNIT-2

Transmission System

Requirements Clutches, Toque converters, Over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle, wheel camber, Steering geometry, Ackerman mechanism.

UNIT-3

Electrical and Control Systems

Types of storage battery, Construction and operation of lead acid battery, Testing of battery, Principle

& operation of starting mechanism, Electric fuel gauge, Fuel pump, Horn, Wiper, Lighting system, Head light dazzling, Signaling devices and circuit, Battery operated vehicles. Microprocessor based control system for automobiles, Car air conditioning systems and components, Indian standards for automotive vehicles exhaust emission Bharat and Euro norms, Indian Motor vehicle act- preliminary information.

UNIT-4

Chassis and Body Engineering

Chassis classification, Types of frames, Vehicle body types & construction, Body materials, Driver’s visibility and methods for improvement, Safety aspects of vehicles, Location of engine, Front wheel and rear wheel drive, Performance of Vehicle.

UNIT-5

Suspensio

n System

Vehicle Dynamics and requirement of suspension , Suspension types & construction, Shock absorber, Types of leaf springs coil spring, Air spring, Torsion bar, Location of shackles, Brakes-classification & construction, Mechanical, Hydraulic & Pneumatic power brake systems, Air-bleeding of Hydraulic brakes, ABS, Performance- Braking efforts, Efficiency, Stopping Distance & time, tendency of over turning.

BOOKS RECOMMENDED:

[1] Singh Kirpal, Automobile Engineering, Vol.1, Standard Pub, 9e.
[2] Giri N.K., Automotive Technology, Khanna Pub, 4e 2009.
[3] Newton & Steeds, Automobile Engineering, Butterworth Int.
[4] Heitner Joseph, Automotive Mechanics, Principles and Practices, East-West Pub.
[5] Crouse W.H., Automotive series Part-I to VI, Tata McGrawhill, 9e.

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Can apply kinematic-structures of machine tools: elementary, complex and compound structure elementary,
- Learn the concept of Gear Mechanism of Rear Axle. Automatic transmission
- Learn the concept of Signaling devices and circuit, Battery operated vehicles. Microprocessor based control system for automobiles.

M.E Mechanical Engineering (Industrial Engineering & Management)
(Full Time)
Proposed Scheme for CBCS

SEM I				
S No	**Sub Code**	**Sub Name**	**Number of Credit**	**Sub Type**
1.	IMR1C1	Productivity & Technology Management	3-1-1	PC1
2.	IMR1C2	Quantitative Techniques for Management	3-1-1	PC2
3.	IMR1C3	Production & Operations Management	3-1-1	PC3
4.	IMR1Gx	**Generic Elective I**	3-1-0	GE1
5.	IMR1Ex	**Elective I**	3-1-1	PE1
6.	ASR1S1	Soft Skills -1	2-0-0	
7.	IMR1W1	Seminar/ Res. Tool/Work Shop-1	0-2-0	
8.	IMR1V1	Comprehensive Viva I	0-0-4	
Total Credit for SEM I			**28 actual + 4 Virtual credits**	
List of Generic Elective I				
1.	IMR1G1	Principles & Practices of Management	3-1-0	GE1
2.	IMR1G2	Human Resource management	3-1-0	GE1
3.	IMR1G3	e –Business & Commerce	3-1-0	GE1
List of Elective I				
1	IMR1E1	Statistical Quality Control and Total Quality Management	3-1-1	PE1
2.	IMR1E2	Strategic Management	3-1-1	PE1
3.	IMR1E3	Business Process Reengineering	3-1-1	PE1
SEM II				
1.	IMR2C1	Financial Management	3-1-1	PC4
2.	IMR2C2	Materials Management	3-1-1	PC5
3.	IMR2C3	Supply Chain Management	3-1-1	PC6
4.	IMR2Gx	**Generic Elective II**	3-1-0	GE2
5.	IMR2Ex	**Elective II**	3-1-1	PE2
6.	ASR2S2	Soft Skills -2	2-0-0	
7.	IMR2W2	Seminar/ Res. Tool/Work Shop-2	0-2-0	
8.	IMR2V2	Comprehensive Viva II	0-0-4	
Total Credit for SEM II			**28 actual + 4 Virtual credits**	
List of Generic Elective II				
1.	IMR2G1	Project Management	3-1-0	GE2
2.	IMR2G2	Enterprise Resource Planning	3-1-0	GE2
List of Elective II				
1.	IMR2E1	Marketing Management	3-1-1	PE2
2.	IMR2E2	Product Design and Manufacturing	3-1-1	PE2
3.	IMR2E3	Customer Relationship Management	3-1-1	PE2
4.	IMR2E4	Industrial Marketing	3-1-1	PE2

SEM III				
1	IMR3D1	Dissertation Phase I	0-0-12	
2	IMR3V3	Comprehensive Viva III	0-0-4	
Total Credit for SEM III			**12 actual + 4**	**Virtual credits**
SEM IV				
1	IMR4D2	Dissertation Phase II	0-0-12	
2	IMR4V4			
Total Credit for SEM IV			**12 actual + 4**	**Virtual credits**
Total Credits			**80 actual + 16 Virtual credits**	

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMR1C1
PRODUCTIVITY AND TECHNOLOGY MANAGEMENT.</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td colspan="4"></td></tr>
</table>

Objectives & Pre requisites:

- To impart the basics of Productivity Concepts, to refine the skills of Workplace design through Work Study, Job Evaluation, etc. To develop the skills of Technology management through different technology transfer.

COURSE CONTENTS

UNIT-1
Productivity:
Productivity, Introduction, types of productivity, methods to improve productivity. Introduction to work study, method study, definition, importance, selection, recording, different recording techniques, principal of motion economy.

UNIT-2
Work Measurement:
Introduction to work measurement, time study, Steps in time study. Various techniques to measure time, slandered time, normal time, observed time. Allowances, measurement & significance. Work sampling, introduction & importance

UNIT-3
Job Evaluation:
Job evaluation and merit rating, introduction to job evaluation, various method of job evaluation, importance of job evaluation.

UNIT-4
Technology Management:
Introduction to technology, technology management, importance of technology management, know how of technology, know why of technology, dimensions of technology management Technology life cycle, syndication diffusion.

UNIT-5

Technology Transfer

Technology forecasting, introduction, importance, absorption & adoption, generation of technology, method of technology transfer, technology transfer modes, technology diffusion, importance. Technology requirement for India, strategies for the companies in the changing environment. Case studies.

Course outcomes

After completing the couse the student will able to:

- Can perform analysis of Differrent productivity Measures relted to specific industries.
- Having the practical approach towards analysis of different Recoding techniques for a given process.
- Can make Estimation of Standard Time for a given Job, Process and its comparison with relevant industry data.
- Go in to deep and can make analysis of Job Evaluation process and its comparison with related industry.
- Having knowledge of technology transfer process with special cases of indusries or service organisation.
- Learn about various Forecasting methods and their applications in Indian context.

LABORATORY EXPERIMENTS:

1. Study and analysis of Differrent produtivity Measures relted to specific industries.
2. Study and analysis of different Recoding techniques for a given pocess.
3. Estimation of Standard Time for a given Job, Process and its comparison with relevent industry data.
4. Study and Analysis of Job Evaluation process and its compraison with related industry.
5. Study of Technology Transfer process with special cases of indusries or service organisation.
6. Study of Technology Forescating methods and their applications in Indian context.
7. Case studies.

BOOKS RECOMMENDED:

[1]. Dhawan, Productivity and Technology Management.2002
[2]. I.L.O, Work Study. 2004
[3]. Branes K.M, Time & Motion Study.
[4]. Farland Mc, Management –Principal and Practice. .Dec 1990
[5]. Dr. Sushil, Technology Management. New Delhi Vikas, 2001

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMR1C2
Quantitative Techniques for Management</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td colspan="4"></td></tr>
</table>

Objectives & Pre requisites:

- To develop the skills of decision making in dynamic business situations through quantitative analysis using different mathematical models like linear programming, Transportation, Assignment, Queuing etc. Strategies formulation with the help of game theory and simulation etc.

COURSE CONTENTS

UNIT-1
Introduction:
History and development of O.R Present Trend.
Linear Programming:
Formulation, graphical methods, simplex method, Big- M- method, two phase method, degeneracy unrestricted variables. Quality in L p. revised simplex, duality, sensitivity analysis.

UNIT-2
I **Assignment Models:** Formulation, Balanced and Unbalanced problems. **II Transportation:** Formulation, graphical methods
III Introduction to Integer Programming.

UNIT-3
Waiting Line Models:
Introduction, classification, state in queue, probability distribution of arrival and service times. Single server model (M/M/I). Multiple server model (MMS). Birth & death process.

UNIT-4
Game Theory & Simulation:
Rectangular, two persons, zero sum games, maximin and minimax Principles. Saddle point. Dominic. graphical and algebraic method of solution by transforming into linear programming problem. Bidding problem. Building a simulation model, Monte-Carlo simulation and application.

UNIT-5

Dynamic Programming: Introduction, developing optimal decision policy.

Replacement and Maintenance Models: Introduction, Individual replacement and group replacement policy.

Course outcomes

After completing the couse the student will able to

- Having knowledge of decision making in dynamic business situations through quantitative analysis using different mathematical models like linear programming, Transportation, Assignment, Queuing etc. Strategies formulation with the help of game theory and simulation etc.
- Learn the process of d evelopment,formulation and analysis of Linear Programming Problem for given decision making situations.
- Development and Analysis of Transportation and Assignment models.
- Learn the Development, Formulation and Analysis of Inventory problem for a given system.
- Able to model Queuing situations at a given service problems.
- Perform various Simulations exercise relating various operations research problems.

BOOKS RECOMMENDED:

[1]. Taha, *Operations Research*, Tata Mc.Graw Hill.
[2]. Wagner, *Operations Research*, PHI. New Delhi, 2003
[3]. Ravindram & Philips, *Operations Research*, Tata Mc.Graw Hill.
[4]. Gupta & Hira, *Operations Research*, S. Chand. 1e, 2008
[5]. Chitle & Negi, *Operations Research,* Jain Brothers.
[6]. Vohra N.D, Kataria S.K, *Quantitative Techniques for Management*. Tata Mc.Graw Hill, 2004.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMR1C3
Production &
Operations Management</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
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Objective and Pre requisites:

- To inbuilt the foundation of different Operations strategies like Aggregate planning, Plant location decisions, capacity planning. To ensure the development of skills required for new product development their production planning & control.

COURSE CONTENTS

UNIT-1
Introduction:
Overview of operation management, nature & content of operation management, various schools of management thought, framework for managing operations strategy & competitiveness, strategic planning for production & operations.

UNIT-2
Product Design:
Product / service and process design, product development, morphology of design process , product life cycle concept need identification, conceptual design , creative design concepts , feasibility study, Preliminary design , detailed design , design for customer, for manufacturer and assembly , types of processes, process planning and selection process flow structure , product / process matrix , technologies in manufacturing , FMS and CIM.

UNIT-3
Operation Capacity Planning:
Operation capacity planning , design and system capacity , capacity planning models , economic analysis capital budgeting and analysis , capital investment evaluation techniques, facility location and layout, foreign locations , factory affecting location decisions , models , analysis and selection of layouts , cellular manufacturing layouts.

UNIT-4
Production Planning & Control:
Functions of production planning and control, forecasting, qualities and quantitative models for forecasting, accuracy of forecasting and selection of forecasting technique, aggregate planning, master production scheduling and MRP, operations scheduling,

loading sequencing detailed scheduling and expediting, forward and backward scheduling, optimized production technology (OPT).

UNIT-5

Modern operations Techniques:

Overview of synchronous manufacturing and theory of constraints, introduction to Japanese contribution for WCM overview, JIT purchasing, KANBAN, KAIZEN concepts, modern trends in operations management, introduction to learn and agile manufacturing**.**

Course outcomes

After completing the course the student will able to:

- Analysis of Production planing & Control situations in industry.
- Understand and make analysis of various Forecasting Models.
- Learn about Aggregate Planning Models.
- Can make a practical approach towards matertrial requirement planning for the given data.

LABORATORY EXPERIMENTS:

1. Study and analysis of Production planing & Control situations in industry.
2. Study and analysis of variuous Forecasting Models.
3. Developmentr and analysis of Aggregate Planning Maodels.
4. Development and Analysis of matertrial requirement planning for the given data.
5. Study and analysis of prodution Sheduling.
6. Case studies related to proudction & Operations Management(manufacturing Sector).
7. Case studies related to proudction & Operations Management(Service Sector).

BOOKS RECOMMENDED:

[1]. Chase, Aquiline & Jacobs, Production & Operations management. Tata Mc.Graw Hill
[2]. Dilworth, Production & Operations management. 1999
[3]. Adams & Ebert, Production & Operations management. 1999
[4]. Monks, Operations Management. . Tata McGraw Hill, 1985

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<tr><td rowspan="2">IMR1G1
PRINCIPLES & PRACTICES OF MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Duration of Theory Paper:
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Objectives & Pre requisites:

- To impart the basics of Management Concepts, Evolution of management as discipline and to deal with different Management Functions.

COURSE CONTENTS

UNIT-1
The Nature of Management:
Definition and role of management, the function of a manager, scientific management. Various schools of management thought.

UNIT-2
Planning:
Nature and purpose of planning, components of planning objective of business, forecasting, decision making, policy formulation and strategies. Management by objectives.

UNIT-3
Organization:
Nature and purpose of organizing structure, centralization, decentralization, span of control, delegation of authority relationship. Shaping the overall structure, formal and informal organization.

UNIT-4
Directions & Staffing:
Direction process, theories of motivation and leadership, need analysis, communication. Role and function of personal management, manpower planning, selection and recruitment, interviewing, training methods, welfare techniques.

UNIT-5
Control:
Meaning and process of control techniques of control evaluation, developing and compensating the employees, merit rating. Comparison of American, Japanese and Indian philosophies of management.

Course outcomes

After completing the course the student will able to:

- Learn various Scientific management process
- Learn various schools of management thought.
- Get a deep knowledge of training methods, manpower planning, selection and recruitment, interviewing, welfare techniques.

BOOKS RECOMMENDED:

[1]. Koontz and O'Donnell, *Essentials of Management* .Mc.Graw-Hill, Jan 1986.
[2]. Terry G.R, *Principals of Management.*
[3]. Peter Drucker, *Practice of Management.* 1992.
[4]. Farland Mc, *Management, Principal and Practice.*
[5]. Prasad L.M, *Principal and Practice & Mgt.*Sulatan Chand & Sons.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMR1G2
HUMAN RESOURCE MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Duration of Theory Paper:
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Objective and Pre requisites:

- The objective of this course is to help the students develop an understanding of the dimensions of the management of human resources, with particular reference to HRM policies and practices at international level.

COURSE CONTENTS

UNIT-1

HRM Concept

Definition, Concept, Evaluation and Relevance of HRM. Human Resource Functions, HRM in Indian and
Global Scenario. Human Resource Policies.

UNIT-2

Human Resource Acquisition Process

Job Analysis - Job Specification, Job Analysis Methods, Human Resource Planning Concept and Process of HRD, HRP Process at National and Corporate Level, Human Resource Information System. Steps of HRIS, Recruitment, Sources of recruitment, Selection, Stages in selection process. Global Scenario in HR Acquisition

UNIT-3

Human Resource Training and Development.

Orientation, Training and Development Process and Methods, Need Assessment, Training Evaluation, Approaches and Types of Evaluation Instruments, Developing Effective Training Programmes, HRD mechanism, HRD for Organizational Effectiveness

UNIT-4

Appraising and Improving Performance

Basic Concepts Objectives and Process of Performance Appraisal Systems, Performance verses Potential Appraisal, Types of Employee Appraisal Systems, New Trends in Performance Appraisal Systems at Global level, Succession Planning, Career Planning and Assessment Centers.

UNIT-5

Maintenance of Human Resources:

Job Evaluation, Incentive and Reward System, Objectives and Major Phases of Compensation Management, Cross-national variation in reward structures. Knowledge & knowledge transfer, knowledge and situation cognition, Implications for knowledge
transfer, knowledge management in multinational companies, knowledge management & International HRM.

Learning outcomes:

- Contribute to the development, implementation, and evaluation of employee recruitment, selection, and retention plans and processes.
- Administer and contribute to the design and evaluation of the performance management program.
- Develop, implement, and evaluate employee orientation, training, and development programs.

BOOKS RECOMMENDED:

[1] Bohlander, Human Resource Management,14 th edition Cengage Learning, India,2009
[2] Dessler, Verckey, Human Resource Management, Pearson Education,2009.
[3] Monir H. Tayeb, International Human Resource Management, Oxford, 2009.
[4] Patnaik, Human Resource Management,3 rd edition,PHI,2009.
[5] Subba Rao, Essential of HRM and Industrial Relation, Himalaya Pub. House. 2008,
[6] Subba Rao,International Human Resource Management,Himalaya Publishing House., 2009.
[7].Jeffery Mello, Human Resource Management, Cengage Learning, India, 2008.

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<tr><td rowspan="2">IMR1G3
E- BUSINESS & COMMERCE</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Duration of Theory Paper:
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Learning Objective

- This course is aimed at providing the student with an in-depth understanding of the still emerging field of E-Commerce. By the end of the course, the student will be able to understand the various elements that are fundamental for a successful E-Commerce enterprise and develop a business plan for developing one such E-Commerce site. Topics covered include:

COURSE CONTENTS

UNIT – 1

Introduction

Fundamentals in E-Commence – Meaning, Nature, Limitation, E – Commerce – Origin, Nature, Meaning, Definitions, Features, Need , Advantages & Disadvantages, Essential requirements, e – Commerce Vs Traditional Commerce.

UNIT – 2

Business Models for e Commerce

e-Business: Meaning, Definition, Importance, e Business models based on the Relationships of transaction parties, B2C, B2B, C2C, C2B. e Business models based on the relationship of transaction types – Manufacture Model, Advertising Model, Value Chain Model, Brokerage Model.

UNIT – 3

E –Payment Systems:

Modes of e Payment – Credit Cards, Debit Cards, Smart Cards, e Credit Accounts, e Money/Cash, Digital Signatures – Legal Positions of Digital Signatures, How Digital Signature Technology Works, Risks & e Payment system : Data protection, risk from mistakes & disputes – Consumer protection, Management Information Privacy, Managing Credit Risk.

UNIT – 4

E-Business Communication

Introduction, Importance of e Technology in e Business Communication, Modes of e-Business communication, e- Business Communication, e – Business Conferencing – Audio, Document Telephone, Video Conferencing – Types Email in e Commence, Mobile Communication. E – Banking Introduction concept & meaning, Electronic Fund Transfer – Automated Clearing house, Automated ledger posting, Electronic Money transfer e- Cheque, ATM, FOS, Tele banking.

UNIT – 5

E- Security & E- Markets

Introduction, Need for Security, Security concepts, attacking methods – Cyber crimes, Cryptology, Hacker, encryption. E-commerce security solutions – E – Locking Techniques, e-Locking product, e-Locking services, Net Scape security solution E-

Markets: On line shopping – On Line purchasing –Electronic Market –Three models of e-Markets, e-Advertising e- Branding.

Course outcomes

After completing the course the student will able to:

- Learn about e – Commerce Vs Traditional Commerce
- Learn about Manufacture Model, Advertising Model, Value Chain Model, Brokerage Model.
- Learn the practical implementation of Advertising Model, Value Chain Model, Brokerage Model.
- Learn the features and practical implementation of e- Business Communication, e – Business Conferencing – Audio, Document Telephone,

BOOKS RECOMMENDED:

[1]. Murthy C.S.V., e Commerce–Concepts Models Strategies Himalaya Publishing House 3e, 2005.

[2]. Basics of e Commerce-Legal & Security issues ISBN 81-203-2432-3.

[3]. Joseph P.T., e Commerce : An Indian Perspective, 2ndEd., SJ, 2006.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMR1E1
STATISTICAL QUALITY CONTROL & TQL</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
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Objective and Pre requisites:

- To develop the skills required for Quality consciousness among the students. Basics of Quality control through different techniques like theory of Control charts & Acceptance sampling. To build the Knowledge base of Total Quality Management, Six Sigma etc.

COURSE CONTENTS

UNIT-1

Quality Control:

Definitions, place of quality control in industries, quality control organization, difference between inspection and quality control, application of quality control in industries, economic of quality systems, quality assurance. Theory of Control Charts

Sample size and frequency of sampling, out control, control for variables and attributes and their application design of X and R charts, Process capability studies.

UNIT-2

Acceptance Sampling:

Single sampling planes, double sampling& sequential sampling planes, rectifying inspection for lots, sampling planes for continues production, selection of sampling planes for different situation, economics of acceptance sampling.

UNIT-3

Total Quality Management (TQM):

Evolution of total quality management , historical perspective, elements of TQM - Total employee involvement , elimination of waste and problem exposure , total quality control systems , Deming's wheel , Deming's 14 points – pros and cons in industrial engineering context , Philip Croshy philosophy , Juran philosophy , Ishikwa diagram , Just – in- Tinme philosophy design and development strategy in TQM – Quality function deployment.

Application of TQM to service type organization, service guarantees, case studies on application of TQM to services type organization, various quality award, cost benefit analysis, life cycle costing.

UNIT-4

Reliability:

Distributions encountered in controlling reliability mean time to failure , exponential failure density, MTTF, Weibull, failure density, measurement and tests , maintenance and reliability , life testing.

UNIT-5

Concepts & Application of 6 – Sigma Quality:

Comparison between 3-sigma & 6- sigma quality relationship between DPMO and slandered normal variate , short term and long term yield cost and quality effectiveness of 6- sigma strategy , DMAIC approach to 6-sigma implementation application to service industry link between 6- sigma & DOE. ISO 9000 Series and SPC, Quality Circles

Course outcomes

After completing the course the student will able to:

- Able to perform analysis of set parameters relating to different mathematical distributions (Variable).
- Learn different mathematical distributions (Discrete) methods.
- Learn about Construction & analysis of various process control charts.
- Analyse the performance of Acceptance Sampling for a given set of lots.

BOOKS RECOMMENDED:

[1]. Mahajan M., *Statistical Quality Control*, Dhanpat Rai & Sons, 2001.
[2]. Mitra A., *Quality Control Applications*, Pearson Education. 2e, 1998
[3]. Sharma D. D, *Total Quality Management*, Sultan Chand & Sons. New Delhi, 2000
[4]. Basterfield, *Total Quality Management*, Pearson Education, 2003
[5]. Logothitis, *Total Quality Management*, PHI.

LABORATORY EXPERIMENTS:

1. Study and Analysis of set parameters relating to different mathematical distributions (Variable).
2. Study and Analysis of set parameters relating to different mathematical distributions (Discrete).
3. Construction & analysis of various process control charts.
4. Performance of Acceptance Sampling for a given set of lots.
5. Analysis of tools of related to total Quality Management like QFD, Fish bone diagram etc.
6. Case studies related to subject.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**I Year M.E. (Industrial Engineering and management) Full Time**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
IMR1E2 STRATEGIC MANAGEMENT	**L**	**T**	**P**	**L**	**T**	**P**	**TOTAL**
	3	**1**	**1**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Objectives & Prerequisites:

- The objective of teaching this course is to enable students to integrate knowledge of various functional areas and other aspects of management, required for perceiving opportunities and threats for an organization in the long-run and second generation planning and implementation of suitable contingency strategies for seizing / facing these opportunities & threats.

COURSE CONTENTS

UNIT-1
Introduction:
Meaning, Need and Process of Strategic Management; Business Policy, Corporate Planning and Strategic Management; Single and Multiple SBU organisations; Strategic Decision–Making Processes – Rational–Analytical, Intuitive-Emotional, Political – Behavioral;

UNIT-2
Objectives & Strategic Analysis:
Need, Formulation and changes in these three; Hierarchy of objectives, Specificity of Mission and Objectives. SWOT Analysis General, Industry and International Environmental Factors; Analysis of Environment, Environmental Threat and Opportunity Profile (ETOP) Strategic Advantage Profile (SAP).

UNIT-3
Strategy Alternatives:
Grand Strategies and their sub strategies; Stability, Expansion, Retrenchment and Combination; Internal and External Alternatives; Related and Unrelated Alternatives, Horizontal and Vertical Alternatives; Active
and Passive Alternatives; International Strategy Variations

UNIT-4

Strategy Choice:

Making: Managerial Choice Factors, Choice Processes – Strategic Gap Analysis, ETOP-SAP Matching, BCG Product – Portfolio Matrix, G.E. Nine Cell Planning Grid; Prescriptions for choice of Business Strategy

UNIT-5

Strategy Implementation, Evaluations and Control:

Strategy Implementation, Evaluations and Control: Implementation Process; Resource Allocation; Organizational Implementation; Plan and Policy Implementation; Control and Evaluation Process; Criteria for Evaluation; Measuring Feedback; and Corrective Action.

Course outcomes

After completing the course the student will able to:

- Learn about Historical background Fundamentals of BPR Concepts and techniques.
- Able to make analysis of Major issues in process redesign:.
- Adopt the fetures of information technology (IT) and identifying IT levers.
- Designing and building a prototype of the new process.

Change management, Performance management, and programmed management

LABORATORY EXPERIMENTS:

1. Case studies related to Process of Strategic Management; Business Policy, Corporate Planning.
2. Case studies related to Strategic Decision–Making Processes.
3. Case studies related to Strategy alternatives.
4. Case studies related to Making: Managerial Choice Factors, Choice Processes – Strategic Gap Analysis.
5. Case studies related to Strategy Implementation, Evaluations and Control.
6. Case studies related to Implementation; Control and Evaluation Process.

BOOKS RECOMMENDED

[1]Azhar Kazmi, Business Policy and Strategic Management, TMH,2010
[2]Fred David, Strategic Management Concepts and Cases, PHI, 12 Ed
[3] Whller and Hunger, Basic Concepts of Strategic Management, TMH, 12 Ed

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMR1E3
BUSINESS PROCESS RE-ENGINEERING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
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Objective and Pre requisites:

- To provide a greater understanding of effective solutions to change problems that need to combine technological, organizational and people-orientated strategies by adopting a process based approach to change management. To introduce the contingencies that affect management and the most effective measures for dealing with them. To introduce strategic IS/IT planning and how it must relate to business strategy. To demonstrate the use and validity of organizational development models through current real-life case studies.

COURSE CONTENTS

UNIT-1
Business process reengineering-an overview:
Historical background Fundamentals of BPR Concepts and techniques. Changing business processes: the importance of technology as a driver for organization: Nature, significance and rationale of business process reengineering (BPR),

UNIT-II
Process redesign:
Major issues in process redesign: Business vision and process objectives, Processes to be redesigned, measuring existing processes, Role of information technology (IT) and identifying IT levers.

UNIT-III
Designing and building a prototype of the new process:
BPR phases, Relationship between BPR phases. BPRE & TQM, benchmarking, ISO standards. Implementation of BPRE-business process management, principles, Business models, barriers.

UNIT-IV

Change management:

Change and the manager: change and the human resource: the cultural web and the past: the cultural attributes of change Typical BPR activities within phases: Change management, Performance management, and programme management.

UNIT-V

BPR and continuous improvement:

Co-ordination and complementary efforts, IT capabilities and their organizational impacts, Implementation of BPR, Stages of implementation and critical aspects, Case studies on BPR. The concept of the learning organization and its influence on systems development: restructuring the organization .The importance of communication and the resistance to change: building the culture for successful strategy implementation; the influence IT will have on the internal appearance of organizations in the future.

Course outcomes

After completing the course the student will able to:

- Learn about various Processes – Rational–Analytical, Intuitive-Emotional,
- Perform SWOT analysis .
- Know about the fact used for the practical implementation of Strategy alternatives.
- Learn Managerial Choice Factors, Choice Processes – Strategic Gap Analysis.
- How to make Strategy Implementation, Evaluations and Control.
- Learn the procedure related to Implementation; Control and Evaluation Process.

BOOKS RECOMMENDED:

[1] Omar El Sawy, Business Process Re-engineering, Tata McGraw Hill , 2010
[2] R. Srinivasan, Business Process Re-engineering, Tata McGraw Hill , 2011
[3] Warner Winslow, Strategic Business Process Transformation through BPR, , Tata McGraw Hill , 1996
[4] Radhakrisnan, Business Process Reengineering, Prentice Hall of India.

LABORATORY EXPERIMENTS:

1. Case studies related to Historical background Fundamentals of BPR Concepts and techniques.
2. Case studies related to Major issues in process redesign:.
3. Case studies related to Role of information technology (IT) and identifying IT levers.
4. Case studies related to Designing and building a prototype of the new process.
5. Case studies related Change management, Performance management, and programmed management.
6. Case studies related to BPR and continuous improvement.
7. Case studies related to concept of the learning organization, importance of communication and the resistance to change.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMR2C1
FINANCIAL
MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td colspan="4"></td></tr>
</table>

Objectives and Pre requisites:

To inbuilt the concepts of Financial management. To strengthen skills related to Accounting. Application of financial tools and techniques, helpful for financial planning Capital Budgeting and Decision Making.

COURSE CONTENTS

UNIT-1

Nature and Scope of Financial Management:

Role of financial management in business decisions, goals of financial management, evolution of corporate finance, finance function, broader applicability of financial management concepts, tasks of finance controller.

UNIT-2

Book Keeping and Accounting:

Introduction of book keeping. Accounting Process & its concepts, Introduction & working knowledge of different books of account. Preparation of Financial Statements of the firm**.**

UNIT-3

Tools of Financial Analysis:

Funds flow analysis – sources and use of funds, balance sheet and profit and loss statements, measurement of cash flows, revenue cost, profit relationship, break even analysis, ratio analysis, analysis of operating and financial leverages, long term and short term cost out put relationship.

UNIT-4

Financial Planning:

Financial forecasting, forecasting techniques, criterion for investment decisions, dividend policy, cost of capital problems of financial planning and budgeting in public sector undertaking.

UNIT-5

Financial Budgeting:

Capital budgeting, capital budgeting, capital rationing, sources of rising fixed and working capital, management of working capital, internal financing, balanced capital structure,

Course outcomes

After completing the course the student will able to:

- Practical implementation of Accounting Procedure and Book Keeping.
- How to prepare different Financial Statements.
- Make understating of Ratio Analysis.
- Learn the process of internal financing, balanced capital structure,
- .Financial forecasting, forecasting techniques
- Funds flow analysis – sources and use of funds, balance sheet and profit and loss statements.

BOOKS RECOMMENDED:

[1]. Kuchchal, *Financial management*. Tata McGraw Hill, 2003

[2]. Chandra Prasanna, *Financial management*. Tata Mc.Graw Hill, 2000

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMR2C2
MATERIAL
MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
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<tr><td>Duration of Theory Paper:
3 Hours</td><td colspan="4"></td></tr>
</table>

Objective and Pre requisites: To inbuilt the concepts of Material handling and purchase procedure of an organization. To impart the basics of standardization & stores management within an organization. To concrete the concepts of inventory management for effective decision making related to material & inventory.

COURSE CONTENTS

UNIT-1
Introduction:
Objective of materials management, field and scope of material management, general analysis material quality, material planning programming.

UNIT-2
Standardization: Concepts and Procedure,
Simplification: Concepts and Procedure,
Codification: Concepts and Procedure.

UNIT-3
Purchase Management:
Problems of purchasing , organization of purchasing Deptt, purchase procedures , placing of orders , inspection and testing , purchasing for mass production , purchase contract , make or buy decision , material import , DGS & D rate contract.

UNIT-4
Stores Management:
Stores organization, methods of storing, record – keeping & checking, issue methods, stores layout.

UNIT-5
Inventory Management:
Various inventory models, quantity discounts, shortages, instantaneous production with back orders, fixed time mode, single period model of profit maximization with time

independent costs, lead time , re-order point , Buffer stock, models with price breaks, selective control of inventory, POQ system.

Course outcomes

After completing the course the student will able to:

- Learn about field and scope of material management,
- Learn about Standardization: Concepts and Procedure,
- Simplification: Concepts and Procedure,
- Codification: Concepts and Procedure.
- Get deep knowledge of Problems of purchasing , organization of purchasing Deptt
- Stores organization, methods of storing, record –

BOOKS RECOMMENDED:

[1]. Lee & Dobler, *Material management.* Tata Mc.Graw Hill, 1990
[2]. Arnold J.R Tony & Stephen N. Chapman, *Introduction to Material management.* 2003
[3]. Gopal Krishnan, *Material Management*.1992

LABORATORY EXPERIMENTS:

1. Cases related to material handling problem in the plant or organization.
2. Cases related to the problem of Standardization, simplification, codification.
3. Cases related to Problems of purchasing.
4. Cases related to inspection and testing, purchasing for mass production.
5. Cases related to stores layout.
6. Cases related to various inventory models.
7. Determination of EOQ from the given data & its comparison with data of the industry.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMR2C3
SUPPLY CHAIN MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
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</table>

Objectives and Pre requisites: To inbuilt the concepts of Logistics and supply chain Management.
To strengthen skills related to supply chain strategies decisions.

COURSE CONTENTS

UNIT-1

Introduction to Supply chain:

Introduction to supply chain. Objective of supply chain, Process view of supply chain, Supply chain management, supply chain challenges, Supply Chain performance. Competitive and Supply chain strategies, achieving strategic fit, expanding strategies scope, Supply chain drives & obstacles: Frame work, inventory, transportation facilities, information, and obstacles to achieving fit.

UNIT– 2

Designing the Supply Chain Network:

Role of distribution in supply chain, factors influencing distribution network, design options, e – business and distribution network.

Network Design in supply chain: Role of network design, factors influencing, framework for network design decision, role of IT.

UNIT-3

Sourcing decision in Supply chain

Role of sourcing, supplier scoring, design collaboration, sourcing planning and analysis, role of IT in sourcing, Risk management, in sourcing, design collaboration, making sourcing decisions in practice

UNIT-4

Transportation in supply chain

Transportation in supply chain: Factors affecting transportation decision , modes of transportation & their performance characteristics , design options , tradeoffs , tailor transportation , routing & scheduling in Transportation , Network design in supply chain : Factors affecting network designing decisions, frame work, models , information technology in supply chain

UNIT-5

Supply chain coordination and Information technology

Understanding lack of coordination and Bullwhip effect, obstacle to coordination in supply chain, managerial levers to achieve coordination, building strategic partnership, collaborative planning, forecasting, achieving coordination in practice.

Role of IT in supply chain, supply chain IT frame work, supply chain IT in practice

Course outcomes

After completing the course the student will able to:

- Learn the concept of supply chain, Supply chain management, supply chain challenges
- Understand various Risk management, in sourcing, design collaboration, making sourcing decisions in practice
- Learn the procedure of routing & scheduling in Transportation
- Learn the drawbacks of lack of coordination and Bullwhip effect
- Learn about supply chain IT in practice

BOOKS RECOMMENDED:

[1]. Hutchinson Norman E., an Integrated approach to logistics management, PHI, 1987

[2]. Finkelstein & Guertin, Integrated logistics support, IFS publication U.K., 1988

[3]. Copra Sunil & Meindl Peter, Supply chain management. McGraw-Hill, 1998.

[4]. Mentzer, Supply chain management. . Sage Publications, 2004

[5]. Chistofer M., Logistics & supply chain management. 1998.

LABORATORY EXPERIMENTS:

(1) Case studies related to operation and systems logistics.

(2) Case studies related to Logistics in system utilization and support

(3) Case studies related to integrated logistic support.

(4) Case studies related to Competitive and Supply chain strategies.

(5) Case studies related to Factors affecting transportation decision.

(6) Case studies related to Network design in supply chain.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMR2G1
PROJECT MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
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<tr><td>Duration of Theory Paper:
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</table>

Objective and Pre requisites: To develop the Knowledge & concepts of Project Management. To develop the of Project's Analysis on different criteria like Market potential, Technical & Financial Analysis. To develop the skills of Project Appraisal through different criteria.

COURSE CONTENTS

UNIT-1
Project Management:
Definition characteristics and life cycle, difference with operation s management, steps in PM, projects managers jobs organization for PM, critical chain concepts.

UNIT-2
Market Potentiality & Technical Analysis:
Identification of opportunities of new products.
Materials and input production technology, product mix, plant capacity, project planning and analysis tools.

UNIT-3
Financial Analysis:
Estimation of cost of project, means of finance, estimate of working capital, estimate of cost of production, working result & profitability, projected balance sheet and projected cash flow statements. Project Appraisal Criteria: Payback period, net present value methods, cost benefit analysis, internal rate of return.

UNIT-4
Project Management through Network:
Work break down structure, Gantt chart etc. PERT: - Activity average time variance and project completion time by normal distribution. CPM: - Critical path, floats their interpretation, event occurrence time, slacks, resource allocation, crashing of NW, time cost trade-off, resource smoothing and leveling.

UNIT-5

Monitoring and Control:

Features of control, project control, performance analysis and cost control curves, line of balance, GERT, computer applications.

Course outcomes

After completing the course the student will able to:

- Will able to make performance analysis and cost control curves
- With critical chain concepts.
- Learn about various Materials and input production technology
- Learn about Payback period, net present value methods,
- Work break down structure, Gantt chart etc. PERT:

BOOKS RECOMMENDED:

[1]. Chandra Prasanna, *Project preparation,* Tata Mc.Graw Hill publishing CO. 1, New Delhi

[2]. Jain D.K, *Project planning and appraisal in planned economy*, Uppal publishing house, New Delhi.

[3]. Lock Dennis, *Project management,* Galgotia book service, New Delhi.

[4]. Mohsin M., *Project planning and control* Vikas publishing house, New Delhi.

[5]. Sonha A.K and Sinha Ram, *project engineering and management,* Vikas publishing house, New Delhi.

LABORATORY EXPERIMENTS:

(1) Case studies related to difeerent types of project and their charateristics.
(2) Case studies related to responsiblities of project manager related with different Projects
(3) Case studies related to market poteniality analysis with reference to new product.
(4) Case studies related to technical analysis with reference to different projects.
(5) Case studies related to finacial analysis with reference to new product.
(6) Case studies related to project implementation techniques.
(7) Case studies related to project control techniques.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year M.E. (Industrial Engineering and management) Full Time			
Subject Code & Name	Instructions Hours per Week			Credits			
	L	T	P	L	T	P	TOTAL
IIMR2G2 ENTERPRISE RESOURCE PLANNING	3	1	0	3	1	0	4
Duration of Theory Paper: 3 Hours							

Objectives & Prerequisites:

- To impart the basics of Enterprise Resource Planning (ERP) 7 its implementation methodologies to the students

COURSE CONTENTS

Unit - 1
Introduction:
ERP: an over view, Benefits of ERP, REP and related technologies, Business Process Reengineering, Date warehousing, Data Mining, Online Analytical processesing (OLAP), Supply Chain Management.

Unit – 2
ERP Implementation:
ERP implementation Life cycle, Implementation Methodology, Not all packages are created equal, ERP Implementation Hidden Costs, Organizing the implementation, Vendors, Consultants and Employees.

Unit – 3
The Business Modules:
Business Modules in an ERP Package, Finance, Manufacturing (Production), Human Resources, Plant Maintenance, Materials Management, Quality Management, Sales & Distribution.

Unit – 4
The ERP Market:
ERP Market place, SAP AG, PeopleSoft, Bann Company, Orcale Corporation. QAD, System Software Associates, Inc. (SSA).

Unit - 5
ERP – Present & Future:
Turbo Charge the ERP System, Enterprise Integration Applications (EIA), ERP and E – Commerce, ERP & Internet, Future Directions in ERP.

Course outcomes

After completing the course the student will able to:

- Learn About Supply Chain Management.
- Having deep knowledge of Date warehousing, Data Mining
- Learn the process of ERP implementation Life cycle
- Make a practical implementation of Business Modules using ERP Package
- Learn about practical implementation of various SAP AG, PeopleSoft, Bann Company, Orcale Corporation.
- Learn about Internet, Future Directions in ERP.

BOOKS RECOMMENDED:

[1] Leon Alexis, ERP Demystified, Tata McGraw – Hill, le,2004.
[2] Garg V.K. & N.K. Venkitakrishnan ERP Ware: ERP Implementaion Framework, PHI, 4e,2004.
[3] Leon Alexis, ERP Concepts and Planning, Tata Mcgraw – Hill,le,2000.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMR2E1
MARKETING
MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
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</table>

Objective and Pre requisites:

- To build a strong foundation of marketing concepts & to acquaint the students about the different Marketing Functions. To develop the skills of Marketing Strategies formulation & its implementation in an organization to maximize profits and improvement of Brand Image.

COURSE CONTENTS

UNIT-1
Introduction:
Tasks and philosophies of marketing MANAGEMENT, the marketing system and environment, system and environment, system approach to marketing. Marketing Organization**,** Organization of marketing department, responsibilities and functions of marketing managers, interaction of marketing in other functions.

UNIT-2
Marketing Research:
Scope and objective, planning and formulating marketing research projects, methods of collecting data, analysis and evolution of data, consumer behavior analysis, vendor analysis.

UNIT-3
Product Planning:
Product policy decision, life cycle innovation, product failure, introduction new products, product mix strategies, product portfolios management ,BCG GF-directional matrices, planning & budgeting for establishing and new products- MARMIX model.

UNIT-4
Sales Promotion and Advertising:
Role of promotion and advertising, type of promotion and advertising method, promotion and advertising appropriation, development and evaluation of advertising program.

UNIT-5

Distribution & Sales Function:

Importance of middlemen, types of distribution channel, channel design decisions, problems in channel determination and uses. Recruitment, selection, training, motivation and compensation of sales force, controlling and evaluating**.**

Course outcomes

After completing the course the student will able to:

- Learn about different philosophies of marketing concepts.
- Learn the Importance of middlemen, types of distribution channel, different marketing organizations.
- Having knowledge of marketing research approaches adopted by business organisation.
- Case studies related to product development and planning by different organisation.
- Case studies related to sales promotion and advertising practices of different organisation product portfolios management ,BCG GF-directional matrices, planning.
- Learn about sales promotions practices of different organisation.
- Able to make Product policy decision.
- Learn about life cycle innovation and product failure,.

BOOKS RECOMMENDED:

[1]. Kotler Philip, *Marketing management, planning, analysis and control.* PHI, 2001

[2]. Cundiff, Still & Govoni, PHI. , 2003

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMR2E2
PRODUCT DESIGN
& MANUFACTURING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
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</table>

Objectives & Pre requisites : To impart the basics of Product Design & Development of a new Product. To sharpen the skills of the students to understand the different manufacturing processes/ systems for new product development.

COURSE CONTENTS

UNIT -1

Introduction

Characteristics of successful product development, Design and development of products, duration and cost of product development, the challenges of product development. Development Processes and Organizations: A generic development process, concept development: the front-end process, adopting the generic product development process, the AMF development process, product development organizations, the AMF organization.

UNIT -2

Product Planning

The product planning process, identify opportunities. Evaluate and prioritize projects, allocate resources and plan timing, complete pre project planning, reflect all the results and the process.

UNIT - 3

Identifying Customer Needs

Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs and reflect on the results and the process. Product Specifications: What are specifications, when are specifications established, establishing target specifications, setting the final specifications.

UNIT - 4

Concept Generation

The activity of concept generation clarify the problem, search externally, search internally, explore systematically, and reflect on the results and the process. Concept

Selection: Overview of methodology, concept screening, and concept scoring, Concept Testing: Define the purpose of concept test, choose a survey population, choose a survey format, communicate the concept, measure customer response, interpret the results.

UNIT – 5

Design for Manufacturing

Definition, estimation of manufacturing cost, reducing the cost of components, assembly, supporting production, impact of DFM on other factors. Prototyping: Prototyping basics, principles of prototyping, technologies, planning for prototypes. Product Development Economics: Elements of economic analysis, base case financial mode, Sensitive analysis, project trade-offs, influence of qualitative factors on project success, qualitative analysis.

Course outcomes

After completing the course the student will able to:

- Learn about Characteristics of successful product development, Design and development of products.
- Prctical knowledge of Development Processes and Organizations.
- Learn how to make the product planning process, identify opportunities.
- Well understanding of Customer Needs.
- Perform Sensitive analysis, project trade-offs.
- Sensitive analysis, project trade-offs.

BOOKS RECOMMENDED:

[1] Ulrich Karl.T. & Eppinger Steven D., "Product Design and Development" Irwin McGrawHill- 3e, 2000.

[2] Chitale A. C. and Gupta R. C., PH1, "Product Design and Manufacturing", 3e, 2003.

[3] Timjones Butterworth Heinmann, "New Product Development" Oxford. UCI. 1997.

[4] Boothroyd G., Dewhurst P. and Knight W., "Product Design forManufacture and Assembly", **2002.**

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMR2E3
CUSTOMER RELATIONSHIP MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
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</table>

Objective and Pre requisites:

- To make the students understand the organizational need, benefits and Process of creating long-term value for individual customers. To disseminate knowledge regarding the concept of eCRM and eCRM technologies. To enable the students understand the technological and human issues relating to Implementation of CRM in industries.

COURSE CONTENTS

Unit-I
introduction
Definition of CRM as a business strategy ,elements of CRM ,CRM process and system .Strategy and organization of CRM ,History of CRM ,Dynamics of customer supplier relationship, Nature and context of CRM strategy ,The relationship oriented organization

Unit-2
Marketing Aspects of CRM
Customer knowledge, privacy issue, communication and multi channel in CRM,the individual customer proposition ,relationship policy .

Unit-3:
Analytical CRM
Relationship data management, Data analysis and data mining, segmentation and selection ,Retention and cross sell analysis ,Effects of marketing activities, Reporting results operational CRM:Call centre management ,Internet and website ,Direct mail collaborative CRM]

UNIT-4
CRM Subsystems:
Contact Management, Campaign Management, Sales Force Automation,
Choosing CRM Tools / Software Package: Short listing prospective CRM vendors, setting evaluation criteria for the appropriate CRM package, selection

UNIT-5

CRM implementation:

CRM systems and Implementation: CRM systems, Implementation of CRM systems Applications in various industries: Applications in manufacturing, banking hospitality and telecom Sectors, Ethical Issues in CRM

Course outcomes

After completing the course the student will able to:

- Get deep knowledge of CRM as a business strategy.
- Learn about Dynamics of Customer Supplier Relationships.
- Make study on various aspects related to Marketing Aspects of CRM**.**
- Learn about Relationship data management.
- Learn about Contact Management, Campaign Management,
- Sales Force Automation.
- Case studies related to CRM implementation.

BOOKS RECOMMENDED:

[1] Peelen , Customer Relationship Management , Ed. Pearson 2004

. Z ikmund, William G. Customer Relationship Management: Integrating

[2] Marketing Strategy & Information Technology John Wiley. 2006

[3] Greenberg, P CRM at the Speed of Light, 4^{th} e. Mcgraw Hill 2009

[4] Brown , Stanley , Customer Relationship Management, A strategic Imperative in the World of eBusiness . John Wiley & Sons 2008

[5] Peppers, D. / Rogers, Martha. Doubleday The One to One B2B: Customer Relationship Management Strategies for the Real Economy Business 2001

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**II Year M.E. (Industrial Engineering and management) Full Time**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
IMR2E4 INDUSTRIAL MARKETING	**L**	**T**	**P**	**L**	**T**	**P**	**TOTAL**
	3	**1**	**1**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Objective and Pre requisites:

- The objective of this course is to help the students develop an understanding of the dimensions of the Marketing, with particular reference to Industrial reference and practices at national and international level.

COURSE CONTENTS

UNIT-1

Nature of Industrial Marketing

Industrial Marketing Vs. Consumer Marketing , Relational approach to Industrial Marketing- The Nature of Industrial Demand & Industrial Customer

UNIT-2

Types of Industrial Products

Major Equipment; Accessory Equipment; Raw and Processed Materials; Component Parts and Sub- Assemblies; Operating Supplies; Standardized and Non-standardized parts, Industrial services

UNIT-3

Organizational Buying

Factors influencing Organizational Buying, Buying Roles; Organizational Buying Decision Process; environmental & organizational Influences, Organizational Influences on Buying Behavior: Buying Roles; The Buy Grid Model; The Organizational Buying Decision Process

UNIT-4

Industrial Product Decisions

Industrial Product Life Cycle, Industrial Product Mix determinants viz. technology, competition, operating capacity, shift in location of customers, government controls, changes in level of business activity, Channel Structure for Industrial Products,

Geographical, size, operating characteristics manufacturers' and sales agents Brokers Channel Logistics

Purchasing systems – Auctions- Documentation bids order placement follow up receipt and inspection

UNIT-5

Pricing & Promotion for Industrial Products

Pricing Objectives ,Price Decision Analysis , Breakeven analysis, net pricing, discount pricing , trade discounts, geographic pricing , factory pricing , freight allowance pricing ,Terms of Sale, Outright purchase , Hire-purchase , Leasing Promotion for Industrial products , Supporting salesman , Motivating distributors , Stimulating primary demand , Sales appeal , Publicity & sponsorships , Trade shows, exhibits , Catalogs, Samples promotional letters – Promotional novelties

Course outcomes

After completing the course the student will able to:

- Get deep knowledge of CRM as a business strategy.
- Learn about Dynamics of Customer Supplier Relationships.
- Make study on various aspects related to Marketing Aspects of CRM**.**
- Learn about Relationship data management.
- Learn about Contact Management, Campaign Management,
- Sales Force Automation.
- Case studies related to CRM implementation.

BOOKS RECOMMENDED:

[1] Reeder, Robert R., Brierty, Edward G. and Reeder, Betty H, Industrial Marketing Analysis, Planning and Control. Publisher: Prentice Hall ,1991.

[2] Ralph S. Alexander, James S. Cross [and] Richard M. Hill., Industrial marketing - 3d ed. Homewood,

[3] P K Ghosh Industrial Marketing Oxford University Press India 2005

[4] Havaldar, Krishna Industrial Marketing, Tata McGraw-Hill 2010

[5] C S G Krishnamacharyulu, Lalitha R , Industrial Marketing , Jaico Publishing House, 2009

[6] Anderson,Business Marketing, Pearson 2010.

M.E Mechanical Engineering (Design & Thermal) (Part Time)
Proposed Scheme for CBCS

SEM I				
S.NO	***Sub Code***	***Sub Name***	***Number of Credit***	***SubType***
1.	DTP1C1	Tribology	3-1-1 =5	PC1
2.	DTP1C2	Design of Internal Combustion Engine Systems	3-1-1 =5	PC2
3.		***Generic Elective I***	3-1-0 =4	GE1
4.	DTP1V1	Comprehensive Viva I	0-0-2=2	
Total Credit for SEM I			**14 actual + 2 Virtual credits**	
SEM II				
1.	DTP2C3	Advanced Machine Design	3-1-1 =5	PC3
2.		***Elective I***	3-1-1 =5	PE1
3.	DTP2W1	Seminar/ Res. Tool/Work Shop-1	0-2-0=2	
4	DTP2V2	Comprehensive Viva II	0-0-2=2	
5.	ASP2S1	Soft Skills -1	2-0-0 =2	
Total Credit for SEM II			**14 actual + 2 Virtual credits**	
List of Generic Elective I				
1.	**DTP1G1**	**Advanced Thermodynamics**		
2.	DTP1G2	Non Conventional Energy Systems		
3.	DTP1G3	Management Information System		
4.	DTP1G4	Finite Element Analysis		
List of Elective I				
1.	**DTP2E1**	**Advanced Mechanics of Solids**		
2.	DTP2E2	Fatigue Creep and Fracture		
3.	DTP2E3	Mechanism and Robot Kinematics		
4.	DTP2E4	Thermal Systems : Simulation and Design		
SEM III				
1.	DTP3C1	Machinery Fault Diagnosis and Signal Processing	3-1-1 =5	PC4
2.	DTP3C2	Advanced Refrigeration and Air Conditioning	3-1-1 =5	PC5
3.		***Generic Elective II***	3-1-0 =4	GE2
4.	DTP3V3	Comprehensive Viva III	0-0-2=2	
Total Credit for SEM III			**14 actual + 2 Virtual credits**	
SEM IV				
1.	DTP4C3	Computer Aided Modeling and Simulation	3-1-1 =5	PC6
2.		***Elective II***	3-1-1 =5	PE2
3.	DTP4W2	Seminar/ Res. Tool/Work Shop-2	0-2-0=2	
4.	DTP4V4	Comprehensive Viva IV	0-0-2=2	
5.	ASP4S2	Soft Skills -2	2-0-0 =2	
Total Credit for SEM IV			**14 actual + 2 Virtual credits**	
List of Generic Elective II				
1.	**DTP3G1**	**Advanced Heat Transfer**		
2.	DTP3G2	Rapid Prototyping		
3.	DTP3G3	Cogeneration and Waste Heat Recovery		
4.	DTP3G4	Mechatronics in Manufacturing Systems		

List of Elective II				
1.	**DTP4E1**	**Machine Vibrations Analysis**		
2.	DTP4E2	Experimental Stress Analysis		
3.	DTP4E3	Applied Elasticity and Plasticity		
4.	DTP4E4	Automotive Systems: Analysis and Design		
SEM V				
DTP5D1		Dissertation Phase I	0-0-12=12	
DTP5V5		Comprehensive Viva V	0-0-4=4	
Total Credit for SEM V			**12 actual + 4 Virtual credits**	
SEM VI				
DTP6D2		Dissertation Phase II	0-0-12=12	
DTP6V6		Comprehensive Viva VI	0-0-4=4	
Total Credit for SEM VI			**12 actual + 4 Virtual credits**	
Total Credits			**80 actual + 16 Virtual credits**	

SEMESTER - 1

Devi Ahilya University, Indore, India Institute of Engineering & Technology				M.E.(Design & Thermal) Semester A Part Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTP1C1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Tribology	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Objectives & Pre requisites:
The basic objective of the subject is to deal fundamentals of friction, wear and lubrication. The subject is useful in understanding the nature of surfaces of engineering materials. The Pre requisites are material science and machine design.

UNIT- 1
Fundamentals of Tribology:
Introduction to tribology and its historical background, Industrial importance, factors influencing Tribological phenomenon. Engineering surfaces- surface characterization, computation of surface parameters. Surface measurement techniques.

UNIT- 2
Friction:
Genesis of friction, friction in contacting rough surfaces, sliding and rolling friction, various laws and theory of friction, friction of elastomers, friction of various materials, friction measurement methods.

UNIT- 3
Wear:
Introduction, types of wear, wear mechanism, minor forms of wear, wear debris analysis, wear testing method, wear of metals, ceramics, polymers, system approach for wear reduction.
UNIT-4
Lubrication:
Basic principal of lubrication, choice of lubricant type, selection of lubrication oils, oil changing and oil conservation, oil feed system, Greece and anti seizes, gas bearing, lubricating sealing, lubricating testing and specifications, lubrication monitoring.

UNIT- 5
Design for Tribological Elements:
An overview of engineering materials having potential for tribological application, characterization and evaluation of ferrous materials for tribological requirements/application, selection of ferrous materials for rolling element bearings, Boundary lubrication, Hydrodynamic lubrication, elastohydrodynamic lubrication, Design of hydrodynamically loaded journal bearing, externally pressurized bearing, rolling element bearing, performance analysis of bearing.

BOOKS RECOMMENDED

[1] Moore F Desmond ,*Principals and application of Tribology*, ,Pergamon press,1975
[2] Sahoo Prashant *Engineering Tribology*, Prentice-Hall of India, New Delhi, 2005
[3] Lansdown A R ,*Lubrication, A practical Guide to Lubricant selection*, Pergamon Press1982
[4]Majumdar BC, *Introduction to Tribology of Bearings*, Wheeler Publishing, New Delhi,1999

LABORATORY EXPERIMENTS:

1. Performance analysis of Journal Bearings.
2. Experimental analysis of Lubricants.
3. Experimental analysis of Friction on different material.
4. Study of method for Wear Debris analysis.
5. Design analysis for Hydrodynamic Journal Bearing and rolling contact bearing

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO HAVE

The knowledge of the subject and fundamentals of friction, wear and lubrication. The subject is useful in understanding the nature of surfaces of engineering materials. The Pre requisites are material science and machine design.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">M.E.(Design & Thermal)
Part Time</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTP1C2
Design of Internal Combustion Engine Systems</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td></tr>
</table>

Objectives: To impart the knowledge of internal combustion engine from systems design perspective.

Pre requisites: Fundamentals of thermodynamics, Combustion process, Theory of Internal combustion Engines.

COURSE CONTENT

UNIT-1

Genesis

Evolution: Limitation of Steam Engines, Hot Air Engine, Internal Combustion Engines, Atmospheric Engines, Lenoir Engines, Otto-Langen Engine; Engine Cycles; Flow chart of typical Internal Combustion engine processes; Classification; Configurations; Operational and performance parameters; Fuels for engines: composition, characteristics.

UNIT-2

Induction and Exhaustion Systems

Gas exchange; Intake system: Air-filter, Carburetor, Injectors: throttle body, port, direct injection; Diesel Injection: Low and High pressure Common Rail Systems, Jerk pump systems, Electronically controlled; Manifolds; Superchargers and turbochargers; Exhaust Systems; Exhaust manifold, Exhaust Pipe, Catalytic Converter, Muffler; Valves Flows:Flow Patterns, Discharge Coefficient, Performance, Timing and its Effects; Scavenging: Performance parameters; Volumetric Efficiency.

UNIT-3

In-cylinder flows and Combustion Thermochemistry

In-cylinder flows: Measurement; Swirl: Induction Swirl, Swirl Coefficient, Swirl Ratio; Swish; Tumble; Squish; Prechamber flows;Stoichiometry Relations: Air required for Complete Combustion based on Fuels, Incomplete Combustion, Calculation of Dry Flue Gases for known fuel composition, Estimating Fuel Composition and Excess Air quantity from Exhaust Gas Analysis, Flue Gas Analysis (O_2, CO_2, CO, NO_x, SOx); Combustion Terminology: Adiabatic Flame temperature, Combustion Rates, Equilibrium Coefficient, First Law applied to Chemical Reactions Combustion Efficiency.

UNIT-4

IC Engines Sub Systems

Starting and Charging systems; Ignition Systems; Engine Heat transfer and Cooling systems; Engine friction and lubrication systems; Mechanisms for system operations.

UNIT-5

Pollutant Formation and Control

Emission Formation in SI Engines: Constituents, Formation Mechanisms: Hydrocarbon, Carbon Monoxide, Oxides of Nitrogen, Carbon dioxide, Aldehydes; Control Techniques; Fuel Injection Technologies, Heated Oxygen Sensors, Emission formation in CI Engines: Constituents, formation Mechanisms: Carbon Monoxide, Unburned Hydrocarbons, Oxides of Nitrogen, Compounds of Sulpher, Particulate Matter, Control Techniques: Fuel Injection Technology, Electronically Controlled Distribution, Electronic Unit injector System, After Treatment Devices.

Text Books:

[1] Engineering Fundamentals of internal Combustion Engines, Willard W. Pulkrabek, Printice Hall New Jersey.

[2] Internal Combustion Engine Fundamentals, John B Heywood, McGraw-Hill Book Company, New York, 1988.

Reference Books

[3] Internal Combustion Engines Applied Thermosciences, Colin R. Ferguson and Allan T. Kirkpatrick, John Wiley & Sons, 2e, 2004

[4] Internal Combustion Engines, V. Ganesan, Tata McGrraw-Hill, New-Delhi, 1990

[5] An Introduction to Combustion: Concept and Applications, Stephen R. Turns, McGraw-Hill Education (India), New-Delhi, 2011

List of Experiments

1. Study of various IC engine Components and Sub-systems.
2. Study of Induction and Exhaustion Systems
3. Study of Ignition Systems, Cooling systems, lubrication systems for IC engine systems
4. Simulation and Modeling of Spark Ignition engines
4.Simulation and Modeling of Compression Ignition engines
5. Emission measurement in Spark Ignition and Compression Ignition Engines.

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO HAVE

The knowledge of internal combustion engine from systems design perspective.

Fundamentals of thermodynamics, Combustion process, Theory of Internal combustion Engines

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">1 Year M.E.(Design &Thermal Engg.)
Part Time</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTP1G1
Advanced Thermodynamics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td>3</td><td>1</td><td>-</td><td>4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td></tr>
</table>

Objective: The basic objective of the subject is to deal fundamentals of Thermodynamics, Compressible Fluid Flow properties, Thermodynamics relations & Exergy.

Prerequisite: Basic Engineering Thermodynamics.

COURSE CONTENT

UNIT 1

Mass And Energy Analysis Of Control Volume

Control Volume, Steady Flow Process, Mass Balance and Energy Balance in a Simple Steady Flow Processes, Variable Flow Processes, Comparison of SFEE with Euler and Bernoulli Equations, Examples of a Variable Flow Problems. Illustrative Problems.

UNIT 2

Thermodynamic Property Relations

Mathematic Theorems, Maxwell,s Relations, TdS Equations, Heat Capacities, Joule Kelvin Effects, Claussius Clapeyron Equation, Gibb's Phase Rule, General Thermodynamic considerations on an Equation of State. Illustrative Problems

UNIT 3

Exergy

Work Potential of Energy, Reversible work and Irreversibility, Second Law Efficiency, Exergy Change of System, Exergy of a Closed System, Exergy of a Steady Flow System, Maximum Work Obtainable Conditions, Illustrative Problems

UNIT 4

Vapour Power Cycles

General Aspects, Simple Steam Power Cycle, Rankine Cycle, Reheat Cycle, Ideal Regenerative Cycle, Feedwater Heaters, Exergy Analysis of Vapour Power Cycles, Illustrative Problems

UNIT 5

Finite Time Thermodynamics

General Aspects, Application of principles on Reversible and Irreversible Cycles, Maximum Power Output conditions, Effect of Cycle Irreversibility Parameter on the performance of the Cycles, Performance of Engines working under Maximum Power and Maximum Power Density conditions, Entropy Generation Minimization, Concepts of Virtual Entropy, Illustrative Problems.

Books Recommended:

[1.] Y.A Cengel, *Thermodynamics-An Engineering Approach* , McGraw Hill Companies,2006.
[2.] P.K Nag, *Engineering Thermodynamics* , The McGraw Hill Companies, Third Edition
[3.] G.E Myers, *Engineering Thermodynamics* ,Prentice Hall, Third Edition

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO :

- Perform Comparison of SFEE with Euler and Bernoulli Equations,
- Mathematic Theorems, Maxwell,s Relations, TdS Equations, Heat Capacities
- Work Potential of Energy, Reversible work and Irreversibility, Second Law Efficiency
- General Aspects, Application of principles on Reversible and Irreversible Cycles

<table>
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Part Time</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTP1G2
Non Conventional Energy Systems</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td></tr>
</table>

Objective: The objective of the subject to acquaint the students the renewable energy technological systems, its principle ,working, system design and analysis of present systems, to analysis the environmental and cost economics of using renewable energy sources compared to fossil fuels.

Pre requisites: Thermal Engineering, Heat and Mass transfer, fluid mechanics, steam engineering, combustion technology.

COURSE CONTENT

UNIT-1

Solar Energy

Solar radiation its measurements and prediction - solar thermal flat plate collectors concentrating collectors – applications - heating, cooling, desalination, power generation, drying, cooking etc - principle of photovoltaic conversion of solar energy, types of solar cells and fabrication. Photovoltaic applications: battery charger, domestic lighting, street lighting, and water pumping, power generation schemes. Design and Thermal analysis.

UNIT-2

Wind Energy

Atmospheric circulations – classification - factors influencing wind - wind shear – turbulence - wind speed monitoring - Betz limit - Aerodynamics of wind turbine rotor- site selection - wind resource assessment - wind energy conversion devices - classification, characteristics, and applications. Hybrid systems - safety and environmental aspects.

UNIT-3

Bio-Energy

Biomass resources and their classification - chemical constituents and physicochemical characteristics of biomass - Biomass conversion processes - Thermo chemical conversion: direct combustion, gasification, pyrolysis and liquefaction - biochemical conversion: anaerobic digestion, alcohol production from biomass - chemical conversion process: hydrolysis and hydrogenation. Biogas - generation - types of biogas Plants- applications Design of bio gas digesters, landfill gas systems and gasifiers.

UNIT-4

Hydrogen and Fuel Cells

Thermodynamics and electrochemical principles - basic design, types, and applications - production methods - Bio photolysis: Hydrogen generation from algae biological pathways - Storage gaseous, cryogenic and metal hydride and transportation. Fuel cell – performance characteristics ,principle of working- various types - construction and applications.

UNIT-5

Other Types of Energy

Ocean energy resources - principles of ocean thermal energy conversion systems - ocean thermal power plants - principles of ocean wave energy conversion and tidal energy conversion – hydropower – site selection, construction, environmental issues - geothermal energy - types of geothermal energy sites, site selection, and geothermal power plants, MHD, Thermal analysis

Note: HMT Data-books and certified notes are allowed in the examination hall.

BOOKS RECOMMENDED:

[1] Sukhatme, S.P., Solar Energy, Tata McGraw Hill, 1984**.**
[2] Twidell, J.W. and Weir, A., Renewable Energy Sources, EFN Spon Ltd., 1986.
[3] Kreith, F and Kreider, J. F., Principles of Solar Engineering, McGraw-Hill, 1978.

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO :

- Working, system design and analysis of present systems, to analysis the environmental and cost economics of using renewable energy sources compared to fossil fuels.
- Applications: battery charger, domestic lighting, street lighting, and water pumping, power generation schemes. Design and Thermal analysis.
- Biomass resources and their classification - chemical constituents and physicochemical characteristics of biomass - Biomass conversion processes
- Thermodynamics and electrochemical principles

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="5">I Year ME (Design & Thermal Engg.)
Part Time</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="5">Credits</td></tr>
<tr><td rowspan="2">DTP1G3
Management Information System</td><td>L</td><td>T</td><td>P</td><td></td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td></td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Objectives & Pre requisites:
The basic objective of the subject is to deal fundamentals of Management Information System. The subject is useful in understanding the various information sources and database structures.

COURSE OF CONTENT

Unit-1
Introduction to Management Information Systems
An Overview of Management Information Systems, Structure of a Management information System
Survey of Information Systems Technology
Hardware, Software, and Communication technology for Information Systems, Storage and Retrieval of Data, Transaction Processing, Office Automation and Information processing Control Functions.

Unit-2
Conceptual Foundations
The Decision Making Process, Concepts of Information, Humans as information Processors, System Concepts, Concepts of Planning and Control, Organizational Structures and Management Concepts.

Unit-3
Information Based Support System
Support Systems for Planning, Control and Decision Making, Support Systems for Management of Knowledge Work.

Unit-4
Information System Requirements
Developing a Long Range Information System Plan, Strategies for the Determination of Information Requirements, Database Requirements, User Interface Requirements.

Unit-5

Development, Implementation and Management of Information System Resources

Developing and Implementing Application Systems, Quality Assurance and Evaluation of Information Systems, Organizational and Management of the Information Resources Functions, Future Development and Their Organizational and Social Implications.

Text Books

[1] Gordan B. Davis and Margrethe H. Olson, “Management Information Systems - Conceptual Foundations, Structures and Development, Mcgeaw Hills International Editions.

Reference Books

[1] Laudon, Kenneth C., and Laudon, Jane P., Management Information Systems-Managing Digital Firm, Tenth Edition, Prentice Hall, 2007
[2] Management Information Systems, Loudon and Loudon, 10th edition, Pearsons Educations
[3] Management Information System, Oz Thomson Learning 5th edition
[4] Management Information System, W.S.Jawadekar, 3rd edition, TMH
[5] Management Information System, James O‘Brien, 7th edition, TMH

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO :

- Structure of a Management information System.
- , Transaction Processing, Office Automation and Information processing Control Functions.
- Organizational Structures and Management Concepts.
- Developing a Long Range Information System Plan

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="5">I Year ME (Design & Thermal Engg.)
Part Time</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="5">Credits</td></tr>
<tr><td rowspan="2">DTP1G4
Finite Element Analysis</td><td>L</td><td>T</td><td>P</td><td rowspan="2"></td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Objectives & Pre requisites:
The basic objective of the subject is to deal with the fundamentals of Finite Element Methods. The subject is useful in understanding the concept of Solving problems using finite element approach.

COURSE OF CONTENT

Unit-1
Introduction
Introduction, Approximate Methods of Analysis, Finite Element Method-An Introduction, Different Approaches in FEM.

Unit-2
Finite Elements and Interpolation Functions
Interpolation Functions, One Dimensional Elements, Two Dimensional Elements, Three Dimensional Elements.

Unit-3
One Dimensional Finite Element Analysis
Linear Spring, Truss Element, 1D Torsion of a Circular Shaft, 1D Steady State Heat Conduction, 1D Flow Through Porous Media, 1D Ideal Fluid Flow Through Pipes, Beam Element, Analysis of Plane Frames and Grids.

Unit-4
Two Dimensional Finite Element Analysis
2D Flow through Porous Media, 2D Stress Analysis, Iso-Parametric Formulation, Finite Element Solution of Partial Differential Equations by Method of Weighted Residual, FEM Formulation Based on Variational Principle, Finite Element Solution of Stokes Flow Equations.

Unit-5
Three Dimensional Finite Element Analysis
Axi-Symmetric Solids, 8 Node Isoperimetric Element for 3D Stress Analysis, Computer Implementation of FEM, Applications of Finite Element Method.

Text Books

[1] Y. M. Desai, T. L. Eldho, A. H. Shah, “Finite Element Method with Applications in Engineering”, Pearson Publication.
[2] Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, “Concepts and Applications of Finite Element Analysis”, Wiley India (P) Ltd.
[3] Chennakesava R. Alavala, “Finite Element Methods Basic Concepts and Applications”, PHI Learning Private Limited.

Reference Books

[1] Daryl L. Logan, “A First Course in the Finite Element Method”, Cengage Learning India.
[2] V. Ramamurti, “Finite Element Method in Machine Design”, Narosa Publishing House.
[3] Klaus Jurgen Bathe, “Finite Element Procedures”, PHI Learning India.

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COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Approximate Methods of Analysis,
- Fluid Flow through Pipes, Beam Element, Analysis of Plane Frames and Grids.
- 2D Flow through Porous Media, 2D Stress Analysis
- Axi-Symmetric Solids, 8 Node Isoparametric Element for 3D Stress Analysis
- One Dimensional Elements, Two Dimensional Elements

SEMESTER - 2

Devi Ahilya University, Indore, India Institute of Engineering & Technology	M.E.(Design & Thermal) Part Time

Subject Code & Name	Instructions Hours per Week			Credits			
	L	T	P	L	T	P	Total
DTP2C3 Advanced Machine Design	3	1	2	3	1	1	5
Duration of Theory Paper: 3 Hours							

Course Objectives: The objective of the subject is to deal with failure analysis and advanced areas of design of machine elements based on reliability, fatigue, creep. Also deals with the fracture mechanics approach to design.

Prerequisite(s): Pre requisites are Material science,Machine Design Iand Machine Design II.

COURSE OF CONTENTS

Unit-I:**Introduction to Advanced Mechanical Engineering Design**:
Review of materials and processes for machine elements. Case studies of mechanical engineering design failures. Review of static strength failure analysis – theories of failure. **Unit-II**:**Reliability and Optimum based Design** :
Introduction to optimum design, analysis of simple machine members based on optimum design. Fundamentals of reliability, System concepts in Reliability engineering. Failure distributions, Statistical analysis of failure data, Weibull analysis, dimensioning.

Unit-IV: Design **for Dynamic Loading:**
High cycle and low cycle fatigue, Fatigue strength. Design of Mechanical Equipment Elements. Exercises of fatigue design of shafting and gears. Exercises of surface fatigue design of rolling contact bearings including linear bearings.

Unit-IV: **Design for Creep:**
Introduction to Design for creep. Combined creep and fatigue failure prevention. Design for low temperature (Brittle failure). Design for corrosion, wear, hydrogen embrittlement, fretting fatigue and other combined modes of mechanical failure.

Unit-V: **Fracture mechanics:**
Introduction: Fracture mechanics approach to design, the energy criterion, the stress intensity approach, effect of material properties on fracture, dimensional analysis in fracture mechanics. Fundamental concepts: Stress concentration effect of flaws, the Grifith energy balance, the energy release rate, instability and the R curve, stress analysis of cracks, K as a failure criterion. Fracture toughness testing of metals

Note: **Only Mechanical Engineer's Handbook, Data-books and certified notes are allowed in the examination hall.**

Text Books:

[1] Shingley J.E., *Mechanical Engineering Design*, McGraw-Hill 2003
[2] Dieter G.E., *Engineering Design*, McGraw-Hill 2000.
[3] Mubeen., Machin*e Design*, , Khanna Publications(P) Ltd.,2004

Reference Books:

[1] Spotts M.F.,Shoup T.E., Hrnberger L.E., *Design of Machine Elements*, Pearson Education ,8e,2006

[2] Shariff A.,*Design of Machine Elements*,Dhanpat Rai Publications(P) Ltd.,3e,1995

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO HAVE

The failure analysis and advanced areas of design of machine elements based on reliability, fatigue, creep. Also deals with the fracture mechanics approach to design.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				I Year ME (Design & Thermal Engg.) Full Time				
Subject Code & Name	**Instructions Hours per Week**			**Credits**				
DTP1E1 **Advanced Mechanics of Solids**	**L**	**T**	**P**		**L**	**T**	**P**	**Total**
	3	**1**	**2**		**3**	**1**	**1**	**5**
Duration of Theory Paper: **3 Hours**								

Course Objectives:

[2] To develop the analytical methods for solving problems in mechanics of solid those are generally considered beyond the scope of basic course in the discipline. As such, the developments tend to evolve from fundamentals principles such as equilibrium and conservation of energy.

[3] To understand fundamentals of linear elasticity and energy methods for solving torsion, bending problems.

[4] To gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures using Finite Element Analysis

Prerequisites: Mechanics of Solids

COURSE OF CONTENTS

Unit-1

3D Analysis of Stresses and strains

Concept of stress at a point, stress tensor, stress on inclined plane, stress components on a rectangular parallelepiped in Cartesian coordinate system, derivation of stress equilibrium equations, transformation of stresses, strains. The state of strain at a point, strain displacement relations, strain compatibility condition and stress compatibility conditions, Relations between Elastic Constants.

Unit-2

Unsymmetrical Bending

Stresses and deflections in beams subjected to unsymmetrical loading-Kern of section, Deflection of Beams, Shear Center.

Unit-3

Bending of Curved Beams

Bending Stresses and Deflections of Curved Beams.

Unit-4

Introduction to the Finite Element Method

Introduction, Node and Element Notations, The Truss Element, Beam and Frame Elements, Two Dimensional Elastic Elements, Higher Order and Three Dimensional Elastic Elements.

Unit-5

Finite Element Modeling Techniques

Planing and Creating the Finite Element Model (Preprocessing), Element Selection and Mesh Strategy, Load Application, Constraints, Preprocessing Checks, Processing the Model and Postprocessing.

Text Books

[6] Richard G. Budynas, Advanced Strength and Applied Stress Analysis, Mc Graw Hill Education (India), Second Edition, 2014

[7] L. S. Shreenath, Advanced Mechanics of Solids, Tata McGraw Hill Publication, 2014

Reference Books

[4] G H Ryder, Strength of Materials, McMillan India Ltd., Third Edition, 1969.
[5] Timoshenko, *Elements of Strength of Materials,* 5/e,Wadsworth Publishing;1968
[6] Kamal Kumar and R. C. Ghai, Advanced Mechanics of Materials, Khanna Publishers, 2010.

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO

- Develop the analytical methods for solving problems in mechanics of solid those are generally considered beyond the scope of basic course in the discipline. As such, the developments tend to evolve from fundamentals principles such as equilibrium and conservation of energy.
- Understand fundamentals of linear elasticity and energy methods for solving torsion, bending problems.
- Gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures using Finite Element Analysis
- Prerequisites: Mechanics of Solids

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">1 Year M.E. (Design &Thermal Engg.)
Part Time</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTP2E2
Fatigue Creep and Fracture</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td></tr>
</table>

Objective of the subject

The objectives of this course will be achieved by learning the phenomenon of fatigue creep & fracture Mechanism inside the metallic bodies also the behavior of the material can be understand under these states.

Prerequisites

Strength of Material, Machine Design & Material Science.

COURSE CONTENT

UNIT-1

Introduction

Introduction & types of fatigue creep & Fracture phenomenon. Stress Analysis under fatigue, creep & Fracture. Material selection under the given conditions.

UNIT -2

Fatigue

Types of fatigue leading and failure, Fatigue test, endurance limit, S-N diagram; Various failure relations, Viz., Soderberg, Modified Goodman-, Gerber parabolic-, Elliptical-relations; Factors influencing fatigue strength; Influence of stress concentration on fatigue test; Fretting corrosion; Effect of environment-corrosion fatigue; Increased fatigue life due to surface protection.

UNIT -3

Creep

Mechanics of creep, inter-granular, trans-granular creep, Creep test, Creep strain rate-time curves, Deformation mechanism map; High temperature properties of materials; Long time creep-stress-time relations; Creep contribution to the fracture mechanism; Creep contribution to the fracture mechanism; DVM, DVL German-standard, Hatfield time yield test.

UNIT -4

Fracture

Damage tolerance analysis, residual strength in presence of cracks; Mechanisms of crack growth and fracture; Basic modes of fracture; Stress Concentration factor, state of stress at a stress concentration, load-flow-times; Measurement of Collapse strength; Griffith's theory of brittle fracture; Irwin's theory of fracture in elastic-plastic materials; Theories of linear elastic plastic fracture mechanics (LEFM); Stress intensity fracture, toughness, stress distribution at crack tip: plane stress, plane strain cases; Theories of elastic plastic fracture mechanics (EPFM); Crack opening displacement (COD) Criterion, COD tests, crack tip opening displacement (CTOD) measurement; Crack arresters; Implementation of fracture control.

UNIT -5

Design against Creep

Types of creep, Introduction to Design against creep. Combined creep and fatigue failure prevention.Shearby Dorn Parameter, Larson Miller Parameter, Menson- Haferd Parameter.

BOOKS RECOMMENDED:

[1]. Norman E. Dowling, "*Mechanical Behavior of Materials: Engineering Methods for Deformation, Fracture, and Fatigue*," 3rd edition, *Pearson Prentice Hall,* 2007.

[2] Shigley J.E. , "*Mechanical Engineering Design*"McGraw Hill 2003.

[3] Mubeen A. , "*Machine Design* "Khanna Publications (P) Ltd

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO

Have the phenomenon of fatigue creep & fracture Mechanism inside the metallic bodies also the behavior of the material can be understand under these states.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**1 Year M.E.(Design &Thermal Engg.) Part Time**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTP2E3 Mechanism and Robot Kinematics	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Objective and Pre requisites: The objective of the subject is to introduce the students about the basic analytical techniques and fundamental principles of Robot Kinematics. The Pre requisites are knowledge of the basic course in theory of machines, matrix theory, probability, computer programming and mathematical analysis.

COURSE CONTENT

UNIT-1

Introduction to Robotics & Mechanisms

Introduction, Automation and Robotics, Robot anatomy and Robot configurations, Links and joints notations, End effectors, Work volume and Obstacles, Overview of Robot drive systems and Control systems, Robot sensing, Dynamic performance and Precision of movement, Applications in Robotics.

UNIT-2

Robot Arm Kinematics

Introduction, Forward or direct Kinematics Problem, Matrix Representations, Robot arm coordinates and Transformation matrix, Composite homogeneous transformation matrix, Denavit-Hartenberg representation, Kinematic equations, Location of end effector, Inverse kinematic problem, Geometric approach for solution of inverse kinematic problem.

UNIT-3

Trajectory Planning

Introduction, Constraints and Path specifications, Basic algorithm for generation of joint trajectory, joint interpolated trajectories, Cartesian path trajectory planning.

UNIT-4

Robot Arm Control.

Fundamentals of control system theory, Joint motion controls: Servo mechanism, Computed torque technique, Minimum time control, Variable structure control. Adaptive control modes.

UNIT-5

Robot Programming and Task Planning

Introduction, Characteristics of robotic programming languages, position and motion specification, development and debugging facilities, task-level programming and robot program synthesis, Robot intelligence and task planning.

BOOKS RECOMMENDED:

[1] Mikell P.Groover, *Industrial Robotics,* McGraw Hill Pvt. Ltd., New Delhi.
[2] K. S. Fu, R. C. Gonzalez, C. S.G. Lee, *Robotics: Control, Sensing, Vision and Intelligence,* McGraw Hill Book Company, Singapore, International Edition 1987.
[3] Robert J. Schilling, *Fundamentals of Robotics: Analysis & Control*, Prentice-Hall of India Private Limited, New Delhi, 5th Reprint, 2003

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO HAVE:

- Techniques and fundamental principles of Robot Kinematics
- Robot anatomy and Robot configurations, Links and joints notations, End effectors, Work volume and Obstacles
- Constraints and Path specifications, Basic algorithm for generation of joint trajectory

<table>
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PartTime</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTP2E4
Thermal Systems : Simulation and Design</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td></tr>
</table>

COURSE CONTENTS

Objective of the Subject:
The basic objective of the subject is to have goal of achieving a workable system and of designing an optimum system. The possibility of optimization represents one of the few facets of this subject.

Pre requsites: Thermodynamics, Heat & Mass Transfer.

UNIT- 1
Designing a Workable System and its Economics:
Steps in Arriving at a Workable System, Creativity in Concept Selection, Design of any Thermal Process Plant, Preliminaries to the Study of Optimization.

UNIT- 2
Dynamic Behaviour of Thermal Systems:
Dynamic Analysis, One Dynamic Element in a Steady State Simulation, Laplace Transformers, Inversion of Laplace Transforms, Feedback Control Loops, Time Constants Blocks, Cascaded Time Constant Blocks, Stability Analysis..

UNIT- 3
Modelling Thermal Equipment:
Using Physical Insight, Selecting vs Simulating a Heat Exchanger, Evaporators and Condensers, Condensation of a Binary Mixture, Overview of Search Methods, Assessment of Single Variable Searches.

UNIT-4
System Simulation:
Description of System Simulation Uses of Simulation, Information Flow Diagrams, Sequential and Simultaneous Calculations, Taylor Series Expansion, Newton Raphson Method with Multiple Equations.

UNIT- 5
Optimization:
Levels of Optimization, Mathematical Representation of Optimization Problems, Linear Programming, Setting up the Mathematical Statement, Calculus Methods of Optimization, Expansion of Lagrange Multiplier Equations, Unconstrained Optimization.

BOOKS RECOMMENDED

[1] Cengel YA.,*Heat Transfer-A Practical Approach*, Tata McGraw Hill, New Delhi 2e,2002.
[2] Stoecker, WF. *Design of Thermal Systems* ,McGraw Hill International Editions, New Delhi, 2007
[3] Woodson,TT. *Introduction to Engineering Design*, McGraw Hill, New York, 1996.
[4] Rudd, DF. *Strategy of Process Design*, McGraw Hill, New York, 1996

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Understand concept of Design of any Thermal Process Plant, Preliminaries to the Study of Optimization.
- Can Selecting vs Simulating a Heat Exchanger, Evaporators and Condensers, Condensation of a Binary Mixture, Overview of Search Methods
- Uses of Simulation, Information Flow Diagrams, Sequential and Simultaneous Calculations, Taylor Series Expansion

SEMESTER - 3

Devi Ahilya University, Indore, India Institute of Engineering & Technology				M.E.(Design & Thermal) Part Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTP3C1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
MACHINERY FAULT DIAGNOSIS & SIGNAL PROCESSING	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Objective & Pre requisites:

The basic objective of the subject is to deal with the analysis of faults generated inside the machine during the operations. The subject provides the basic knowledge of the methods used for the prevention of the faults and also the approach for analyzing the signals generated during the faulty condition of the machine. The Pre requisites are Tribology and Vibration.

UNIT- 1

Introduction to Diagnostic Maintenance and Condition Monitoring:

Introduction to condition based maintenance, applications and economic benefits, signature analysis-online & offline technique, various condition monitoring techniques, levels condition monitoring, fault detection and diagnosis.

UNIT- 2

Fault Diagnosis using Vibration Monitoring:

Vibration monitoring and analysis, shock pulse methods, noise monitoring, envelope detection technique, types of vibration test, field balancing, case studies on vibration based condition monitoring.

UNIT- 3

Noise Monitoring & Control:

Introduction to noise, properties of noise, loudness and weighting networks, octave and FFT analysis, impulsive noise, instrumentation for noise measurement and analysis, sound power, sound intensity, noise source location, noise diagnostics, noise monitoring of machines with example, cepstrum analysis, noise control methods, maintenance and noise reduction, vehicle and machinery noise, noise standards, case studies.

UNIT-4

Advanced Methods of Condition Monitoring:

Oil analysis including wear debris and contaminant monitoring, performance monitoring, non-destructive techniques, IR-Thermography, ultrasonic monitoring, reliability centred maintenance, higher order spectrum/advanced signal processing.

UNIT- 5

Computer Aided Monitoring:

Application and choice of the methods, computer aided monitoring including experts system like artificial neural network, fuzzy logic and other optimizing techniques, practical applications and case studies on computer based condition monitoring.

BOOKS RECOMMENDED

[1] Ramamurthy V.,*Mechanical Vibration Practice with Basic Theory* ,Narosa Publication House, New Delhi 1e,2002.

[2] Rao J S & Gupta K. *Introductory Course on Theory and Practice of Mechanical Vibration* ,New Age Publisher, New Delhi, 2e, 2002

[3] Rao J S, *Vibratory Condition Monitoring of Machine*, Narosa Publishing House, New Delhi, 1e,2002.

[4] Mishra R C & Pathak K., *Maintenance Engineering & Management*, Printice Hall of India, New Delhi, 1e , 2002.

[5] Gopalkrishnan P. & Banerji AB, *Maintenance & Spare Part Management*, Printice Hall of India, New Delhi, 3e,2002.

[6] Hand Book of Condition Monitoring by BKN Rao, UK.

LABORATORY EXPERIMENTS:

6. Case studies based on vibration based condition monitoring.
7. Experimental analysis of Noise based condition monitoring.
8. Experimental analysis of faults using IR-Thermography .
9. Experimental analysis of faults using Non- Destructive methods.
10. Case studies on computer aided fault diagnosis.

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO :

- Student will able to deal with the analysis of faults generated inside the machine during the operations. And will have knowledge of the methods used for the prevention of the faults and also the approach for

Devi Ahilya University, Indore, India Institute of Engineering & Technology				I Year M.E. (Design &Thermal Engg.) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTP3C2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Advanced Refrigeration and Air Conditioning	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: **3 Hours**							

Objectives & Prerequisites: Advancements in Refrigeration and Air Conditioning Technologies. Fundamentals of Thermodynamics, Heat transfer, Refrigeration cycles, Psychrometry

COURSE CONTENT

UNIT-1

Advanced Vapour Compression Technologies:

Single Stage System; Multistage Refrigeration: Two-stage with given Intermediate Pressure, Optimum Interstage Pressure, Cascade Refrigeration System; Liquefaction of Gases: Linde–Hampson Cycle: Precooled Linde–Hampson Cycle; Claude's Cycle; Energy and Exergy analyses.

UNIT-2

Advanced Vapour Absorption and other Technologies

Vapor Absorption Systems: Ammonia-Water, Three fluid, Water-Lithium bromide; Solar-Powered Absorption Refrigeration System, Multi Stage Absorption Systems, Energy and Exergy analyses of Vapour Absorption Systems.

UNIT-3

Load Estimation and Air Conditioning Systems

Psychrometry, Psychrometric Processes, Load Estimation, Air-conditioning Systems: Classification-All Air, Air and water, All water Systems; Decentralized Cooling and Heating; Individual systems; Evaporative; Dessicant; Thermal storage; Clean room; Space systems; Packaged; Central systems

UNIT-4

Fans and Duct Design

Fans: Classification, Performance Characteristics and selection; Flow basics: Continuity Equation, Bernoulli's Equation, Flow head loss; Ducts: Types, pressure characteristics, system pressure loss; Duct design: Equal-friction, Constant-velocity method, Static regain method

UNIT-5

Controls

Control Loop and Control Methods; Control Modes: Two-position, Step and Modulating, Floating, Proportional; Proportional plus Integral (PI), Proportional-Integral-Derivative (PID); Controllers: Direct / Reverse acting, Pneumatic, electric, digital; Valves and actuator; Dampers

BOOKS RECOMMENDED:

1. W.F. Stoecker, *Refrigeration and Air conditioning*, McGraw-Hill Book Company, 4e, 1985
2. Prasad M, *Refrigeration and Air conditioning*, New Age International, 2e, 2011
3. Arora C P *Refrigeration and Air conditioning*, McGraw-Hill Book Company, 1e, 1985
4. W.F. Stoecker, *Refrigeration and Air conditioning*, McGraw-Hill Book Company, 1e, 1985
5. Shan Wang, *Handbook of Air-Conditioning and. Refrigeration*, McGraw-Hill Book Company, 2e, 2000
6. McQuiston F C., Parker J.D. and Spitler J. D., *Heating, Ventilating, and Air-Conditioning Analysis and Design*, John Wiley& Sons, 6e, 2005

LABORATORY EXPERIMENTS:

1. To calculate actual and ideal Coefficient of Performance of vapour compression trainer.
2. To calculate actual and ideal Coefficient of Performance of vapour Absorption System
3. To carry out various psychrometric process in Air-conditioning trainer.
4. To estimate the Heating and cooling load of an enclosure
5. To design a duct network for a given plan

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO :

- Understand Cascade Refrigeration System; Liquefaction of Gases
- Understand Vapor Absorption Systems: Ammonia-Water, Three fluid, Water-Lithium bromide
- Understand Decentralized Cooling and Heating; Individual systems; Evaporative; Dessicant; Thermal storage;
- Understand Control Loop and Control Methods; Control Modes

Devi Ahilya University, Indore, India Institute of Engineering & Technology				I Year M.E.(Design& Thermal) (Full Time)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTP3G1	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Advanced Heat Transfer	**3**	**1**	**0**	**3**	**1**	**0**	**4**
Duration of Theory Paper: 3 Hours							

Objectives & Pre requisites:
Advancements in the topics on Heat Transfer Engineering. Fundamentals of Thermodynamics, Heat transfer at Undergraduate level

COURSE CONTENT

UNIT-1
Steady State Unidirectional Heat Conduction with Heat Generation:
Heat flow through slab with heat generation, Heat flow through cylinder with heat generation, Dielectric heating, Heat conduction with heat generation when generation is a function of position, Heat conduction with heat generation when generation is a function of temperature, Steady state two dimensional heat conduction, Purpose of Insulation, Critical Radius of Insulation.

UNIT-2
Unsteady State Unidirectional Heat Conduction:
Unsteady state heating or cooling, Unsteady state heat conduction through finite slab with negligible thermal resistance, Unsteady state heat conduction through finite slab with thermal resistance, Heisler charts, Periodic heat flow.

UNIT-3
Thermodynamic Analysis of Heat Exchangers:
Introduction, Temperature distribution and heat flow, Overall heat transfer coefficient, Fouling of Heat Exchangers, Effectiveness method (NTU) to study the performance of Heat Exchangers, Second Law analyses of Counter and Parallel flow type Heat Exchangers (Exergy Analysis), Finite Time Thermodynamic (FTT) analyses of Heat Exchangers.

UNIT-4
Advanced Convection Principles
Conservation principles; Differential and Integral Equations of momentum and Energy for Laminar and Turbulent Boundary Layers; Heat Transfer in Laminar Internal and External Flows: Axial Variations of Surface temperature and Heat flux; Heat Transfer in Turbulent internal and External Flows.

UNIT-5

Advanced Radiation

Review of fundamentals; View factors: Definition and Evaluation, Area Integration, Contour Integration, View factor algebra, Inside sphere method, unit sphere method, Radiative Heat exchange between gray diffuse surfaces; solution methods for governing integral methods, Partially specular gray and nonideal sufaces.

BOOKS RECOMMENDED:

1. Bergman T.L., Lavine A. S., Incropera F. P. and Dewitt D. P. , *Fundamentals of Heat And Mass Transfer,* John Wiley & Sons, 7e, 2011
2. Kreith F., Manglik R. M., and Bohn M. S., *Principles of Heat Transfer*, Cengage Learning, 7e 2011
3. Kays W., Crawford M., Weigand B., *Convective Heat and Mass Transfer,* McGraw-Hill Book Company, 4e, 2005
4. Modest M. F., *Radiative Heat Transfer,* McGraw-Hill, Inc. 1993
5. Bejan A, *Convective Heat Transfer*, McGraw-Hill Book Company, 4e, 2005

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Apply the concept of heat conduction with heat generation
- Basic understanding of Unsteady state heat conduction through finite slab with thermal resistance
- Learn the Effectiveness method (NTU) to study the performance of Heat Exchangers
- Learn Heat Transfer in Laminar Internal and External Flows

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="5">Credits</td></tr>
<tr><td rowspan="2">DTP3G2
RAPID
PROTOTYPING</td><td>L</td><td>T</td><td>P</td><td></td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td></td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Objective: To understand the basics of non-conventional prototyping processes.

COURSE OF CONTENT

UNIT-1

Basic operation, Role of Rapid Prototyping and tooling in product development and simultaneous engineering, Applications.

Rapid Prototyping Processes

Principles of RP processes, Classification, Laminated object manufacturing, Fused deposition modeling, Sterolithography, Solid ground curing, Selective laser sintering - 3D printing.

UNIT-2

CAD Requirements in RP

Introduction, Data requirements, Solid modeling, Surface modeling, Geometric processing, Interface formats, Model preparation, Slicing, Support structures and machine instructions

UNIT-3

Materials for Rapid Prototyping

Plastics, Resins, Metals, Ceramics, Selection of Materials for suitable processes, Advantages and limitations.

UNIT-4

Rapid Tooling Techniques

Rapid tooling techniques such as Silicone rubber molding, Epoxy molding, Electroforming, Vacuum casting, Vacuum forming, Laminated metallic tooling, Direct metal laser sintering.

UNIT -5

Rapid Manufacture

Introduction, Material and process controls for Rapid manufacture, Production economics, Implementation, Applications, automotive, aeronautical, space applications, additive manufacturing for construction industry, retail industry

Text Books

[1.] Pham, D.T., Dimov, S.S. (2001) Rapid Manufacturing, Springer-Verlag London Limited.

[2.] Neil Hopkinson, Richard Hague, Philip Dickens (Editors) Rapid Manufacturing: An Industrial Revolution for the Digital Age, Wiley Publication, 2005.
[3.] Rafiq I. Noorani, Rapid Prototyping: Principles and Applications, Wiley Publication, 2005.

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Learn Prototyping and tooling in product development and simultaneous engineering
- Learn modeling, Surface modeling, Geometric processing
- Learn Rapid tooling techniques such as Silicone rubber molding

Devi Ahilya University, Indore, India Institute of Engineering & Technology				M.E.(Design & Thermal) Part Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTP3G3 COGENERATION AND WASTE HEAT RECOVERY	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**-**	**3**	**1**	**-**	**4**
Duration of Theory Paper: 3 Hours							

COURSE CONTENT

Objective & Pre requisites:

The objective of the subject is to provide an understanding of energy conservation in various thermal engineering applications. The Pre requisites are Thermodynamics, Fluid Mechanics and Heat Transfer.

UNIT- 1

Energy Usage and Conservation

Energy: forms and Conversion; Patterns of energy use; potential for energy conservation; optimum use of energy resources; total energy approach.

UNIT- 2

Thermodynamic Cycles and Cogeneration

Review of Various Thermodynamic cycles; Coupled cycles; Systems approach to a thermal engineering application based plants; combined plants and cogeneration systems.

UNIT- 3

Energy Storage

Energy Storage Systems: thermal electrical, magnetic and chemical energy storage systems, Need for energy storage; Utilization of industrial waste heat: gas-to-gas, gas-to-liquid and liquid-to-liquid heat recovery systems.

UNIT-4

Waste Heat Recovery

Heat Recovery systems; Recuperators and regenerators; heat pipes; waste heat boilers; fluidized bed heat recovery; shell and tube heat exchangers

UNIT- 5

Heat Recovery Sources

Sources of heat recovery; Prime mover exhausts; incineration plants; heat pump systems; thermoelectric devices. Utilization of low grade rejected heat from power plants.

BOOKS RECOMMENDED

[1] Reay, D. A., *Heat Recovery Systems*, London, 1979.
[2] Boyce, M, P,. *Handbook for Cogeneration and Combined Cycle Power Plants,* ASME 2002
[3] Fin David, Cogeneration: A Users Guide, IET
[4] Daiment, *Energy Systems*, Longman, UK

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Potential for energy conservation; optimum use of energy resources;
- Coupled cycles; Systems approach to a thermal engineering application based plants
- Utilization of industrial waste heat: gas-to-gas, gas-to-liquid and liquid-to-liquid heat recovery systems.
- Heat Recovery systems;

SEMESTER - 4

Devi Ahilya University, Indore, India Institute of Engineering & Technology				1 Year M.E. (Design & Thermal Engg.) Part Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTP4C3 **Computer Aided Modeling and Simulation**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: *3 Hours*							

Objectives:
To understand the basic analytical fundamentals that are used to create and manipulate geometric models in a computer program.
To model complex shapes including freeform curves and surfaces.
To understand various graphics standard for CAD data exchange (such as IGES, PARA etc).
To understand the application of Computers in Analysis and Design of Machine Elements.
Prerequisite:

COURSE CONTENT

UNIT - 1
INTRODUCTION
Fundamentals of CAD: Introduction: Design Process: Application of computers in design: Benefits of CAD. Computer Hardware: Graphic input devices; display devices; Graphic output devices; Central processing unit (CPU), Workstations.

UNIT- 2
COMPUTER GRAPHICS
CAD software and Database: Software configuration of a graphics system, Output primitives frame buffer – Bresenham’s Algorithm – Line – Circle – function of graphics software - 2D & 3D transformation – Translation – scaling – Rotation – Homogeneous coordinate – Concatenation, clipping algorithm.

UNIT - 3
TECHNIQUES FOR GEOMETRIC MODELING
Geometric Modelling: Curves And Surfaces- Representation, Wire Frame models, Intrinsic and parametric representations, analytic and parametric curves and surfaces, Manipulations of curves and surfaces.

UNIT- 4
TECHNIQUES FOR GEOMETRIC MODELING AND DATA EXCHANGE STANDARDS
Geometric Modeling: Solids- Solid models, Fundamentals of Solid Modeling, Half -spaces,

Boundary Representation (B-rep), Constructive Solid Geometry (CSG), Sweep Representation, Analytic Solid Modeling, Solid Manipulations.
Graphics standards – GKS, Data exchanger standards – IGES – STEP - DXF – Concept of data storage for solid models.

UNIT - 5
VISUAL REALISM
Introduction, Model Clean-up, Hidden Line Removal, Hidden Surface Removal, Hidden Solid Removal, Shading, Coloring and User Interface for Shading and Coloring, Introduction to CAD Modeling Systems. Tolerance and Interference Analysis

Text Book:

[1.] Zeid Ibrahim and R Sivasubramanian, *CAD / CAM Theory and Practice*, 2nd Edition, 3rd Reprint, 2010, Tata McGraw Hill Education Private Limited, New Delhi.
[2.] P N Rao, CAD/CAM Principles and Applications, 3rd Edition, 4th Reprint, 2011, Tata McGraw Hill Education Private Limited, New Delhi.
[3.] M Groover and E Zimmers, CAD/CAM Computer Aided Design and Manufacturing, 10th Impression, Pearson Education.
[4.] Krishnamoorathy C.S. and J.S. Rajeev, *Computer Aided Design* (Software and Analysis Tools), Narosa Pub House, New Delhi

List of Practicals:
1. To draw the basic geometrical shapes such as line, triangle, rectangle etc using programming language Autolisp/C++/etc.
2. To perform the various geometrical transformations on the geometrical shapes drawn in practical 1 using programming language Autolisp/C++/etc.
3. To model the simple machine elements like gear, shaft, pulleys, cams etc parametrically using CAD/CAM software.
4. To obtain the 2d drawings from the 3d object created in practical 3.
5. To create the assembly of machine elements using CAD/CAM software.
6. To perform the finite element analysis of machine elements using CAD/CAM Software.

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Understand the basic analytical fundamentals that are used to create and manipulate geometric models in a computer program.
- Can model complex shapes including freeform curves and surfaces.
- Understand various graphics standard for CAD data exchange (such as IGES, PARA etc).
- Understand the application of Computers in Analysis and Design of Machine Elements.

<table>
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>DTP4E1</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>MACHINE VIBRATIONS ANALYSIS</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td></tr>
</table>

Objective of the subject: The objective of the subject is to deal with machine vibration analysis techniques and advanced areas of vibrations of machine elements based on Undamped and Damped Free Vibrations for single degree of freedom systems, Multi-degree of Freedom and Continuous Systems . Pre requisites are Theory of vibrations , Machine Design I and Machine Design II.

COURSE CONTENTS

UNIT-1
Review: Fundamentals of Vibration
Main causes, Advantages and Disadvantages. Vector method of representing Harmonic motion. Characteristics of vibration. Harmonic analysis. Beats Phenomenon. Work done by harmonic forces on harmonic motion. Periodic, non-harmonic functions: Fourier Series analysis, Evaluation of coefficients of Fourier series. Elements of vibratory system. Lumped and distributed parameter systems.

UNIT -2
Systems with single and two Degrees of Freedom
Forced harmonic vibration: vector representation of forces. Excitation due to Rotating and Reciprocating unbalance. Vibration isolation, Force transmissibility. Motion transmissibility: absolute motion of mass and relative motion of mass.

Undamped free vibrations and Principal Modes of vibration. Torsional vibrations. Forced Undamped vibrations with harmonic excitation.

UNIT -3
Systems with Multi-degree of Freedom and Continuous Systems.
Equations of motion.The Matrix method : Eigen values and eigen vectors. Vibration of Strings. Longitudinal vibrations of bars. Torsional vibrations of Circular Members. Transverse Vibrations of Beams.

UNIT -4
Determination of Natural Frequencies
Approximate methods of determining fundamental frequencies: Dunkerleys lower bound approximation and Rayleighs Method. Stodolas Method. The Holzers Method. The Method of Matrix Iteration, Envelop Analysis.

UNIT -5

Numerical Integration methods in Vibration Analysis

Introduction, Finite Difference Method, Runge-Kutta Method for single degrees of freedom systems, Houbolt method ,Finite Difference method for continuous systems.

BOOKS RECOMMENDED: Reference books:

[1] Thomson W.T., *Theory of Vibration with Applications*, CBS Pub. And Distributors.

[2] Morse T., and Hinkle, *Mechanical Vibration*, Prentice Hall of India Pvt. Ltd.

[3] Singiresu S. Rao, *Mechanical Vibrations*, Pearson Education.,2005

[4] Ambekar A. G., *Mechanical Vibrations and Noise Engineering* , Prentice Hall of India Pvt. Ltd.,2006

[5] G. K. Grover, *Mechanical Vibrations*, Nem Chand and Bros., Roorkee.

LABORATORY EXPERIMENTS:

11. Performance Analysis of single degree of systems.
12. Performance Analysis of two degree of systems.
13. Performance Analysis of multi degree of systems.
14. Study of vibration signature analysis methods
15. Study of vibration measuring instruments

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Learn various Fourier series analysis, Evaluation of coefficients of Fourier series. Elements of vibratory system. Lumped and distributed parameter systems.

- Understand the concept of undammed free vibrations and Principal Modes of vibration. Torsional vibrations

Devi Ahilya University, Indore, India Institute of Engineering & Technology				M.E.(Design & Thermal) Part Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTP4E2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
EXPERIMENTAL STRESS ANALYSIS	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Objective & Pre requisites:

The basic objective of the subject is to deal fundamentals of stress analysis techniques. The subject is useful in understanding the behavior of material under the load and distribution of stress inside the material. The Pre requisites are material science, machine design and measurement and control.

UNIT- 1

Introduction:

Introduction to theory of elasticity. General principles governing the approach to experimental stress analysis technique. Principal of measurements. Accuracy, Sensitivity and range of measurement.

UNIT- 2

Polariscope & Extensometer:

Plain polariscope, circular polariscope, white light illumination, analysis of photo elastic data, Moira Method, Mechanism of formation of Moira fringe-geometrical approach to Moire fringe analysis-displacement field approach to Moiré fringe analysis., Mechanical , Optical , Acoustical and Electrical extensometer and their uses, advantages and disadvantages.

UNIT- 3

Electrical Resistance Strain Gauge:

Principal of operation and requirement, types and their uses, Material of strain gauge, Calibration and temperature compensation, cross sensitivity, Rosette analysis, Wheatstone bridge and potentiometer circuits for static and dynamic strain measurements, strain indicators, strain gauge adhesive and mounting methods.

UNIT-4

Photo elasticity:

Two dimensional photo elasticity. Concepts of light-photo-elastic effects, stress optic law, Interpretation of fringe pattern, compensation and separation technique, photo elastic material, Introduction to three dimensional photo elasticity, digital photo elasticity, Effects of stressed model in a plane polar scope.

UNIT- 5

Non Destructive Testing:

Fundamentals of NDT, Radiography, Ultrasonic, Magnetic particle inspection, Fluorescent penetrate technique, Eddy current testing, Acoustic Emission Technique, Fundamentals of brittle coating methods, Holography, Ultrasonic, C-Scan, Thermography, Fibre optic Sensors.

BOOKS RECOMMENDED

[1] Dally J.W. and Riley, W.F. "*Experimental Stress Anaysis*" Mc Graw Hill Inc., New York, 1978

[2] Hetyenyi M " *Hand Book of Experimental Stress Analysis*" John Wiley and Sons Inc. New York, 1972.

[3] Srinath L.S., Raghava M.R.,Lingaiah, K.Gargesha G, Pant B, Ramchendra K., " *Experimental Stress Analysis*" Tata Mc Graw Hill, New Delhi., 1984

[4] Singh S. "*Experimental Stress Analysis*" Khanna Publication, 2001.

[5] Mubeen., Machin*e Design*, , Khanna Publications(P) Ltd.,2004.

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Learn the concept of Principal of measurements. Accuracy, Sensitivity and range of measurement.
- Learn the concept of temperature compensation, cross sensitivity, Rosette analysis
- Apply Material of strain gauge, Calibration and temperature compensation, cross sensitivity concept
- Learn the concept of three dimensional photo elasticity, digital photo elasticity, Effects of stressed model in a plane polariscope.

<table>
<tr><td colspan="3">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">M.E.(Design & Thermal)
Part Time</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">DTP4E3
APPLIED ELASTICITY AND PLASTICITY</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">2</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td></td></tr>
</table>

Objective of the subject:
With this subject, the students get knowledge of the various Mechanical engineering materials property as well as behavior of material under Elastic & Plastic zone with different plane of surface.

Prerequisite(s): Strength of Material, Material Science.

COURSE CONTENTS

UNIT - 1
Elasticity
Analysis of stress and strain relationship – Generalized Hook's law, Plane stress and plane strain problems, The state of strain at a point, Basic equations of elasticity, Methods of solution of elasticity problems.

UNIT- 2
Two-Dimensional Problems in Cartesian Co-Ordinates
Two dimensional problems in Cartesian and polar co-ordinates for simple problems, Airy's stress function, Bi harmonic equation, Saint Venant's Principle, Thick cylinder, Bending of curve bars , Simply supported rectangular beam under a triangular load, Fourier series, Complex potentials, Cauchy integral method , Fourier Transform Method, Real potential methods.

UNIT-3
Torsion of Non Circular Section
Methods of analysis, Membrane analogy, Torsion of thin rectangular section and hollow thin walled section, St. Venant's theory, Torsion of hollow cross-sections, Torsion of thin – walled tubes, Torsion of hollow bars, Analogous methods, Torsion of bars of variable diameter.

UNIT-4
Numerical and Energy Methods
Principle of Virtual Work-Energy theorem, Rayleigh Ritz method, Deflection of beams problems, Finite difference method, Rayleigh's method, Finite element method.

UNIT-5

Plasticity

Physical assumption , Mechanical models, Kelvin and Maxwell model, Viscous elasticity, Friction and Coulomb models, Parallel and Hybrid models, Applications, Criterion of Yielding, Yield surface, Flow rule, Elastic – Plastic problem in bending, Torsion and Thick cylinders, Introduction to Fracture mechanics, Wave propagation in plastic materials. Theory and application of slip line field, Bound theorem, Plastic anisotropic large deformation.

BOOKS RECOMMENDED:

[1] Timoshenko S., *Theory of Elasticity*, Mc Graw Hill Book Co., Newyork1988.

[2]. Singh S, *Theory of Elasticity*, Khanna Publishers, New Delhi.1988.

[3] Singh S., *Theory of Plasticity,* Khanna Publishers, New Delhi.1988.

[4] Chakrabarty J., *"Applied Plasticity",* Springer New Yark, 1st ed. 2000.

[5] Hoffman, *"Theory of Plasticity",* Mc Graw Hill, 2nd ed. 1985.

[6] Johnson, *"Engineering plasticity",* Van Nostrand, 1st ed. 1983.

COURSE OUTCOMES:

AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Perform Analysis of stress and strain relationship
- Saint Venant's Principle, Thick cylinder, Bending of curve bars , Simply supported rectangular beam under a triangular load, Fourier series, Complex potentials,
- Apply Torsion of thin – walled tubes, Torsion of hollow bars, Analogous methods, Torsion of bars of variable diameter.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				M.E.(Design & Thermal) Part Time			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
DTP4E4 **AUTOMOTIVE SYSTEM ANALYSIS & DESIGN**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Objective: The objective is to understand the principles and working of different systems of Automobiles & design principal & its applications.

Pre requisites: Machine Design and Strength of Material**.**

COURSE CONTENT

UNIT-1

Design for Tool Drive

Design of machine tools, machine tools motions, transmission-rotation in to rotation, rotation in to translation, kinematic-structures of machine tools: elementary, complex and compound structure elementary, complex and compound structure, kinematic-features of gear shapers and gear hobbing machine.

UNIT-2

Transmission System

Requirements Clutches, Toque converters, Over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle, wheel camber, Steering geometry, Ackerman mechanism.

UNIT-3

Electrical and Control Systems

Types of storage battery, Construction and operation of lead acid battery, Testing of battery, Principle & operation of starting mechanism, Electric fuel gauge, Fuel pump, Horn, Wiper, Lighting system, Head light dazzling, Signaling devices and circuit, Battery operated vehicles. Microprocessor based control system for automobiles, Car air conditioning systems and components, Indian standards for automotive vehicles exhaust emission Bharat and Euro norms, Indian Motor vehicle act- preliminary information.

UNIT-4

Chassis and Body Engineering

Chassis classification, Types of frames, Vehicle body types & construction, Body materials, Driver’s visibility and methods for improvement, Safety aspects of vehicles, Location of engine, Front wheel and rear wheel drive, Performance of Vehicle.

UNIT-5

Suspension System

Vehicle Dynamics and requirement of suspension , Suspension types & construction, Shock absorber, Types of leaf springs coil spring, Air spring, Torsion bar, Location of shackles, Brakes-classification & construction, Mechanical, Hydraulic & Pneumatic power brake systems, Air-bleeding of Hydraulic brakes, ABS, Performance- Braking efforts, Efficiency, Stopping Distance & time, tendency of over turning.

BOOKS RECOMMENDED:

[1] Singh Kirpal, Automobile Engineering, Vol.1, Standard Pub, 9e.
[2] Giri N.K., Automotive Technology, Khanna Pub, 4e 2009.
[3] Newton & Steeds, Automobile Engineering, Butterworth Int.
[4] Heitner Joseph, Automotive Mechanics, Principles and Practices, East-West Pub.
[5] Crouse W.H., Automotive series Part-I to VI, Tata McGrawhill, 9e.

COURSE OUTCOMES:
AFTER THE COMPLETION OF COURSE STUDENT WILL BE ABLE TO:

- Can apply kinematic-structures of machine tools: elementary, complex and compound structure elementary,
- Learn the concept of Gear Mechanism of Rear Axle. Automatic transmission

M.E Mechanical Engineering (Industrial Engineering & Management)
(Part Time)
Proposed Scheme for CBCS

SEM I				
S.NO	**Sub Code**	**Sub Name**	**Number of Credit**	**Sub Type**
1.	IMP1C1	Productivity & Technology Management	3-1-1	PC1
2.	IMP1C2	Quantitative Techniques for Management	3-1-1	PC2
3.	IMP1Gx	**Generic Elective I**	3-1-0	GE1
4.	IMP1V1	Comprehensive Viva I	0-0-2	
Total Credit for SEM I			**14 actual + 2 Virtual credits**	
SEM II				
1.	IMP2C3	Production & Operations Management	3-1-1	PC3
2.	IMP2Ex	**Elective I**	3-1-1	PE1
3.	IMP2W1	Seminar/ Res. Tool/Work Shop-1	0-2-0	
4	IMP2V2	Comprehensive Viva II	0-0-2	
5.	ASP2S1	Soft Skills -1	2-0-0	
Total Credit for SEM II			**14 actual + 2 Virtual credits**	
List of Generic Elective I				
1.	IMP1G1	Principles & Practices of Management	3-1-0	GE1
2.	IMP1G2	Human Resource management	3-1-0	GE1
3.	IMP1G3	e –Business & Commerce	3-1-0	GE1
List of Elective I				
1.	IMP2E1	Statistical Quality Control and Total Quality management	3-1-1	PE1
2.	IMP2E2	Strategic Management	3-1-1	PE1
3.	IMP2E3	Business Process Reengineering	3-1-1	PE1
SEM III				
1.	IMP3C1	Financial Management	3-1-1	PC4
2.	IMP3C2	Materials Management	3-1-1	PC5
3.	IMP3Gx	**Generic Elective II**	3-1-0	GE2
4.	IMP3V3	Comprehensive Viva III	0-0-2	
Total Credit for SEM III			**14 actual + 2 Virtual credits**	
SEM IV				
1.	IMP4C3	Supply Chain Management	3-1-1	PC6
2.	IMP4Ex	**Elective II**	3-1-1	PE2
3.	IMP4W2	Seminar/ Res. Tool/Work Shop-2	0-2-0	
4.	ASP4S2	Soft Skills -2	2-0-0	
5.	IMP4V4	Comprehensive Viva IV	0-0-2	
Total Credit for SEM IV			**14 actual + 2 Virtual credits**	
List of Generic Elective II				
1.	IMP3G1	Project Management	3-1-0	GE2
2.	IMP3G2	Enterprise Resource Planning	3-1-0	GE2
List of Elective II				
1.	IMP4E1	Marketing Management	3-1-1	PE2
2.	IMP4E2	Product Design And Manufacturing	3-1-1	PE2

3.	IMP4E3	IMP3G2 Relationship Management	3-1-1	PE2
4.	IMP4E4	Industrial Marketing	3-1-1	PE2
SEM V				
1	IMP5D1	Dissertation Phase I	0-0-12	
2	IMP5V5	Comprehensive Viva V	0-0-4	
Total Credit for SEM V			**12 actual + 4 Virtual credits**	
SEM VI				
1	IMP6D2	Dissertation Phase II	0-0-12	
2	IMP6V6	Comprehensive Viva VI	0-0-4	
Total Credit for SEM VI			**12 actual + 4 Virtual credits**	
Total Credits			**80 actual + 16 Virtual credits**	

Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**I Year M.E.** **(Industrial Engineering and management)** **Part Time**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
IMP1C1 **PRODUCTIVITY AND TECHNOLOGY MANAGEMENT.**	**L**	**T**	**P**	**L**	**T**	**P**	**TOTAL**
	3	**1**	**1**	**3**	**1**	**1**	**5**
Duration of Theory Paper: **3 Hours**							

Objectives & Pre requisites:

- To impart the basics of Productivity Concepts, to refine the skills of Workplace design through Work Study, Job Evaluation, etc. To develop the skills of Technology management through different technology transfer.

COURSE CONTENTS

UNIT-1
Productivity:
Productivity, Introduction, types of productivity, methods to improve productivity. Introduction to work study, method study, definition, importance, selection, recording, different recording techniques, principal of motion economy.

UNIT-2
Work Measurement:
Introduction to work measurement, time study, Steps in time study. Various techniques to measure time, slandered time, normal time, observed time. Allowances, measurement & significance. Work sampling, introduction & importance

UNIT-3
Job Evaluation:
Job evaluation and merit rating, introduction to job evaluation, various method of job evaluation, importance of job evaluation.

UNIT-4
Technology Management:
Introduction to technology, technology management, importance of technology management, know how of technology, know why of technology, dimensions of technology management Technology life cycle, syndication diffusion.

UNIT-5
Technology Transfer
Technology forecasting, introduction, importance, absorption & adoption, generation of technology, method of technology transfer, technology transfer modes, technology diffusion,

importance. Technology requirement for India, strategies for the companies in the changing environment. Case studies.

Course outcomes

After completing the course the student will able to:

- Can perform analysis of Different productivity Measures related to specific industries.
- Having the practical approach towards analysis of different Recoding techniques for a given process.
- Can make Estimation of Standard Time for a given Job, Process and its comparison with relevant industry data.
- Go in to deep and can make analysis of Job Evaluation process and its comparison with related industry.
- Having knowledge of technology transfer process with special cases of industries or service organization.
- Learn about various Forecasting methods and their applications in Indian context.
- Case studies.

BOOKS RECOMMENDED:

[1]. Dhawan, *Productivity and Technology Management.*2002
[2]. I.L.O, *Work Study.* 2004
[3]. Branes K.M, *Time & Motion Study.*
[4]. Farland Mc, *Management –Principal and Practice.* .Dec 1990
[5]. Dr. Sushil, *Technology Management.* New Delhi Vikas, 2001

LABORATORY EXPERIMENTS:

1. Study and analysis of Differrent produtivity Measures relted to specific industries.
2. Study and analysis of different Recoding techniques for a given pocess.
3. Estimation of Standard Time for a given Job, Process and its comparison with relevent industry data.
4. Study and Analysis of Job Evaluation process and its compraison with related industry.
5. Study of Technology Transfer process with special cases of indusries or service organisation.
6. Study of Technology Forescating methods and their applications in Indian context.
7. Case studies.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">I Year M.E.
(Industrial Engineering and management)
Part Time</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMP1C2
QUANTITATIVE TECHNIQUES FOR MANAGEMENT.</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td colspan="4"></td></tr>
</table>

Objectives & Pre requisites:

- To develop the skills of decision making in dynamic business situations through quantitative analysis using different mathematical models like linear programming, Transportation, Assignment, Queuing etc. Strategies formulation with the help of game theory and simulation etc.

COURSE CONTENTS

UNIT-1
Introduction:
History and development of O.R Present Trend.
Linear Programming:
Formulation, graphical methods, simplex method, Big- M- method, two phase method, degeneracy unrestricted variables. Quality in L p. revised simplex, duality, sensitivity analysis.

UNIT-2
I **Assignment Models:** Formulation, Balanced and Unbalanced problems. **II Transportation:** Formulation, graphical methods
III Introduction to Integer Programming.

UNIT-3
Waiting Line Models:
Introduction, classification, state in queue, probability distribution of arrival and service times. Single server model (M/M/I). Multiple server model (MMS). Birth & death process.

UNIT-4
Game Theory & Simulation:
Rectangular, two persons, zero sum games, maximin and minimax Principles. Saddle point. Dominic. graphical and algebraic method of solution by transforming into linear programming problem. Bidding problem. Building a simulation model, Monte-Carlo simulation and application.

UNIT-5
Dynamic Programming: Introduction, developing optimal decision policy.
Replacement and Maintenance Models: Introduction, Individual replacement and group replacement policy.

Course outcomes

After completing the course the student will able to

- Having knowledge of decision making in dynamic business situations through quantitative analysis using different mathematical models like linear programming, Transportation, Assignment, Queuing etc. Strategies formulation with the help of game theory and simulation etc.
- Learn the process of development formulation and analysis of Linear Programming Problem for given decision making situations.
- Development and Analysis of Transportation and Assignment models.
- Learn the Development, Formulation and Analysis of Inventory problem for a given system.
- Able to model Queuing situations at a given service problems.
- Perform various Simulations exercise relating various operations research problems.

BOOKS RECOMMENDED:

[1]. Taha, *Operations Research*, Tata Mc.Graw Hill.
[2]. Wagner, *Operations Research*, PHI. New Delhi, 2003
[3]. Ravindram & Philips, *Operations Research*, Tata Mc.Graw Hill.
[4]. Gupta & Hira, *Operations Research*, S. Chand. 1e, 2008
[5]. Chitle & Negi, *Operations Research*, Jain Brothers.
[6]. Vohra N.D, Kataria S.K, *Quantitative Techniques for Management*. Tata Mc.Graw Hill, 2004.

LABORATORY EXPERIMENTS:

1. Development, Formulation and Analysis of Linear Programming Problem for given decision making situations.
2. Development and Analysis of Transportation and Assignment models.
3. Development, Formulation and Analysis of Inventory problem for a given system.
4. Study and modeling of Queuing situations at a given service problems.
5. Simulations exercise relating various operations research problems.
6. Development & solution of dynamic programming models.
7. Formulation and solution of various replacement models.
8. Case studies based on Operations Research Problems.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">I Year M.E.
(Industrial Engineering and management)
Part Time</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMP1G1
PRINCIPLES & PRACTICES OF MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td colspan="4"></td></tr>
</table>

Objectives & Pre requisites:

- To impart the basics of Management Concepts, Evolution of management as discipline and to deal with different Management Functions.

COURSE CONTENTS

UNIT-1
The Nature of Management:
Definition and role of management, the function of a manager, scientific management. Various schools of management thought.

UNIT-2
Planning:
Nature and purpose of planning, components of planning objective of business, forecasting, decision making, policy formulation and strategies. Management by objectives.

UNIT-3
Organization:
Nature and purpose of organizing structure, centralization, decentralization, span of control, delegation of authority relationship. Shaping the overall structure, formal and informal organization.

UNIT-4
Directions & Staffing:
Direction process, theories of motivation and leadership, need analysis, communication. Role and function of personal management, manpower planning, selection and recruitment, interviewing, training methods, welfare techniques.

UNIT-5
Control:
Meaning and process of control techniques of control evaluation, developing and compensating the employees, merit rating. Comparison of American, Japanese and Indian philosophies of management.

Course outcomes

After completing the course the student will able to:

- Learn various Scientific management process
- Learn various schools of management thought.

Get a deep knowledge of training methods, manpower planning, selection and recruitment, interviewing, welfare techniques

BOOKS RECOMMENDED:

[1]. Koontz and O'Donnell, Essentials of Management .Mc.Graw-Hill, Jan 1986.
[2]. Terry G.R, Principals of Management.
[3]. Peter Drucker, Practice of Management. 1992.
[4]. Farland Mc, Management, Principal and Practice.
[5]. Prasad L.M, Principal and Practice & Mgt.Sulatan Chand & Sons.
[6]. Chhabra T.N, Principal and Practice & Mgt.
[7]. Agrawal R.D, Organization & Management. McGraw-Hill New Delhi, 1997.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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(Industrial Engineering and management)
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMP1G2
HUMAN RESOURCE MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td colspan="4"></td></tr>
</table>

Objective and Pre requisites:

- The objective of this course is to help the students develop an understanding of the dimensions of the management of human resources, with particular reference to HRM policies and practices at international level.

COURSE CONTENTS

UNIT-1

HRM Concept

Definition, Concept, Evaluation and Relevance of HRM. Human Resource Functions, HRM in Indian and Global Scenario. Human Resource Policies.

UNIT-2

Human Resource Acquisition Process

Job Analysis - Job Specification, Job Analysis Methods, Human Resource Planning Concept and Process of HRD, HRP Process at National and Corporate Level, Human Resource Information System. Steps of HRIS, Recruitment, Sources of recruitment, Selection, Stages in selection process. Global Scenario in HR Acquisition

UNIT-3

Human Resource Training and Development.

Orientation, Training and Development Process and Methods, Need Assessment, Training Evaluation, Approaches and Types of Evaluation Instruments, Developing Effective Training Programmes, HRD mechanism, HRD for Organizational Effectiveness

UNIT-4

Appraising and Improving Performance

Basic Concepts Objectives and Process of Performance Appraisal Systems, Performance verses Potential Appraisal, Types of Employee Appraisal Systems, New Trends in Performance Appraisal Systems at Global level, Succession Planning, Career Planning and Assessment Centers.

UNIT-5

Maintenance of Human Resources:

Job Evaluation, Incentive and Reward System, Objectives and Major Phases of Compensation Management, Cross-national variation in reward structures. Knowledge & knowledge transfer, knowledge and situation cognition, Implications for knowledge transfer, knowledge management in multinational companies, knowledge management & International HRM.

Learning outcomes:

- Contribute to the development, implementation, and evaluation of employee recruitment, selection, and retention plans and processes.
- Administer and contribute to the design and evaluation of the performance management program.
- Develop, implement, and evaluate employee orientation, training, and development programs.

BOOKS RECOMMENDED:

[1] Bohlander, Human Resource Management,14 th edition Cengage Learning, India,2009

[2] Dessler, Verckey, Human Resource Management, Pearson Education,2009.

[3] Monir H. Tayeb, International Human Resource Management, Oxford, 2009.

[4] Patnaik, Human Resource Management,3 rd edition,PHI,2009.

[5] Subba Rao, Essential of HRM and Industrial Relation, Himalaya Pub. House. 2008,

[6] Subba Rao,International Human Resource Management,Himalaya Publishing House., 2009.

[7].Jeffery Mello, Human Resource Management, Cengage Learning, India, 2008.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMP1G3
E-BUSINESS&
COMMERCE</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Duration of Theory Paper:
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COURSE CONTENTS

Learning Objective

- This course is aimed at providing the student with an in-depth understanding of the still emerging field of E-Commerce. By the end of the course, the student will be able to understand the various elements that are fundamental for a successful E-Commerce enterprise and develop a business plan for developing one such E-Commerce site. Topics covered include:

UNIT I

Introduction

Fundamentals in E-Commence – Meaning, Nature, Limitation, E – Commerce – Origin, Nature, Meaning, Definitions, Features, Need , Advantages & Disadvantages, Essential requirements, e – Commerce Vs Traditional Commerce.

UNIT II

Business Models for e Commerce

e-Business: Meaning, Definition, Importance, e Business models based on the Relationships of transaction parties, B2C, B2B, C2C, C2B. e Business models based on the relationship of transaction types – Manufacture Model, Advertising Model, Value Chain Model, Brokerage Model.

UNIT III

E –Payment Systems:

Modes of e Payment – Credit Cards, Debit Cards, Smart Cards, e Credit Accounts, e Money/Cash, Digital Signatures – Legal Positions of Digital Signatures, How Digital Signature Technology Works, Risks & e Payment system : Data protection, risk from mistakes & disputes – Consumer protection, Management Information Privacy, Managing Credit Risk.

UNIT IV

E-Business Communication

Introduction, Importance of e Technology in e Business Communication, Modes of e-Business communication, e- Business Communication, e – Business Conferencing – Audio, Document Telephone, Video Conferencing – Types Email in e Commence, Mobile Communication. E – Banking Introduction concept & meaning, Electronic Fund Transfer – Automated Clearing house, Automated ledger posting, Electronic Money transfer e- Cheque, ATM, FOS, Tele banking.

UNIT – 5

E- Security & E- Markets

Introduction, Need for Security, Security concepts, attacking methods – Cyber crimes, Cryptology, Hacker, encryption. E-commerce security solutions – E – Locking Techniques, e-Locking product, e-Locking services, Net Scape security solution E-Markets: On line shopping – On Line purchasing –Electronic Market –Three models of e-Markets, e-Advertising e- Branding.

Course outcomes

After completing the course the student will able to:

- Learn about e – Commerce Vs Traditional Commerce
- Learn about Manufacture Model, Advertising Model, Value Chain Model, and Brokerage Model.
- Learn the practical implementation of Advertising Model, Value Chain Model, and Brokerage Model.
- Learn the features and practical implementation of e- Business Communication, e – Business Conferencing – Audio, Document Telephone,

BOOKS RECOMMENDED:

[1]Murthy C.S.V., e Commerce–Concepts Models Strategies Himalaya Publishing House 3e, 2005.

[2]Basics of e Commerce-Legal & Security issues ISBN 81-203-2432-3.

[3]Joseph P.T., e Commerce : An Indian Perspective, 2nd Ed., SJ, 2006.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMP2C3
PRODUCTION&
OPERATIONS
MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
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</table>

- To inbuilt the foundation of differents stratregis like Aggregate planning, Plant location decisions, capacity planning. To ensure the development of skills required for new product development their production planning & control.

COURSE CONTENTS

UNIT-1
Introduction:
Overview of operation management, nature & content of operation management, various schools of management thought, framework for managing operations strategy & competitiveness, strategic planning for production & operations.

UNIT-2
Product Design:
Product / service and process design, product development, morphology of design process , product life cycle concept need identification, conceptual design , creative design concepts , feasibility study, Preliminary design , detailed design , design for customer, for manufacturer and assembly , types of processes, process planning and selection process flow structure , product / process matrix , technologies in manufacturing , FMS and CIM.

UNIT-3
Operation Capacity Planning:
Operation capacity planning , design and system capacity , capacity planning models , economic analysis capital budgeting and analysis , capital investment evaluation techniques, facility location and layout, foreign locations , factory affecting location decisions , models , analysis and selection of layouts , cellular manufacturing layouts.

UNIT-4
Production Planning & Control:
Functions of production planning and control, forecasting, qualities and quantitative models for forecasting, accuracy of forecasting and selection of forecasting

technique, aggregate planning, master production scheduling and MRP, operations scheduling, loading sequencing detailed scheduling and expediting, forward and backward scheduling, optimized production technology (OPT).

UNIT-5

Modern operations Techniques:

Overview of synchronous manufacturing and theory of constraints, introduction to Japanese contribution for WCM overview, JIT purchasing, KANBAN, KAIZEN concepts, modern trends in operations management, introduction to learn and agile manufacturing**.**

Course outcomes

After completing the course the student will able to:

- Analysis of Production planning & Control situations in industry.
- Understand and make analysis of various Forecasting Models.
- Learn about Aggregate Planning Models.
- Can make a practical approach towards material requirement planning for the given data.

LABORATORY EXPERIMENTS:

1. Study and analysis of Production planing & Control situations in industry.
2. Study and analysis of variuous Forecasting Models.
3. Developmentr and analysis of Aggregate Planning Maodels.
4. Development and Analysis of matertrial requirement planning for the given data.
5. Study and analysis of prodution Sheduling.
6. Case studies related to proudction & Operations Management(manufacturing Sector).
7. Case studies related to proudction & Operations Management(Service Sector).

BOOKS RECOMMENDED:

[1]. Chase, Aquiline & Jacobs, *Production & Operations management.* Tata Mc.Graw Hill
[2]. Dilworth, *Production & Operations management*. 1999
[3]. Adams & Ebert, *Production & Operations management.* 1999
[4]. Monks, *Operations Management*. . Tata McGraw Hill, 1985

Devi Ahilya University, Indore, India Institute of Engineering & Technology				**I Year M.E. (Industrial Engineering and management) Part Time**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
	L	**T**	**P**	**L**	**T**	**P**	**TOTAL**
IMP2E1 STATISTICAL QUALITY CONTROL AND TQM	**3**	**1**	**1**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Objective and Pre requisites:

- To develop the skills required for Quality consciousness among the students. Basics of Quality control through different techniques like theory of Control charts & Acceptance sampling. To build the Knowledge base of Total Quality Management, Six Sigma etc.

COURSE CONTENTS

UNIT-1

Quality Control:

Definitions, place of quality control in industries, quality control organization, difference between inspection and quality control, application of quality control in industries, economic of quality systems, quality assurance. Theory of Control Charts

Sample size and frequency of sampling, out control, control for variables and attributes and their application design of X and R charts, Process capability studies.

UNIT-2

Acceptance Sampling:

Single sampling planes, double sampling& sequential sampling planes, rectifying inspection for lots, sampling planes for continues production, selection of sampling planes for different situation, economics of acceptance sampling.

UNIT-3

Total Quality Management (TQM):

Evolution of total quality management , historical perspective, elements of TQM - Total employee involvement , elimination of waste and problem exposure , total quality control systems , Deming’s wheel , Deming’s 14 points – pros and cons in industrial engineering context , Philip Croshy philosophy , Juran philosophy , Ishikwa diagram , Just – in- Tinme philosophy design and development strategy in TQM – Quality function deployment.

Application of TQM to service type organization, service guarantees, case studies on application of TQM to services type organization, various quality award, cost benefit analysis, life cycle costing.

UNIT-4

Reliability: Distributions encountered in controlling reliability mean time to failure , exponential failure density, MTTF, Weibull, failure density, measurement and tests , maintenance and reliability , life testing.

UNIT-5

Concepts & Application of 6 – Sigma Quality:

Comparison between 3-sigma & 6- sigma quality relationship between DPMO and slandered normal variate , short term and long term yield cost and quality effectiveness of 6- sigma strategy , DMAIC approach to 6-sigma implementation application to service industry link between 6- sigma & DOE. ISO 9000 Series and SPC, Quality Circles

Course outcomes

After completing the course the student will able to:

- Able to perform analysis of set parameters relating to different mathematical distributions (Variable).
- Learn different mathematical distributions (Discrete) methods.
- Learn about Construction & analysis of various process control charts.
- Analyse the performance of Acceptance Sampling for a given set of lots.

BOOKS RECOMMENDED:

[1]. Mahajan M., *Statistical Quality Control*, Dhanpat Rai & Sons, 2001.
[2]. Mitra A., *Quality Control Applications*, Pearson Education. 2e, 1998
[3]. Sharma D. D, *Total Quality Management*, Sultan Chand & Sons. New Delhi, 2000
[4]. Basterfield, *Total Quality Management*, Pearson Education, 2003
[5]. Logothitis, *Total Quality Management*, PHI.

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<tr><td rowspan="2">IMP2E2
STRATEGIC MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
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Objectives & Prerequisites:

- The objective of teaching this course is to enable students to integrate knowledge of various functional areas and other aspects of management, required for perceiving opportunities and threats for an organization in the long-run and second generation planning and implementation of suitable contingency strategies for seizing / facing these opportunities & threats.

COURSE CONTENTS

UNIT-1
Introduction:
Meaning, Need and Process of Strategic Management; Business Policy, Corporate Planning and Strategic Management; Single and Multiple SBU organisations; Strategic Decision–Making Processes – Rational–Analytical, Intuitive-Emotional, Political – Behavioral;

UNIT-2
Objectives & Strategic Analysis:
Need, Formulation and changes in these three; Hierarchy of objectives, Specificity of Mission and Objectives. SWOT Analysis General, Industry and International Environmental Factors; Analysis of Environment, Environmental Threat and Opportunity Profile (ETOP) Strategic Advantage Profile (SAP).

UNIT-3
Strategy Alternatives:
Grand Strategies and their sub strategies; Stability, Expansion, Retrenchment and Combination; Internal and External Alternatives; Related and Unrelated Alternatives, Horizontal and Vertical Alternatives; Active
and Passive Alternatives; International Strategy Variations

UNIT-4

Strategy Choice:

Making: Managerial Choice Factors, Choice Processes – Strategic Gap Analysis, ETOP-SAP Matching, BCG Product – Portfolio Matrix, G.E. Nine Cell Planning Grid; Prescriptions for choice of Business Strategy

UNIT-5

Strategy Implementation, Evaluations and Control:

Strategy Implementation, Evaluations and Control: Implementation Process; Resource Allocation; Organizational Implementation; Plan and Policy
Implementation; Control and Evaluation Process; Criteria for Evaluation; Measuring Feedback; and Corrective Action.

Course outcomes

After completing the course the student will able to:

- Learn about various Processes – Rational–Analytical, Intuitive-Emotional,
- Perform SWOT analysis.
- Know about the fact used for the practical implementation of Strategy alternatives.
- Learn Managerial Choice Factors, Choice Processes – Strategic Gap Analysis.
- How to make Strategy Implementation, Evaluations and Control.
- Learn the procedure related to Implementation; Control and Evaluation Process.

BOOKS RECOMMENDED

[1] Azhar Kazmi, Business Policy and Strategic Management, TMH,2010
[2] Fred David, Strategic Management Concepts and Cases, PHI, 12 Ed
[3] Whller and Hunger, Basic Concepts of Strategic Management, TMH, 12 Ed

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMP2E3
BUSINESS PROCESS RE-ENGINEERING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
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Objective and Pre requisites:

- To provide a greater understanding of effective solutions to change problems that need to combine technological, organizational and people-orientated strategies by adopting a process based approach to change management. To introduce the contingencies that affect management and the most effective measures for dealing with them. To introduce strategic IS/IT planning and how it must relate to business strategy. To demonstrate the use and validity of organizational development models through current real-life case studies.

COURSE CONTENTS

UNIT-1

Business process reengineering-an overview:

Historical background Fundamentals of BPR Concepts and techniques. Changing business processes: the importance of technology as a driver for organization: Nature, significance and rationale of business process reengineering (BPR),

UNIT-II

Process redesign:

Major issues in process redesign: Business vision and process objectives, Processes to be redesigned, measuring existing processes, Role of information technology (IT) and identifying IT levers.

UNIT-III

Designing and building a prototype of the new process:

BPR phases, Relationship between BPR phases. BPRE & TQM, benchmarking, ISO standards. Implementation of BPRE-business process management, principles, Business models, barriers.

UNIT-IV

Change management: Change and the manager: change and the human resource: the cultural web and the past: the cultural attributes of change Typical BPR activities within phases: Change management, Performance management, and programme management.

UNIT-V

BPR and continuous improvement:

Co-ordination and complementary efforts, IT capabilities and their organizational impacts, Implementation of BPR, Stages of implementation and critical aspects, Case studies on BPR. The concept of the learning organization and its influence on systems development: restructuring the organization .The importance of communication and the resistance to change: building the culture for successful strategy implementation; the influence IT will have on the internal appearance of organizations in the future.

Course outcomes

After completing the course the student will able to:

- Learn about various Processes – Rational–Analytical, Intuitive-Emotional,
- Perform SWOT analysis .
- Know about the fact used for the practical implementation of Strategy alternatives.
- Learn Managerial Choice Factors, Choice Processes – Strategic Gap Analysis.
- How to make Strategy Implementation, Evaluations and Control.
- Learn the procedure related to Implementation; Control and Evaluation Process.

LABORATORY EXPERIMENTS:

1. Case studies related to Historical background Fundamentals of BPR Concepts and techniques.
2. Case studies related to Major issues in process redesign:.
3. Case studies related to Role of information technology (IT) and identifying IT levers.
4. Case studies related to Designing and building a prototype of the new process.
5. Case studies related Change management, Performance management, and programmed management.
6. Case studies related to BPR and continuous improvement.
7. Case studies related to concept of the learning organization, importance of communication and the resistance to change.

BOOKS RECOMMENDED:

[1] Omar El Sawy, Business Process Re-engineering, Tata McGraw Hill , 2010
[2] R. Srinivasan, Business Process Re-engineering, Tata McGraw Hill , 2011
[3] Warner Winslow, Strategic Business Process Transformation through BPR, , Tata McGraw Hill , 1996
[4] R. Radhakrisnan, Business Process Reengineering, Prentice Hall of India.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMP3C1
FINANCIAL
MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
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Objectives and Pre requisites:
To inbuilt the concepts of Financial management. To strengthen skills related to Accounting. Application of financial tools and techniques, helpful for financial planning Capital Budgeting and Decision Making.

COURSE CONTENTS

UNIT-1
Nature and Scope of Financial Management:
Role of financial management in business decisions, goals of financial management, evolution of corporate finance, finance function, broader applicability of financial management concepts, tasks of finance controller.

UNIT-2
Book Keeping and Accounting:
Introduction of book keeping. Accounting Process & its concepts, Introduction & working knowledge of different books of account. Preparation of Financial Statements of the firm**.**

UNIT-3
Tools of Financial Analysis:
Funds flow analysis – sources and use of funds, balance sheet and profit and loss statements, measurement of cash flows, revenue cost, profit relationship, break even analysis, ratio analysis, analysis of operating and financial leverages, long term and short term cost out put relationship.

UNIT-4
Financial Planning:
Financial forecasting, forecasting techniques, criterion for investment decisions, dividend policy, cost of capital problems of financial planning and budgeting in public sector undertaking.

UNIT-5

Financial Budgeting:

Capital budgeting, capital budgeting, capital rationing, sources of rising fixed and working capital, management of working capital, internal financing, balanced capital structure,

Course outcomes

After completing the course the student will able to:

- Practical implementation of Accounting Procedure and Book Keeping.
- How to prepare different Financial Statements.
- Make understating of Ratio Analysis.
- Learn the process of internal financing, balanced capital structure,
- .Financial forecasting, forecasting techniques
- Funds flow analysis – sources and use of funds, balance sheet and profit and loss statements.

BOOKS RECOMMENDED:

[1]. Kuchchal, *Financial management*. Tata McGraw Hill, 2003

[2]. Chandra Prasanna, *Financial management*. Tata Mc.Graw Hill, 2000

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMP3C2
MATERIAL MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
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Objective and Pre requisites: To inbuilt the concepts of Material handling and purchase procedure of an organization. To impart the basics of standardization & stores management within an organization. To concrete the concepts of inventory management for effective decision making related to material & inventory.

COURSE CONTENTS

UNIT-1
Introduction:
Objective of materials management, field and scope of material management, general analysis material quality, material planning programming.

UNIT-2
Standardization: Concepts and Procedure,
Simplification: Concepts and Procedure,
Codification: Concepts and Procedure.

UNIT-3
Purchase Management:
Problems of purchasing , organization of purchasing Deptt, purchase procedures , placing of orders , inspection and testing , purchasing for mass production , purchase contract , make or buy decision , material import , DGS & D rate contract.

UNIT-4
Stores Management:
Stores organization, methods of storing, record – keeping & checking, issue methods, stores layout.

UNIT-5
Inventory Management:
Various inventory models, quantity discounts, shortages, instantaneous production with back orders, fixed time mode, single period model of profit maximization with time

independent costs, lead time , re-order point , Buffer stock, models with price breaks, selective control of inventory, POQ system.

Course outcomes

After completing the course the student will able to:

- Learn about field and scope of material management,
- Learn about Standardization: Concepts and Procedure,
- Simplification: Concepts and Procedure,
- Codification: Concepts and Procedure.
- Get deep knowledge of Problems of purchasing , organization of purchasing Deptt
- Stores organization, methods of storing, record –

LABORATORY EXPERIMENTS:

1. Cases related to material handling problem in the plant or organization.
2. Cases related to the problem of Standardization, simplification, codification.
3. Cases related to Problems of purchasing.
4. Cases related to inspection and testing, purchasing for mass production.
5. Cases related to stores layout.
6. Cases related to various inventory models.
7. Determination of EOQ from the given data & its comparison with data of the industry.

BOOKS RECOMMENDED:

[1]. Lee & Dobler, *Material management.* Tata Mc.Graw Hill, 1990
[2]. Arnold J.R Tony & Stephen N. Chapman, *Introduction to Material management.* 2003
[3]. Gopal Krishnan, *Material Management*.1992

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMP3G1
PROJECT
MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
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Objective and Pre requisites: To develop the Knowledge & concepts of Project Management. To develop the of Project's Analysis on different criteria like Market potential, Technical & Financial Analysis. To develop the skills of Project Appraisal through different criteria.

COURSE CONTENTS

UNIT-1
Project Management:
Definition characteristics and life cycle, difference with operation s management, steps in PM, projects managers jobs organization for PM, critical chain concepts.

UNIT-2
Market Potentiality & Technical Analysis:
Identification of opportunities of new products.
Materials and input production technology, product mix, plant capacity, project planning and analysis tools.

UNIT-3
Financial Analysis:
Estimation of cost of project, means of finance, estimate of working capital, estimate of cost of production, working result & profitability, projected balance sheet and projected cash flow statements. Project Appraisal Criteria: Payback period, net present value methods, cost benefit analysis, internal rate of return.

UNIT-4
Project Management through Network:
Work break down structure, Gantt chart etc. PERT: - Activity average time variance and project completion time by normal distribution. CPM: - Critical path, floats their interpretation, event occurrence time, slacks, resource allocation, crashing of NW, time cost trade-off, resource smoothing and leveling.

UNIT-5

Monitoring and Control:

Features of control, project control, performance analysis and cost control curves, line of balance, GERT, computer applications.

Course outcomes

After completing the course the student will able to:

- Will able to make performance analysis and cost control curves
- With critical chain concepts.
- Learn about various Materials and input production technology
- Learn about Payback period, net present value methods,
- Work break down structure, Gantt chart etc. PERT:

LABORATORY EXPERIMENTS:

(1) Case studies related to difeerent types of project and their charateristics.
(2) Case studies related to responsiblities of project manager related with different Projects
(3) Case studies related to market poteniality analysis with reference to new product.
(4) Case studies related to technical analysis with reference to different projects.
(5) Case studies related to finacial analysis with reference to new product.
(6) Case studies related to project implementation techniques.
(7) Case studies related to project control techniques.

BOOKS RECOMMENDED:

[1]. Chandra Prasanna, *Project preparation,* Tata Mc.Graw Hill publishing CO. 1, New Delhi

[2]. Jain D.K, *Project planning and appraisal in planned economy,* Uppal publishing house, New Delhi.

[3]. Lock Dennis, *Project management,* Galgotia book service, New Delhi.

[4]. Mohsin M., *Project planning and control* Vikas publishing house, New Delhi.

[5]. Sonha A.K and Sinha Ram, *project engineering and management,* Vikas publishing house, New Delhi.

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<tr><td rowspan="2">IMP3G2
ENTERPRISE RESOURCE PLANNING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">0</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
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Objectives & Prerequisites:

- To impart the basics of Enterprise Resource Planning (ERP) 7 its implementation methodologies to the students

COURSE CONTENTS

Unit I
Introduction:
ERP: an over view, Benefits of ERP, REP and related technologies, Business Process Reengineering, Date warehousing, Data Mining, Online Analytical processesing (OLAP), Supply Chain Management.

Unit II
ERP Implementation:
ERP implementation Life cycle, Implementation Methodology, Not all packages are created equal, ERP Implementation Hidden Costs, Organizing the implementation, Vendors, Consultants and Employees.

Unit III
The Business Modules:
Business Modules in an ERP Package, Finance, Manufacturing (Production), Human Resources, Plant Maintenance, Materials Management, Quality Management, Sales & Distribution.

Unit IV
The ERP Market:
ERP Market place, SAP AG, PeopleSoft, Bann Company, Orcale Corporation. QAD, System Software Associates, Inc. (SSA).

Unit V
ERP – Present & Future:
Turbo Charge the ERP System, Enterprise Integration Applications (EIA), ERP and E – Commerce, ERP & Internet, Future Directions in ERP.

Course outcomes

After completing the course the student will able to:

- Learn About Supply Chain Management.
- Having deep knowledge of Date warehousing, Data Mining
- Learn the process of ERP implementation Life cycle
- Make a practical implementation of Business Modules using ERP Package
- Learn about practical implementation of various SAP AG, PeopleSoft, Bann Company, Orcale Corporation.
- Learn about Internet, Future Directions in ERP.

BOOKS RECOMMENDED:

[1] Leon Alexis, ERP Demystified, Tata McGraw – Hill, le,2004.
[2] Garg V.K. & N.K. Venkitakrishnan ERP Ware: ERP Implementaion Framework, PHI, 4e,2004.
[3] Leon Alexis, ERP Concepts and Planning, Tata Mcgraw – Hill,le,2000.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMP4C3
SUPPLY CHAIN MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td>3</td><td>1</td><td>1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td></td><td></td><td></td><td colspan="4"></td></tr>
</table>

Objectives and Pre requisites: To inbuilt the concepts of Logistics and supply chain Management.
To strengthen skills related to supply chain strategies decisions.

COURSE CONTENTS

UNIT-1
Introduction to Supply chain:
Introduction to supply chain. Objective of supply chain, Process view of supply chain, Supply chain management, supply chain challenges, Supply Chain performance. Competitive and Supply chain strategies, achieving strategic fit, expanding strategies scope, Supply chain drives & obstacles: Frame work, inventory, transportation facilities, information, and obstacles to achieving fit.

UNIT– 2
Designing the Supply Chain Network:
Role of distribution in supply chain, factors influencing distribution network, design options, e – business and distribution network.
Network Design in supply chain: Role of network design, factors influencing, framework for network design decision, role of IT.

UNIT-3
Sourcing decision in Supply chain
Role of sourcing, supplier scoring, design collaboration, sourcing planning and analysis, role of IT in sourcing, Risk management, in sourcing, design collaboration, making sourcing decisions in practice

UNIT-4
Transportation in supply chain
Transportation in supply chain: Factors affecting transportation decision , modes of transportation & their performance characteristics , design options , tradeoffs , tailor transportation , routing & scheduling in Transportation , Network design in supply chain : Factors affecting network designing decisions, frame work, models , information technology in supply chain

UNIT-5

Supply chain coordination and Information technology

Understanding lack of coordination and Bullwhip effect, obstacle to coordination in supply chain, managerial levers to achieve coordination, building strategic partnership, collaborative planning, forecasting, achieving coordination in practice.

Role of IT in supply chain, supply chain IT frame work, supply chain IT in practice

Course outcomes

After completing the course the student will able to:

- Learn the concept of supply chain, Supply chain management, supply chain challenges
- Understand various Risk management, in sourcing, design collaboration, making sourcing decisions in practice
- Learn the procedure of routing & scheduling in Transportation
- Learn the drawbacks of lack of coordination and Bullwhip effect
- Learn about supply chain IT in practice

LABORATORY EXPERIMENTS:

(1) Case studies related to operation and systems logistics.
(2) Case studies related to Logistics in system utilization and support
(3) Case studies related to integrated logistic support.
(4) Case studies related to Competitive and Supply chain strategies.
(5) Case studies related to Factors affecting transportation decision.
(6) Case studies related to Network design in supply chain.

BOOKS RECOMMENDED:

[1]. Hutchinson Norman E., an Integrated approach to logistics management, PHI, 1987
[2]. Finkelstein & Guertin, Integrated logistics support, IFS publication U.K., 1988
[3]. Copra Sunil & Meindl Peter, Supply chain management. McGraw-Hill, 1998.
[4]. Mentzer, Supply chain management. . Sage Publications, 2004
[5]. Chistofer M., Logistics & supply chain management. 1998.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">II Year M.E.
(Industrial Engineering and management)
Part Time</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMP4E1
MARKETING
MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Duration of Theory Paper:
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</table>

Objective and Pre requisites:

- To build a strong foundation of marketing concepts & to acquaint the students about the different Marketing Functions. To develop the skills of Marketing Strategies formulation & its implementation in an organization to maximize profits and improvement of Brand Image.

COURSE CONTENTS

UNIT-1
Introduction:
Tasks and philosophies of marketing MANAGEMENT, the marketing system and environment, system and environment, system approach to marketing. Marketing Organization**,** Organization of marketing department, responsibilities and functions of marketing managers, interaction of marketing in other functions.

UNIT-2
Marketing Research:
Scope and objective, planning and formulating marketing research projects, methods of collecting data, analysis and evolution of data, consumer behavior analysis, vendor analysis.

UNIT-3
Product Planning:
Product policy decision, life cycle innovation, product failure, introduction new products, product mix strategies, product portfolios management ,BCG GF-directional matrices, planning & budgeting for establishing and new products- MARMIX model.

UNIT-4
Sales Promotion and Advertising:
Role of promotion and advertising, type of promotion and advertising method, promotion and advertising appropriation, development and evaluation of advertising program.

UNIT-5

Distribution & Sales Function:

Importance of middlemen, types of distribution channel, channel design decisions, problems in channel determination and uses. Recruitment, selection, training, motivation and compensation of sales force, controlling and evaluating**.**

Course outcomes

After completing the course the student will able to:

- Learn about different philosophies of marketing concepts.
- Learn the Importance of middlemen, types of distribution channel, different marketing organizations.
- Having knowledge of marketing research approaches adopted by business organisation.
- Case studies related to product development and planning by different organisation.
- Case studies related to sales promotion and advertising practices of different organisation product portfolios management ,BCG GF-directional matrices, planning.
- Learn about sales promotions practices of different organisation.
- Able to make Product policy decision.
- Learn about life cycle innovation and product failure,.

BOOKS RECOMMENDED:

[1]. Kotler Philip, *Marketing management, planning, analysis and control.* PHI, 2001

[2]. Cundiff, Still & Govoni, PHI. , 2003

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">IMP4E2
PRODUCT DESIGN
& MANUFACTURING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
<tr><td>3</td><td>1</td><td>1</td><td>3</td><td>1</td><td>1</td><td>5</td></tr>
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Objectives & Pre requisites: To impart the basics of Product Design & Development of a new Product. To sharpen the skills of the students to understand the different manufacturing processes/ systems for new product development.

COURSE CONTENTS

UNIT -1
Introduction
Characteristics of successful product development, Design and development of products, duration and cost of product development, the challenges of product development. Development Processes and Organizations: A generic development process, concept development: the front-end process, adopting the generic product development process, the AMF development process, product development organizations, the AMF organization.

UNIT -2
Product Planning
The product planning process, identify opportunities. Evaluate and prioritize projects, allocate resources and plan timing, complete pre project planning, reflect all the results and the process.

UNIT - 3
Identifying Customer Needs
Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs and reflect on the results and the process. Product Specifications: What are specifications, when are specifications established, establishing target specifications, setting the final specifications.

UNIT - 4
Concept Generation
The activity of concept generation clarify the problem, search externally, search internally, explore systematically, and reflect on the results and the process. Concept

Selection: Overview of methodology, concept screening, and concept scoring, Concept Testing: Define the purpose of concept test, choose a survey population, choose a survey format, communicate the concept, measure customer response, interpret the results.

UNIT – 5
Design for Manufacturing

Definition, estimation of manufacturing cost, reducing the cost of components, assembly, supporting production, impact of DFM on other factors. Prototyping: Prototyping basics, principles of prototyping, technologies, planning for prototypes. Product Development Economics: Elements of economic analysis, base case financial mode, Sensitive analysis, project trade-offs, influence of qualitative factors on project success, qualitative analysis.

Course outcomes

After completing the course the student will able to:

- Learn about Characteristics of successful product development, Design and development of products.
- Prctical knowledge of Development Processes and Organizations.
- Learn how to make the product planning process, identify opportunities.
- Well understanding of Customer Needs.
- Perform Sensitive analysis, project trade-offs.
- Sensitive analysis, project trade-offs.

BOOKS RECOMMENDED:

[1]Ulrich Karl.T. & Eppinger Steven D., "Product Design and Development" Irwin McGrawHill- 3e, 2000.
[2] Chitale A. C. and Gupta R. C., PH1, "Product Design and Manufacturing", 3e, 2003.
[3] Timjones Butterworth Heinmann, "New Product Development" Oxford. UCI. 1997.
[4] Boothroyd G., Dewhurst P. and Knight W., "Product Design forManufacture and Assembly", **2002.**

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<tr><td rowspan="2">IMP4E3
CUSTOMER
RELATIONSHIP
MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
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<tr><td>Duration of Theory Paper:
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</table>

Objective and Pre requisites:

- To make the students understand the organizational need, benefits and Process of creating long-term value for individual customers. To disseminate knowledge regarding the concept of eCRM and eCRM technologies. To enable the students understand the technological and human issues relating to Implementation of CRM in industries.

COURSE CONTENTS

Unit-I
introduction
Definition of CRM as a business strategy ,elements of CRM ,CRM process and system .Strategy and organization of CRM ,History of CRM ,Dynamics of customer supplier relationship, Nature and context of CRM strategy ,The relationship oriented organization

Unit-2
Marketing Aspects of CRM
Customer knowledge, privacy issue, communication and multi channel in CRM,the individual customer proposition ,relationship policy .

Unit-3:
Analytical CRM
Relationship data management, Data analysis and data mining, segmentation and selection ,Retention and cross sell analysis ,Effects of marketing activities, Reporting results operational CRM:Call centre management ,Internet and website ,Direct mail collaborative CRM]

UNIT-IV
CRM Subsystems:
Contact Management, Campaign Management, Sales Force Automation,
Choosing CRM Tools / Software Package: Short listing prospective CRM vendors, setting evaluation criteria for the appropriate CRM package, selection

UNIT-5

CRM implementation:

CRM systems and Implementation: CRM systems, Implementation of CRM systems Applications in various industries: Applications in manufacturing, banking hospitality and telecom
Sectors, Ethical Issues in CRM

Course outcomes

After completing the course the student will able to:

- Get deep knowledge of CRM as a business strategy.
- Learn about Dynamics of Customer Supplier Relationships.
- Make study on various aspects related to Marketing Aspects of CRM**.**
- Learn about Relationship data management.
- Learn about Contact Management, Campaign Management,
- Sales Force Automation.
- Case studies related to CRM implementation.

BOOKS RECOMMENDED:

[1] Peelen , Customer Relationship Management , Ed. Pearson 2004

. Zikmund, William G. Customer Relationship Management: Integrating

[2] Marketing Strategy & Information Technology John Wiley. 2006

[3] Greenberg, P CRM at the Speed of Light, 4th e. Mcgraw Hill 2009

[4] Brown , Stanley , Customer Relationship Management, A strategic Imperative in the World of eBusiness . John Wiley & Sons 2008

[5] Peppers, D. / Rogers, Martha. Doubleday The One to One B2B: Customer Relationship Management Strategies for the Real Economy Business 2001

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<tr><td rowspan="2">IMP4E4
INDUSTRIAL
MARKETING</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>TOTAL</td></tr>
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<tr><td>Duration of Theory Paper:
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</table>

Objective and Pre requisites:

- The objective of this course is to help the students develop an understanding of the dimensions of the Marketing, with particular reference to Industrial reference and practices at national and international level.

COURSE CONTENTS

UNIT-1

Nature of Industrial Marketing

Industrial Marketing Vs. Consumer Marketing , Relational approach to Industrial Marketing- The Nature of Industrial Demand & Industrial Customer

UNIT-2

Types of Industrial Products

Major Equipment; Accessory Equipment; Raw and Processed Materials; Component Parts and Sub- Assemblies; Operating Supplies; Standardized and Non-standardized parts, Industrial services

UNIT-3

Organizational Buying

Factors influencing Organizational Buying, Buying Roles; Organizational Buying Decision Process; environmental & organizational Influences, Organizational Influences on Buying Behavior: Buying Roles; The Buy Grid Model; The

Organizational Buying Decision Process

UNIT-4

Industrial Product Decisions

Industrial Product Life Cycle, Industrial Product Mix determinants viz. technology, competition, operating capacity, shift in location of customers, government controls, changes in level of business activity, Channel Structure for Industrial Products,

Geographical, size, operating characteristics manufacturers' and sales agents Brokers

Channel Logistics

Purchasing systems – Auctions- Documentation bids order placement follow up receipt and inspection

UNIT-5

Pricing & Promotion for Industrial Products

Pricing Objectives ,Price Decision Analysis , Breakeven analysis, net pricing, discount pricing , trade discounts, geographic pricing , factory pricing , freight allowance pricing ,Terms of Sale, Outright purchase , Hire-purchase , Leasing Promotion for Industrial products , Supporting salesman , Motivating distributors , Stimulating primary demand , Sales appeal , Publicity & sponsorships , Trade shows, exhibits , Catalogs, Samples promotional letters – Promotional novelties

Course outcomes

After completing the course the student will able to:

- Get deep knowledge of CRM as a business strategy.
- Learn about Dynamics of Customer Supplier Relationships.
- Make study on various aspects related to Marketing Aspects of CRM.
- Learn about Relationship data management.
- Learn about Contact Management, Campaign Management,
- Sales Force Automation.
- Case studies related to CRM implementation.

BOOKS RECOMMENDED:

[1] **1** Ralph S. Alexander, James S. Cross [and] Richard M. Hill., Industrial marketing - 3d ed. Homewood,

[2] Reeder, Robert R., Brierty, Edward G. and Reeder, Betty H, Industrial Marketing Analysis, Planning and Control. Publisher: Prentice Hall ,1991.

[3] **P K Ghosh Industrial Marketing** Oxford University Press India 2005

[4] Havaldar, Krishna **Industrial Marketing,** Tata McGraw-Hill 2010

[5] C S G Krishnamacharyulu, Lalitha R **, Industrial Marketing** , Jaico Publishing House,

[6] 2009

[7] Anderson,Business Marketing, Pearson 2010.

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

Proposed Scheme for CBCS of
M.Sc. (Applied Mathematics)
with specialization in Computing and Informatics

Batch 2015– 2016 and onwards

(Subject to Revision)

SEM I				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM1PC1	Algebra	3-1-0	Core
2.	AM1PC2	Discrete Mathematics	3-1-0	Core
3.	AM1PC3	Numerical Analysis / Integral Equations	3-1-0	Core
4.	AM1SS1	Advanced Communication Skills	2-0-0	Skill
5.	AM1GE**x**	**Generic Elective I**	3-1-0	Generic
6.	AM1PR1	Computer Lab-I (MATLAB)	0-0-2	Practical
7.	AM1CV1	Comprehensive Viva I	0-0-4	Viva
Total Credit for SEM I			**20 actual + 4 Virtual credits**	
		List of Generic Elective I		
1.	AM1GE1	Computer Architecture/ Digital Electronics and Computer Organization	3-1-0	
2.	AM1GE2	Advanced Special Functions	3-1-0	
3.	AM1GE3	Financial Accounts	3-1-0	

SEM II				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM2PC1	Real Analysis / Measure Theory	3-1-0	Core
2.	AM2PC2	Advanced Differential Equations	3-1-0	Core
3.	AM2PC3	Theory of Computation	3-1-0	Core
4.	AM2EC**x**	**Discipline Elective I**	3-0-0	Disc. Elec.
5.	AM2EM**x**	**Discipline Elective II**	3-0-0	Disc. Elec.
6.	AM2PR2	Computer Lab-II (**Of Subject of Discipline Elective -I**)	0-0-2	Practical
7.	AM2CV2	Comprehensive Viva II	0-0-4	Viva
Total Credit for SEM II			**20 actual + 4 Virtual credits**	
		List of Discipline Elective I		
1.	AM2EC1	Object Oriented Programming with Core Java	3-0-0	
2.	AM2EC2	Comp. Graphics /Multimedia	3-0-0	
		List of Discipline Elective II		
1.	AM2EM1	Operations Research-I	3-0-0	
2.	AM2EM2	Soft Computing Techniques	3-0-0	

(PTO)

SEM III				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM3PC1	Topology	3-1-0	Core
2.	AM3PC2	Database Theory	3-1-0	Core
3.	AM3PC3	Mathematical Statistics	3-1-0	Core
4.	AM3SS2	Life Management Skills	2-0-0	Skill
5.	AM3GE**x**	**Generic Elective II**	3-1-0	Generic
6.	AM3PR3	Computer Lab-III (Research Tools)	0-0-2	Practical
7.	AM3CV3	Comprehensive Viva III	0-0-4	Viva
Total Credit for SEM III			**20 actual + 4 Virtual credits**	
		List of Generic Elective II	3-1-0	
1.	AM3GE1	OS/Microprocessor	3-1-0	
2.	AM3GE2	Integral Transforms	3-1-0	
3.	AM3GE3	Financial Management		

SEM IV				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM4PC1	Complex Analysis	3-1-0	Core
2.	AM4PC2	Analysis of Algorithm	3-1-0	Core
3.	AM4PC3	Functional Analysis	3-1-0	Core
4.	AM4EC**x**	**Discipline Elective III ***	3-0-0	Disc. Elec.
5.	AM4EM**x**	**Discipline Elective IV ***	3-0-0	Disc. Elec.
6.	AM4D**xx**	**Discipline Elective V ***	0-2-4	Diss. Work
7.	AM4PR4	Computer Lab-IV (**Of Subject of Discipline Elective -III**)	0-0-2	Practical
8.	AM4CV4	Comprehensive Viva IV	0-0-4	Viva
Total Credit for SEM IV			**20 actual + 4 Virtual credits**	
		List of Discipline Elective III		
1.	AM4EC1	Advanced Java	3-0-0	
2.	AM4EC2	Unix / Linux Administration	3-0-0	
3.	AM4EC3	Computer Network/ Internet & Web Technology	3-0-0	
		List of Discipline Elective IV		
1.	AM4EM1	Operations Research-II	3-0-0	
2.	AM4EM2	Mathematical Modeling	3-0-0	
3.	AM4EM3	Number Theory/Cryptography	3-0-0	
		List of Discipline Elective V		
1.	AM4DW1	**Dissertation (Minor)***	0-0-4	
2.	AM4DS1	Seminar	0-2-0	

* Student will select either **Discipline Elective III and IV or Discipline Elective V.** Internal evaluation of Dissertation work will be based on monthly Seminars (showing progress of work done) and Attendance of students. Final marking will be a combination of Internal and External evaluation.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">MSc – I Year (<u>Applied Mathematics)</u>
<u>with Specialization in Computing & Informatics</u>
Semester- I</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM1PC1: Algebra</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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</table>

Learning Objectives:

- The philosophy of this course is that modern algebraic notions play a fundamental role in mathematics itself and in applications to areas such as physics, computer science, economics and engineering.
- To study the abstractions such as groups, rings, fields, vector space and linear transformations.
- To introduce the notion of an axiomatic system through the example of group theory, investigate elementary properties of groups and examples, such as general linear groups and symmetric groups; Use a combination of theoretical knowledge and independent mathematical thinking to investigate questions in ring theory and to construct proofs; Linear algebra - unitary matrices, Hermitian matrices, canonical forms; Special rings like: integral domains and polynomial rings and factorizations of elements there in; fundamentals of field theory.

Prerequisites: Knowledge of basics of functions, limits, derivatives, and integrals.

COURSE OF CONTENTS

UNIT I

Preview of Groups, subgroups, cosets, Lagrange's theorem, normal subgroups, quotient groups, homomorphism, isomorphism theorems, Cayley's theorem and Permutation groups. Conjugacy, Sylow theorems, Direct products, Structure theorem for finite abelian groups, Normal and Subnormal series, composition series, Jordan holder theorem, Solvable and Nilpotent groups.

UNIT II

Rings, Integral domains, Ideals, Prime ideals, Maximal ideals, homomorphisms, Quotient rings, Fields, characteristic of an integral domain, Prime fields. Euclidean domains, Unique factorization domains, Principal ideal domain, Polynomial rings, Unique factorization in polynomial rings, Eisenstein's criterion of Irreducibility, Noetherian and Artinian rings.

UNIT III

Review of Basic Concepts of Vector space, Bases, Dimension, Nullity theorem and Rank of a matrix. Linear transformation, Quotient space, Direct sums, dimension of a direct sum, Characteristic polynomials, theorems on Eigen values & Eigen vectors, Cayley- Hamiltonian theorem, Jordan form, Diagonalization, Dual space, Annihilators.

UNIT IV

Modules, Sub modules, Direct Sum, Homomorphism and Isomorphism theorems, Quotient modules, Cyclic modules, simple modules, Free modules, Schur's lemma.

UNIT V

Finite Field Extension, algebraic and transcendental extension, splitting fields, separable and inseparable extension, perfect field, normal extensions, Galois group, solvability by radicals.

Learning Outcomes:

Upon completing the course, students will be able to:

- Develop critical thinking skills, including problem solving, logic, patterns, and deductive and inductive reasoning.
- Explain the fundamental concepts of advanced algebra such as groups and rings and their role in modern mathematics and applied contexts
- Apply problem-solving using advanced algebraic techniques applied to diverse situations in physics, engineering and other mathematical contexts.

BOOKS RECOMMENDED:

[1] I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.

[2] Fraleigh J.B, A First Course in Abstract Algebra, Seventh Edition, Pearson Education, 2002.

[3] S.Kumaresan, Linear Algebra, A Geometric Approach, Prentice - Hall of India, 2000.

[4] S. Lang, Linear Algebra, Undergraduate Texts in Mathematics, Springer-Verlag, New York, 1989.

[5] A.R. Vasishtha, Modern Algebra, Prakashan Media Ltd, Meerut, India, 2002

[6] Artin Michael , Algebra , Pearson Education Inc. , 2007 .

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>AM1PC2: Discrete Mathematics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td><td>3</td><td>1</td><td>-</td><td>3</td><td>1</td><td>-</td><td>4</td></tr>
</table>

Learning Objectives:

- To provide the fundamentals of formal techniques for solve the problems in computational domain and algorithm development.
- Identify and apply basic concepts of set theory, arithmetic, logic, proof techniques, binary relations, graphs and trees; to solve counting problems by applying elementary counting techniques; to use and analyse recursive definitions;

Prerequisites: NIL

COURSE OF CONTENTS

UNIT I

Set Theory: Operation and Algebra; Principle of Inclusion and Exclusion; Computer Representation.
Proposition Logic: Logic Connectives; Truth Tables; Propositional equivalences, predicates, Quantifiers, Method of Proof.
Mathematical induction: Strong induction; Well-ordering; Recursive definitions, Structural Induction.

UNIT II

Counting Techniques: Law of Product and Sum; Permutation, Combination, Pigeon Hole Principle; Tree Diagram. **Function:** Types of Functions; Hashing.
Application of Group theory: Group Coding.

UNIT III

Relations: Binary Relation and Properties; n-ary relation and their applications to Databases, Closures of relations; Equivalence, Partial ordered and Compatible relations, Lattices.
Boolean algebra: Gate Algebra; Logic Algebra; Switching Algebra.

UNIT IV

Graph Theory: Terminology; Graph Representation; Graph isomorphism; Connectedness; Euler and Hamilton Graphs; Shortest Paths, Planar graphs, Euler's formula, Kuratowski's theorem. Graph colouring, chromatic number,
Trees: Terminology; Tree Traversals; Prefix Codes; Spanning Trees.

UNIT V

Overview of the topics: Automata & Grammar; Analysis of algorithms; Fuzzy logic.

Recurrence Relations: Solution of Homogeneous and non-homogeneous recurrence relation with constant coefficients using Boole's operator method, method of undetermined coefficients and generating functions. Simultaneous recurrence relation.

Learning Outcomes:

Upon completing the course, students will be able to:

- Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving.
- Understand the basics of discrete probability and number theory, and be able to apply the methods from these subjects in problem solving.
- Be able to use effectively algebraic techniques to analyze basic discrete structures and algorithms.
- Understand some basic properties of graphs and related discrete structures, and be able to relate these to practical examples.
- Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
- Use finite-state machines to model computer operations and apply fuzzy logic and reasoning to handle uncertainty.

BOOKS RECOMMENDED:

[1] Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th ed., Tata McGraw-Hill Edition 2007.

[2] Kolman, Busby & Ross, Discrete Mathematical Structures, 6th edition, Pearson Education, 2008.

[3] C.L.Liu, Introduction to Discrete Mathematics, McGraw Hill, 1986.

[4] Trembley and Manohar, Discrete Mathematical structures for Computer Science, McGraw Hill, 1986.

[5] Narsingh Deo, Graph Theory with Applications to Engineering. & Computer Science, 4th ed., Prentice Hall of India, 2004.

[6] K. A. Ross and C. R. B. Wright, Discrete Mathematics (Fifth Edition), Prentice Hall, 2003.

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Semester- 1</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM1PC3: Numerical Analysis/Integral Equations</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To familiarize the students about different numerical techniques e.g. solving algebraic and transcendental equations, large linear system of equations, differential equations, approximating functions by polynomials upto a given desired accuracy, finding approximate value of definite integrals of functions etc.
- Also throws light on the convergence analysis of these techniques and explains different types of errors which gets involved and propagates during numerical computations.
- To impart analytical ability in solving Integral equation, which are important in many applications such as radiative energy transfer and the oscillation of a string, membrane, or axle.

Prerequisite(s): NIL

COURSE OF CONTENTS

UNIT I

Errors and Approximation: Representation of integers and fractions, fixed point and floating point arithmetic, error propagation, loss of significance, condition and instability, computational method of error propagation. Solution of Nonlinear Equations: Iterative methods of 2^{nd} degree, convergence of methods, polynomial equations, convergence acceleration.

UNIT II

Solution of Linear Systems: Elimination with and without pivoting, triangular factorization, error and residual of an approximate solution. Backward errors and iterative improvement, relaxation method. Polynomial Interpolation: Existence and uniqueness of interpolation polynomial, error of the interpolating polynomial, Finite difference operators, Interpolation using differences, spline interpolation, piecewise interpolation, approximations.

UNIT III

Numerical differentiation, Extrapolation methods, Numerical Integration: Newton Cote's integration methods, Gaussian integration methods, composite integration methods, Romberg Integration, double integration. Solution of ODEs: Initial and boundary value problems, difference equations, Routh Hurwitz criterion, single step method, Multistep method, Predicator-Corrector methods, Stability analysis, Shooting methods and finite difference methods.

UNIT IV

Integral Equations: Preliminary concepts, formulation of integral equations, and classification of linear integral equations. Integral differential equations, conversions of ordinary differential equations to integral equations, finite difference approximations. Volterra Integral Equations: Basic concepts - Relationship between Linear differential equations and Volterra integral equations - Resolvent Kernel of Volterra Integral equation - Solution of Integral equations by Resolvent Kernel - The Method of successive approximations - Convolution type equations.

UNIT V

Fredholm Integral equations: Fredholm equations of the second kind, Fundamentals – Iterated Kernels, Constructing the resolvent Kernel with the aid of iterated Kernels - Integral equations with degenerate Kernels - Characteristic numbers and eigen functions, solution of homogeneous integral equations with degenerate Kernel - nonhomogeneous symmetric equations - Fredholm alternative.

Learning Outcomes:

On completion of this course students should be able to:

- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- Analyze and evaluate the accuracy of common numerical methods.
- Establish the relationship between integral equations and ordinary differential equations and how to solve the linear and non-linear integral equations by different methods with some problems which give rise to Integral Equations.

BOOKS RECOMMENDED:

1. Conte S.D. and deBoor C., Elementary Numerical Analysis - An Algorithmic Approach; 3rd edn., McGraw Hill, 1981.
2. Froberg C.E., Numerical Mathematics - Theory and Computer Applications; Benjamin Cummings Pub. Co., 1985.
3. Computer Oriented Numerical Methods: Raja Raman V., Prentice Hall 1988.
4 B.P. Parashar, Differential and Integral equations, CBS Publishers and Dist., New Delhi, 1998.
5. Jain N.K., Iyengar, S.R.K. and Jain R.K., Numerical methods for scientific and Engineering Computations, Wile Eastern Ltd., 1984.
6. Ram P Kanwal, Linear Integral Equations, Academic Press, 2nd Ed., 1996.
7. S.S. Sastry, Introductory methods of Numerical Analysis, 3rd ed., Prentice Hall of India, 1998.

Soft -Skill

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">MSc – I Year
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Semester- I</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">Advanced Communication Skill</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td></tr>
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</table>

Learning Objectives:

- To make student aware of how they can make their communication strong by understanding the various parts of communication. To strengthen verbal communication and how various components of nonverbal communication can be used, is one of the major learning objective.
- To inculcate right way of discussion to bring out maximum output.

Prerequisites: Nil

COURSE OF CONTENTS

UNIT I

Fundamentals of Communication: Definitions, importance, forms of communication, process of communication, various channels of communication, barriers for effective communication & ways to overcome them. Listening and its importance: Definition, barriers for effective listening, improving listening abilities, exercises and cases

UNIT II

Communication skills: Importance of communication, Art of communicating, Elements of interpersonal communication, Verbal Communication, Non-verbal Communication, Body Language, exercises and cases.

UNIT III

Group Discussions: Definition, importance, process, effectively participating in Group Discussions, Dos and Don'ts, Practicing by mock Group Discussions.
Interviews: Types of Interview, Role of Interviewee and Role of Interviewer, Commonly asked questions in an interview, Dos and Don'ts in an interview, Practicing by mock interviews.

UNIT IV

Transactional Analysis: Johari Window, FIRO-B, FIRO-B Self-exercise workshop.
Written communication: Report writing, Documentation, Business Correspondence, Preparation of manuals and Project Reports, E-mails, Types of e-mails, e-mail protocol.

UNIT V

Negotiation skills: Need, Definition, Process of negotiation, various stages of negotiation, Essentials of effective negotiation, Strategies of negotiation.

Learning Outcomes:

Upon completing the course, students will be able to-

- Recognize various personality traits and apply them in their day to day life.
- Make their communication precise and correct.
- Understand various negotiation techniques which they can use in real world.
- To understand the right way of presenting their view and thoughts.

BOOKS RECOMMENDED:

[1] P.D. Chaturvedi, Mukesh Chaturvedi , Business Communication, Pearson Education, Singapore Pvt. Ltd. 2008.

[2] K.K. Sinha, Business Communication, 2nd Ed., Galgotia Publishing Company, 2001.

[3] R.C. Sharma, Krishna Mohan, Business Correspondence and Report Writing, 3rd Ed., Tata McGraw Hill, 2002.

[4] Scot Ober, Contemporary Business Communication, 5th Ed., Biztantra, 2004.

Generic-Electives

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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Semester- I</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">Computer Architecture/ Digital Electronics & Computer Organization</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective:

- Aim of this course is to aware students about the hardware of computers, get acquainted with different number systems, their Inter-conversion and operations.
- Familiarized with different logic families & relative performance.
- Ability to design various combinational circuits by solving & reducing Boolean equations.
- Familiarize with the internal working of modern computer systems.

Prerequisite(s): Computer Programming.

COURSE OF CONTENTS

UNIT-I

Introduction to Computer Architecture, Memory Organization and Control Design

Introduction, CPU Organization, Instruction Sets, Memory Technology, Memory system, Caches, Basic concepts of control design, micro programmed Control and Pipeline Control.

UNIT II

Binary Systems: Digital Systems, Binary Numbers, Binary Codes, Error detecting Code. Computer Arithmetic Number Base Conversions, Octal and Hexadecimal – conversions. Boolean Algebra and Logic Gates, Functions Minterms and Maxterms – Laws and theorems of Boolean Algebra – Demorgan's theorems – The Universal Building blocks – NAND & NOR gates as universal Building Blocks.

UNIT III

Simplification of Boolean Expressions : Canonical SOP and POS forms – Algebraic Simplification – Karnaugh Maps – SOP & POS Simplification – NAND / NOR implementation of Boolean expressions – Don't care, conditions – Overlapping groups, eliminating redundant groups. Combinational Logic circuits : Half and Full Adders – Half and Full subtractors – BCD adder – parallel binary adder – Multiplexer & Demultiplexer – Encoder & Decoder.

UNIT IV

Sequential Logic circuits: NAND latch – SR, flipflop – JK flipflop – Edge triggering – PRESET and CLEAR inputs, Shift Register, Universal Shift register – Asynchronous and Synchronous counters – BCD counter.

UNIT V

Parallel Computer Models: Introduction - Flynn's Classifications - Parallel & Vector Computer System - Attributes to performance - implicit and explicit parallelism - shared memory – multiprocessors – Uniform and Non-Uniform Memory Access and Cache only Memory Access Models – Distributed Memory Multicomputers – Multivector & SIMD Computers – PRAM and VLSI Module.

Learning Outcomes:

By the end of this course, student should be able to:

- Be familiar with history of modern computer.
- Describe the various architectural concepts that may be applied to optimize and enhance the classical Von Neumann architecture into high performance computing hardware systems.
- Be familiar with the basic knowledge of the design, digital logic circuit and apply computer organization.
- Understand how computer represent and manipulate data.

BOOKS RECOMMENDED:

[1] John P. Hayes, Computer Architecture and Organization, McGraw Hill, 3rd Ed., 1998.
[2] Kai Hwang, Advanced Computer Architecture, McGraw Hill, 1993.
[3] Stallings W., Computer Organization and Architecture, Designing for Performance, Prentice Hall, 2010.
[4] Meena K, Principles of Digital Electronics, PHI Learning Pvt. Ltd., 2009
[5] Thomas Bartee C, Digital Computer Fundamentals, TMH, 6th Edition, 1995.
[6] Moris Mano, Computer Architecture and Logic Design, TMH Publications, ND, 2002.
[7] Nicholas Carter, Computer Architecture Schaum Series Adaptation, 2nd edition, 2011.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">Advanced Special Functions</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
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</table>

Learning Objectives:

- To study mathematical functions which are useful in mathematical analysis, physics, engineering fields and so on.
- Deal with Bessel, Hermite, Legendre differential equations and so on along with the corresponding recurrence formulas, orthogonal polynomials etc. of different functions.

Prerequisites: Nil.

COURSE OF CONTENTS

UNIT I

Orthogonal polynomials: Simple set, orthogonal set, orthogonal polynomials, zeros of orthogonal polynomials.

The Gamma and Beta functions: Gamma function, Euler or Mascheroni constant γ, a series for $\Gamma'(z)/\Gamma(z)$, the Euler product for $\Gamma(z)$, Beta function, the value of $\Gamma(z)\ \Gamma(1-z)$, Factorial function, Gauss multiplication theorem, Legendre's duplication formula.

UNIT II

The Hyper geometric functions: A simple integral form, evaluation of F(a, b, c, l), the contiguous function relations, the hyper geometric differential equations, simple transformations.

Generalized Hyper geometric functions: The function pFq, Saalschutz's theorem, Wipple's theorem, Dixon's theorem, Confluent Hyper geometric function, basic properties of $_1F_1$, Kummer's theorems, Ramanujan's theorem.

UNIT III

Bessel's functions: Definition of $J_n(x)$, generating function, Bessel's differential equation, recurrence relations, Bessel's integral.

Legendre's Polynomial: Generating functions for Legendre's polynomials, recurrence relation, Rodrigues formula, Murphy's formula, hyper geometric forms of $P_n(x)$, Bateman's generating function, Laplace's first integral form, orthogonality.

UNIT IV

Hermite polynomials: Hermite differential equation, definition of Hermite polynomials $H_n(x)$, generating functions, Rodrigue's formula, recurrence relation, orthogonality, expansion of polynomials, more generating functions.

Laguerre Polynomials: Laguerre polynomials $L_n(x)$, generating functions, Rodrigue's formula, recurrence relations, orthogonality, expansion of polynomials.

UNIT V

Chebyshev polynomial: Independent solution of Chebyshev's equation, generating function, recurrence relations, orthogonal properties.

Jacobi polynomial: Jacobi polynomials, Batemans generating function, Rodrigues formula, orthogonal properties.

Learning Outcomes:

Upon completing the course, students will be able to:

- To apply Special functions and their application in areas of Mathematics, Science and industry. Carry basic research in the field of Special Functions.
- Apply them in the fields of mechanics, wave propagation and scattering, fiber optics, heat conduction in solids, and vibration phenomena.

BOOKS REOMMENDED:

[1] Rainville, E.D., Special functions, the Macmillan Co., New York 1971.

[2] Saran, N., Sharma S.D., Trivedi T.N., Special Functions, Pragati Prakashan, 1982.

[3] Labder N.N., Special functions and their applications, Prentice Hall, New Jersey, USA, 1995.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">Financial Accounting</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
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</table>

Learning Objectives:

- To give an in-depth knowledge of all business mathematics and how they should be recorded, classified & interpreted to get a meaningful judgment of viability & profitability of the business.
- The course is designed to make students be able to prepare a set of financial statements for various forms of businesses and nonprofit entities, develop an ability to apply accounting concepts, principles and practices and be familiar with the basic tools for analyses of financial statements.

Prerequisite(s): Students must be aware about the basic quantitative mathematics.

COURSE OF CONTENTS

UNIT I

Introduction and purpose of accounting, uses of accounting information & basic accounting concepts. Accounting Structure: Process of accounting, Journal, Ledger & Trial balance, based on double entry book keeping.

UNIT II

Practical system of accounting: Cash book, sales & purchase of goods, Bill of exchange bank reconciliation statements.

UNIT III

Preparation of Financial Statements: Income statements, (Profit and Loss A/C), Statement of financial Position (Balance Sheet) and Adjustments, valuation of Assets and Depreciation methods (SLR & WDV). Cash and fund flow, Analysis of financial statements- Financial Ratio.

UNIT IV

Introduction to cost accounting: Elements of cost, Cost determination, Direct and Indirect cost, Cost centers & cost units, the behavior of cost.

UNIT V

Break Even Analysis: Leverages: operating, financial and combined. Inventory Management and Responsibility Accounting: Methods of Inventory Management and

Material Issues. Responsibility Accounting Meaning, Preparation of Cost Sheet, Preparation of Tender, Production Accounts.

Learning Outcomes:
Upon completing the course, students will be able to:

- The student will experience real-world learning and application of skills via their internship.
- Recognize and understand ethical issues related to the accounting profession.
- Prepare financial statements in accordance with Generally Accepted Accounting Principles.
- Employ critical thinking skills to analyze financial data as well as the effects of differing financial accounting methods on the financial statements.
- Effectively define the needs of the various users of accounting data and demonstrate the ability to communicate such data effectively, as well as the ability to provide knowledgeable recommendations.
- Recognize circumstances providing for increased exposure to fraud and define preventative internal control measures.
- Apply cost accounting methods to evaluate and project business performance.
- Apply appropriate judgment derived from knowledge of accounting theory, to financial analysis and decision making.
- The subject will develop through concepts of accounting and cost accounting that will help them acquire the ability to develop and use the accounting data as an aid to decision making, work successfully on any project in the corporate.

BOOKS REOMMENDED:
1. T S Grewal & S C Gupta, Introduction to Accountancy, S. Chand & Co. Ltd., 2014.
2. Robert Anthony & James S. Reece, Accounting Principles, Richard d Irwin, 1988.
3. M.Y. Khan & P. K Jain, Financial Management, McGraw Hill Education; Seventh edition, 2017.
4. S.N. Maheshwari & S.N. Mittal, Cost Accounting, Mahavir Publications; 26th Edition, 2015.

DEVI AHILYA VISHWAVIDYALAYA, INDORE
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FACULTY OF ENGINEERING

SCHEME OF EXAMINATION (CBCS)
&
COURSE OF CONTENTS

M.Sc. (Applied Mathematics)
(Specialization in Computing & Informatics)
Batch 2015– 2016 and onwards

(www.iet.dauniv.ac.in)

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

Proposed Scheme for CBCS of
M.Sc. (Applied Mathematics)
with specialization in Computing and Informatics

Batch 2015– 2016 and onwards

(Subject to Revision)

SEM I				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM1PC1	Algebra	3-1-0	Core
2.	AM1PC2	Discrete Mathematics	3-1-0	Core
3.	AM1PC3	Numerical Analysis / Integral Equations	3-1-0	Core
4.	AM1SS1	Advanced Communication Skills	2-0-0	Skill
5.	AM1GE**x**	**Generic Elective I**	3-1-0	Generic
6.	AM1PR1	Computer Lab-I (MATLAB)	0-0-2	Practical
7.	AM1CV1	Comprehensive Viva I	0-0-4	Viva
Total Credit for SEM I			**20 actual + 4 Virtual credits**	
		List of Generic Elective I		
1.	AM1GE1	Computer Architecture/ Digital Electronics and Computer Organization	3-1-0	
2.	AM1GE2	Advanced Special Functions	3-1-0	
3.	AM1GE3	Financial Accounts	3-1-0	

SEM II				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM2PC1	Real Analysis / Measure Theory	3-1-0	Core
2.	AM2PC2	Advanced Differential Equations	3-1-0	Core
3.	AM2PC3	Theory of Computation	3-1-0	Core
4.	AM2EC**x**	**Discipline Elective I**	3-0-0	Disc. Elec.
5.	AM2EM**x**	**Discipline Elective II**	3-0-0	Disc. Elec.
6.	AM2PR2	Computer Lab-II (**Of Subject of Discipline Elective -I**)	0-0-2	Practical
7.	AM2CV2	Comprehensive Viva II	0-0-4	Viva
Total Credit for SEM II			**20 actual + 4 Virtual credits**	
		List of Discipline Elective I		
1.	AM2EC1	Object Oriented Programming with Core Java	3-0-0	
2.	AM2EC2	Comp. Graphics /Multimedia	3-0-0	
		List of Discipline Elective II		
1.	AM2EM1	Operations Research-I	3-0-0	
2.	AM2EM2	Soft Computing Techniques	3-0-0	

(PTO)

SEM III				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM3PC1	Topology	3-1-0	Core
2.	AM3PC2	Database Theory	3-1-0	Core
3.	AM3PC3	Mathematical Statistics	3-1-0	Core
4.	AM3SS2	Life Management Skills	2-0-0	Skill
5.	AM3GE**x**	**Generic Elective II**	3-1-0	Generic
6.	AM3PR3	Computer Lab-III (Research Tools)	0-0-2	Practical
7.	AM3CV3	Comprehensive Viva III	0-0-4	Viva
Total Credit for SEM III			**20 actual + 4 Virtual credits**	
		List of Generic Elective II	3-1-0	
1.	AM3GE1	OS/Microprocessor	3-1-0	
2.	AM3GE2	Integral Transforms	3-1-0	
3.	AM3GE3	Financial Management		

SEM IV				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM4PC1	Complex Analysis	3-1-0	Core
2.	AM4PC2	Analysis of Algorithm	3-1-0	Core
3.	AM4PC3	Functional Analysis	3-1-0	Core
4.	AM4EC**x**	**Discipline Elective III ***	3-0-0	Disc. Elec.
5.	AM4EM**x**	**Discipline Elective IV ***	3-0-0	Disc. Elec.
6.	AM4D**xx**	**Discipline Elective V ***	0-2-4	Diss. Work
7.	AM4PR4	Computer Lab-IV (**Of Subject of Discipline Elective -III**)	0-0-2	Practical
8.	AM4CV4	Comprehensive Viva IV	0-0-4	Viva
Total Credit for SEM IV			**20 actual + 4 Virtual credits**	
		List of Discipline Elective III		
1.	AM4EC1	Advanced Java	3-0-0	
2.	AM4EC2	Unix / Linux Administration	3-0-0	
3.	AM4EC3	Computer Network/ Internet & Web Technology	3-0-0	
		List of Discipline Elective IV		
1.	AM4EM1	Operations Research-II	3-0-0	
2.	AM4EM2	Mathematical Modeling	3-0-0	
3.	AM4EM3	Number Theory/Cryptography	3-0-0	
		List of Discipline Elective V		
1.	AM4DW1	**Dissertation (Minor)***	0-0-4	
2.	AM4DS1	Seminar	0-2-0	

* Student will select either **Discipline Elective III and IV or Discipline Elective V.** Internal evaluation of Dissertation work will be based on monthly Seminars (showing progress of work done) and Attendance of students. Final marking will be a combination of Internal and External evaluation.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM2PC1: Real Analysis/ Measure Theory</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To study the analytic properties of real functions and sequences, including convergence and limits of sequences of real numbers, the calculus of the real numbers.
- Study measures whose main applications are in the foundations of the Lebesgue integral.

Prerequisites: Knowledge of Set theory, algebra of functions and sequence & series of Real and Complex numbers.

COURSE OF CONTENTS

UNIT I

The Riemann-Stieltjes Integral, Definition and existence of the integral, properties of the integral, integration and differentiation, integration of vector-valued functions, rectifiable curves.

UNIT II

Rearrangements of terms of a series, Riemann theorem, Sequences and Series of Functions, pointwise and uniform convergence, Cauchy criterion for uniform convergence, Weiestrass M-test, uniform convergence and continuity, uniform convergence and integration, Uniform convergence and differentiation, equicontinuous families of functions, the Stone-Weierstrass Theorem, uniform convergence and Riemann-Stieltjes integral, Abels test for uniform convergence, Dirichlet's test for uniform convergence, power series, Abel's theorem.

UNIT III

Lebesgue outer measure, Measurable sets, Measurable functions, Borel and Lebesgue measurability, non measurable sets, Littlewoods three principles, non Borel measurable set, Lebesgue integral of a bounded function over a set of finite measure, the integral of a nonnegative function, the general Lebesgue integral.

UNIT IV

Measure space, Measurable functions, Integration, General convergence theorems, signed measure, product measure, inner measure.

UNIT V

L^p spaces, convex functions, Jensen’s Inequality, Minkowski and Holder inequalities, convergence and completeness of L^p, approximations in L^p.

Learning Outcomes:

Upon completing the course, students will be able to:

- Describe fundamental properties of the real numbers that lead to the formal development of real analysis.
- Appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
- The course provides the basis for further studies within functional analysis, topology and complex analysis.

BOOKS RECOMMENDED:

[1] Halsey Royden, Real Analysis, Prentice Hall of India, New Delhi, 3rd Edition, 2010.

[2] Walter Rudin, Principles of Mathematical Analysis, McGraw-Hill Publishing Co.3rd edition, 1976.

[3] R. G. Bartle and D.R. Sherbert, Introduction to Real analysis, 3rd Ed., 2000.

[4] H. K. Pathak, Real Analysis, Shiksha Sahitya Prakashan, Meerut, 2010.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM2PC2: Advanced Differential Equations</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
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Learning Objectives:

- To introduce students to the methods of ordinary and partial differential equations. Ordinary and partial differential equations form an essential part of the mathematical background required for modelling a large number of real-life problems. The course concentrates on some fundamental analytical methods for applied differential equations arising from the mathematical modelling of physical, chemical and biological systems.
- To study various properties like existence and uniqueness of solutions, methods for approximating solutions.

Prerequisite(s): Basic knowledge of differentiation and integration**.**

COURSE OF CONTENTS

UNIT I

Existence of solution, uniqueness of solution, method of successive approximation, system of differential equation, dependence of solution on initial condition and parameters, maximum and minimum solution, variation of solutions.

UNIT II

Exact Linear Differential Equations of nth order – condition of exactness for a linear equation of order n. Integrating factors. Non-linear differential equation of particular forms-exact non-linear differential equations. Riccati,s Equation, Homogeneous equations.

UNIT III

Series Solutions of second order Linear Differential Equations, Method of Frobenius, Total differential Equation- Necessary & Sufficient condition for the total Differential Equations, Solution of a Total Equation involving four variables.

UNIT IV

Partial Differential equations of first order – formulation and Classification of partial differential equations, Langrange's linear equation, Particular forms of non-linear partial differential equations, Charpit's method.

Linear partial differential equations with constant coefficients. Homogeneous equations, Non homogeneous equation.

UNIT V

Partial differential equations of second order with variable coefficients, Monge's Methods, Separation of variables, canonical forms, Elliptic, Parabolic and Hyperbolic differential equations, Green's Functions.

Learning Outcomes:

On successful completion of the course students will be able to:

- Have a broad overview of ordinary and partial differential equations as well as an appreciation of the application of analysis and linear algebra in studying differential equations.
- Apply an appropriate method for the solution of linear and non-linear ordinary/partial differential equations

BOOKS RECOMMENDED:

[1] Rai Singhania, Advanced Differential Equations & Integral Transform.
[2] Zafar Ahsan, Differential Equations and their Application, Prentice-Hall of India Pvt. Ltd., New Delhi, 2004.
[3] Sankara Rao, K., Introduction to Partial Differential Equations, Prentice Hall of India Pvt. Ltd., New Delhi 1997.
[4] Earl A. Coddington, An Introduction to ordinary Differential Equations, Tata McGraw Hill, 2009.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">MSc – I Year (Applied Mathematics)
with Specialization in Computing & Informatics
Semester- II</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM2PC3: Theory of Computation</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To familiarize students about theoretical and mathematical aspects of computer science.
- Be exposed to a broad overview of the theoretical foundations of computer science.

Prerequisite: Basics of Discrete Maths.

COURSE OF CONTENTS

UNIT I

Automata Theory: Introduction to Finite Automata, Structural Representations, Automata and Complexity, Central Concepts to Automata Theory, Finite Automata: An Informal Picture of FA, DFA, NDFA, NFA, Equivalence of NFA and DFA, FA with e-transitions: Eliminating €-transitions-Conversion of NFA with e to NFA without e, Conversion of NFA without e to DFA, Conversion of NFA to DFA (direct method), Moore and Mealy machines.

UNIT II

Regular Expressions (RE) and Languages: Regular Expressions – Operators of RE, Building RE, Precedence of operators, Algebraic laws for RE, Arden's Theorem, FA and RE: DFA to RE, RE to DFA (RE to s-NFA & e-NFA to DFA and RE to DFA-direct method), FA limitations, Properties of Regular Languages: pumping lemma for regular languages, closure and decision properties of regular languages, Equivalence and minimization of automata, Lexical analysis and finding patterns in text

UNIT III

Context Free Grammars (CFG) and Languages: Context Free Grammar-Definition, derivations, languages of a grammar, sentential form, Parse Tree, Ambiguity in grammars and languages, Properties of CFL- Normal forms- Chomsky Normal Form and Greibach Normal Form, Eliminating unit productions, useless production, useless symbols, and e-productions, Regular Grammar and Finite Automata, FA to RG and RG to FA, Inter-conversion between left linear and right linear regular grammar

UNIT IV

Push Down Automata (PDA): The Language of PDA, CFG to PDA, PDA to CFG, Deterministic Push Down Automata - Regular language and DPDA, DPDA and CFL, DPDA and ambiguous grammar, Non-deterministic Push Down Automata, The pumping lemma for CFL, Closure properties of CFL, Chomsky Hierarchy.
Turing Machine: Notation, the language of TM, TM and Halting, Programming techniques to TM, Extensions to basic TM, Comparison between FA, PDA.
UNIT V
Petri nets and its Applications; Programming Language Semantics; Verification of Programs; Formal and Type Systems; Computational Complexity. Complexity of Computing using HLL programs and Automata models; Formal Semantics of programming Languages; Verification of Programs.

Learning Outcomes:
By the end of this course, student should be able to

- Apply knowledge of computing and mathematics appropriate to the discipline.
- Be familiar with thinking analytically and intuitively for problem-solving situations in related areas of theory in computer science.
- Apply knowledge of context-free languages, grammar, finite automata, push down automata, and Turing recognizable languages.

BOOKS RECOMMENDED:
[1] Cohen, Introduction to Computer Theory, John Wiley, 1990.
[2] P Linz, An Introduction to Formal languages and Automata, 3/e, Narosa Pub. 2003.
[3] J. Martin, Introduction to Languages and the Theory of Computation, 3/e, Tata McGraw Hill, 2005.
[4] J.Hopcroft and J.D. Ullmam, Introduction to Languages, Automata and Computation, Addition Wesley, 1981.
[5] K L P Mishra and N Chandraskran, Theory of Computer Science, PHI Learning Pvt. Ltd., 2006.

Discipline-Electives-I

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">MSc – I Year (Applied Mathematics)
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Semester- II</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM2EC1: Object Oriented Programming with Core Java</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To learn Object-Oriented programming concepts and techniques using the Java programming language.
- To learn to write, test, and debug introductory level Object-Oriented programs using Java.
- Introduce to the following concepts, which are important workforce activities like: Design/Develop Program, Implement Program, Write code, perform unit testing, Integrate subsystems, Resolve defects and revise and adapt existing code, Test and Validate Program, develop test procedures, perform tests.

Prerequisite: Basic knowledge about computers, test editors etc.

COURSE OF CONTENTS

UNIT-I

Introduction to Java: Features of Java, Object-oriented programming overview, Introduction of Java Technologies, How to write simple Java programs, Data Types, Variables, Memory concepts, decision making operators, Naming Conventions. . Type conversion & casting, Operators, Control Statements, break and continue Statements. Static Method, static field and Math Class, Argument Promotion and Casting,

UNIT-II

Introduction to Java classes and objects: Introduction to Class, Objects, Methods and Instance Variables, Primitive type Vs Reference Type, Initializing Objects with Constructors Scope of declaration and Method Overloading.

String Handling: The String constructors, String operators, Character Exaction, String comparison, String Buffer.

Arrays: Enhanced for Statement, Passing Arrays to Method, Multidimensional Arrays, Variable-Length Argument lists, Using Command-line Arguments. final Instance Variables, this reference, static import, overloaded Constructors, Garbage collection and method finalize, Overloading methods, Parameter passing.

UNIT-III

Inheritance: Relationship between Superclasses and Subclasses, Using super, Constructor in Subclasses, The Object Class, Object Copying in Java.

Polymorphism: Method overriding, upcasting, Dynamic Method Dispatch, final Method and classes, Abstract classes and Methods, instance of operator, Downcasting, Class class, Runtime type Identification

Packages: Defining a Package, Understanding CLASSPATH, Access Protection, Importing packages, creating own packages.

Interfaces Defining an Interface, Properties of interface, advantages of interface achieving multiple inheritance through interfaces, Variables in Interfaces, Comparable interface.

UNIT IV

Exception Handling: Introduction, overview of doing it and keywords used, when to use it, JavaException Hierarchy, finally block, chained exceptions, declaring new exception types, preconditions and postconditions.

Multithreading: What are threads, The java thread model, Thread priorities, Thread life cycle, Creating thread and executing thread, Thread Synchronization, producer-consumer problem without Synchronization, Producer-consumer problem with Synchronization, Other class and Interfaces in java.util. concurrent, Monitor and Monitor Locks, Thread Groups, Synchronization, Inter-thread Communication.

UNIT V

Streams and Files: Introduction, Data Hierarchy, Files and Streams, Sequential-access Text Files, Object Serialization, Random-Access files, Java Stream class Hierarchy.

Introduction To GUI: Introduction, Overview of swing Components, Introduction to Event Handling, Common GUI Event Type and Listener Interfaces, How Event Handling Works, Adapter Classes, Layout Managers.

Applets: Applet basics, Applet Architecture, Applet life cycle methods, Applet HTML Tag and attributes, executing applet in web browser and in the appletviewer.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply Object-Oriented programming concepts and techniques using the Java programming language.
- Write, test, and debug introductory level Object-Oriented programs using Java.

BOOKS RECOMMENDED:

[1] Cay S.Horstmann, Core JAVA Vol-1, Pearson Education, 8th Ed., 2008.

[2] Herbert Schildt, Java: The Complete Reference 7th Edition, Tata McGraw Hill, 2006.

[3] Scott W Amber, The Object Primer, 2nd Ed., Cambridge, 2001.

[4] Timothy, Budd, Object Oriented Programming, Pearson Education, 2001.

[5] Kathy Sierra, Bert Bates, Head First Java, 2nd Edition, Oreilly , 2005.

[6] Balagurswamy, Programming with Java, 3rd Ed., Tata McGraw-Hill Education, 2006.

Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**MSc – I Year (Applied Mathematics)** with Specialization in Computing & Informatics **Semester- II**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
AM2EC2: Comp. Graphics / Multimedia	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**-**	**3**	**1**	**-**	**4**
Duration of Theory Paper: **3 Hours**							

Learning Objectives:
The objectives of the course are to:

- Understand the need of developing graphics applications.
- Learn the hardware involved in building graphics applications.
- Learn algorithmic development of graphics primitives like: line, circle, ellipse, polygon etc.
- Learn the representation and transformation of graphical images and pictures.
- Learn the concept of Colour Generation.

Prerequisite(s): C/C++ programming, Solid high school mathematics: Vectors, Matrices, Basic linear algebra such as solving a system of linear equations, Polynomials, Elementary signal processing (Fourier transform and filtering).

COURSE OF CONTENTS

UNIT I
Introduction to Computer Graphics, Application of Graphics, Display Devices: Refresh Cathode -Ray Tubes, Raster Scan Displays, Random Scan Displays, Color CRT Monitors, Flat Panel Displays. Video cards/display cards Input Devices: Mouse, Trackball, Space ball, Data Glove, Joystick, Light pen, Scanner, Digital Camera, Touch Panels, Voice Systems. Hardcopy Devices: Printers and Plotters

UNIT II
Creation of two dimensional objects and applying simple transformations like Translation, Scaling, Rotation and applying Composite transformations. Graphics Primitives Algorithms for line, polygon and circle. Creation of simple three dimensional objects like cube, cone and cylinder and applying simple transformations like Translation, Scaling, Rotation, Composite transformations, projections –Parallel, Perspective.

UNIT III
Clipping: Clipping operations, Point clipping, Line clipping: Cohen Sutherland Algorithm, Liang Barsky Algorithm, Nicholl-Lee-Nicholl Algorithm. Polygon clipping: Sutherland- Hodgeman Algorithm, Weiler Atherton Algorithm. Text clipping, Exterior clipping.

UNIT IV

Finding out visible surfaces and removal of hidden surfaces in simple objects using object space and image space algorithms, Image enhancement, Image transformation from color to gray scale and vice versa, Image manipulation and Image optimization for web - Usage of editing tools, layers, filters, special effects and color modes. Creation of simple Gif animated images with textual illustrations, Image Compression.

UNIT V

Color Models and Color Application: Color models: Properties of Light. Standard Primaries and the Chromaticity Diagram, XYZ Color Model, CIE Chromaticity Diagram. RGB Color Model, YIQ Color Model, CMY Color Model, HSV Color Model. Conversion between HSV and RGB Models. HLS Color Model, Color Selection and Application. Advancements in the technology in Computer Graphics.

Learning Outcomes:

Upon completing the course, students will be able to:

- Understand the structure of modern computer graphics systems.
- Understand the basic principles of implementing computer graphics primitives.
- Familiarity with key algorithms for modelling and rendering graphical data.
- Develop design and problem solving skills with application to computer graphics.
- Gain experience in constructing interactive computer graphics programs using OpenGL.

BOOKS RECOMMENDED:

[1] A.P.Godse, D.A.Godse, Computer Graphics and Multimedia, Technical Publications, 2009.

[2] D. Hearn & M. Pauline Baker, Computer Graphics, Second Edition, Prentice Hall of India, 1996.

[3] David F. Rogers, Procedural Element of computer Graphics, McGraw Hill International, 1985.

[4] William M. Newman Robert F. Sproull, Principles of Interactive Computer Graphics, McGraw Hill, 1979.

[5] D. Foley, A. van Dam, S.K. Feiner, J.F. Hughes, and R.L. Philips, Introduction to Computer Graphics, Addison-Wesley, 1994.

[6] D. P. Mukherjee, Fundamentals Of Computer Graphics And Multimedia, PHI, 2004.

Discipline-Electives-II

Devi Ahilya University, Indore, India Institute of Engineering & Technology				MSc – I Year (Applied Mathematics) with Specialization in Computing & Informatics Semester- II			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
AM2EM1: Operations Research-I	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**-**	**3**	**1**	**-**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- The course aims at making the students aware of the various techniques, which provides an analytical and objective basis for decisions. These techniques use scientific methods to problems arising from operations involving integrated men, machine and materials and provide a mathematical model to represent complex functional relationships.
- To understand the mathematical tools that are needed to solve optimization problems.
- To develop the skills of decision making in dynamic business situations through quantitative analysis using different mathematical models like LPP, Transportation, Assignment, Queuing etc.

Prerequisite(s): Basic knowledge of differentiation & integration of functions, vector algebra, determinants & matrices and calculus of finite difference.

COURSE OF CONTENTS

UNIT I

Introduction to Operations Research, Linear Programming: Principles of Simplex Method, Simplex Method in Tabular Form, Big-M method, Two phase method, Duality and Dual Simplex Method, Degeneracy and Cycling.

UNIT II

Assignment models: Definition, Mathematical Representation, Formulation and Solution, Alternate optimal solution. Transportation Problems: Definition, Formulation and solution, Alternate optimal solution. Travelling salesman problem

UNIT III

Queuing Theory: Objectives and Different Characteristics of a Queuing System, classification of Queuing models, probability distribution of arrival and service times, Models (M/M/1, M/M/C, $M/E_K/1$, M/D/1, D/D/1).

UNIT IV

Inventory management system, EOQ model with shortage, without shortage and with constraints.

UNIT V

Sequencing Models: Processing n jobs through two machines, m machines, and processing two jobs through m machines.

Simulation: Building a simulation model, Monte-Carlo simulation and applications.

Learning Outcomes:

On completion of this course students should be able to:

- Apply linear programming models in different practical situations.
- Optimize the resources different conditions.
- Know the various situation for queuing in service and industrial situations.
- Develop inventory models for various real-life situations.

BOOKS RECOMMENDED:

1. Hillier, F. S. and Lieberman, G. J. – Introduction to Operation Research, 8th Ed., New York, McGraw- Hill, 2005.
2. Taha, H. A. – Operations Research: An Introduction, 7th ed., Macmillan Publication Co., 2003.
3. Sharma, S.D. – Operations Research, Kedarnath Ramnath & Co., Meerut, 2004.
4. Dantzig G., Thapa M. Linear programming 1: Introduction, Springer, 1997.
5. P K Gupta & D S Hira, Operations Research, S. Chand., 2008.
6. J.K. Sharma, Operations Research: Theory and Application, 3rd Ed., Macmillan, 2006.

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<tr><td colspan="4">Devi Ahilya University, Indore, India
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Semester- II</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM2EM2: Soft Computing Techniques</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce the basic notions and study the techniques of Fuzzy mathematics and study neural network and genetic algorithm.
- Evaluate and compare solutions by various soft computing approaches for a given problem.

Prerequisites: Knowledge of Set theory, algebra of functions.

COURSE OF CONTENTS

UNIT I

Crisp sets, Fuzzy sets and their basic concepts, operations on fuzzy sets, Fuzzy arithmetic, Fuzzy relations, Fuzzy relation equations based on sup – i composition and on Inf – wi composition.

UNIT II

Fuzzy measure, Evidence theory, Possibility theory, Fuzzy sets and possibility theory, Uncertainty based Information.

UNIT III

Fuzzy logic, Classical logic, multivalued logic, Fuzzy propositions, Fuzzy quantifiers, inference from conditional fuzzy propositions. Methods of construction : An overview – Direct methods with one expert – Direct method with multiple experts – Indirect method with multiple experts and one expert – Construction from sample data, Defuzzification, Fuzzy Controllers and their applications.

UNIT IV

Basic concepts, Model of artificial neural Network (ANN), Neural Network architectures, learning methods, Back propagation networks, architecture of back propagation networks, Associative memory, Auto correlators, Adaptive resonance theory, Introduction to ART1 and ART2, Applications.

UNIT V

Fundamentals of Genetic Algorithms (GAs), history, basic concepts and biological background, working principle, encoding, fitness function, reproduction, Genetic modeling, various operators, crossover and mutation, convergence of Genetic Algorithm, Applications.

Learning Outcomes:

Upon completing the course, students will be able to:

- Identify and describe soft computing techniques and their roles in building intelligent machines.
- Apply fuzzy logic and reasoning to handle uncertainty and solve practical problems.
- Apply genetic algorithms to combinatorial optimization problems.
- Apply neural networks to pattern classification and regression problems.

BOOKS RECOMMENDED:

[1] Rajsekaran, G. A. Vijayalakshmi Pai, Neural Netwoks, Fuzzy logic and Genetic Algorithms: Synthesis and Applications, PHI, New Delhi, 2005.
[2] G. J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PHI, New Delhi, 2005.
[3] H. J. Zimmerman, Fuzzy Set Theory and its Applications, Allied Publishers, 1996.
[4] David E. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Kluwer Academic Publishers, Boston, MA, 1989.
[5] B. Kosko, Neural networks and fuzzy systems, Prentice-Hall, 1993.
[6] A.K. Bhargava, Fuzzy Set theory, Fuzzy Logic and their Applications, S. Chand & Co. Pvt. Ltd., New Delhi, 2013.

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

FACULTY OF ENGINEERING

SCHEME OF EXAMINATION (CBCS)
&
COURSE OF CONTENTS

M.Sc. (Applied Mathematics)
(Specialization in Computing & Informatics)
Batch 2015– 2016 and onwards

(www.iet.dauniv.ac.in)

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

Proposed Scheme for CBCS of
M.Sc. (Applied Mathematics)
with specialization in Computing and Informatics

Batch 2015– 2016 and onwards

(Subject to Revision)

SEM I				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM1PC1	Algebra	3-1-0	Core
2.	AM1PC2	Discrete Mathematics	3-1-0	Core
3.	AM1PC3	Numerical Analysis / Integral Equations	3-1-0	Core
4.	AM1SS1	Advanced Communication Skills	2-0-0	Skill
5.	AM1GE**x**	**Generic Elective I**	3-1-0	Generic
6.	AM1PR1	Computer Lab-I (MATLAB)	0-0-2	Practical
7.	AM1CV1	Comprehensive Viva I	0-0-4	Viva
Total Credit for SEM I			**20 actual + 4 Virtual credits**	
		List of Generic Elective I		
1.	AM1GE1	Computer Architecture/ Digital Electronics and Computer Organization	3-1-0	
2.	AM1GE2	Advanced Special Functions	3-1-0	
3.	AM1GE3	Financial Accounts	3-1-0	

SEM II				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM2PC1	Real Analysis / Measure Theory	3-1-0	Core
2.	AM2PC2	Advanced Differential Equations	3-1-0	Core
3.	AM2PC3	Theory of Computation	3-1-0	Core
4.	AM2EC**x**	**Discipline Elective I**	3-0-0	Disc. Elec.
5.	AM2EM**x**	**Discipline Elective II**	3-0-0	Disc. Elec.
6.	AM2PR2	Computer Lab-II (**Of Subject of Discipline Elective -I**)	0-0-2	Practical
7.	AM2CV2	Comprehensive Viva II	0-0-4	Viva
Total Credit for SEM II			**20 actual + 4 Virtual credits**	
		List of Discipline Elective I		
1.	AM2EC1	Object Oriented Programming with Core Java	3-0-0	
2.	AM2EC2	Comp. Graphics /Multimedia	3-0-0	
		List of Discipline Elective II		
1.	AM2EM1	Operations Research-I	3-0-0	
2.	AM2EM2	Soft Computing Techniques	3-0-0	

(PTO)

SEM III				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM3PC1	Topology	3-1-0	Core
2.	AM3PC2	Database Theory	3-1-0	Core
3.	AM3PC3	Mathematical Statistics	3-1-0	Core
4.	AM3SS2	Life Management Skills	2-0-0	Skill
5.	AM3GE**x**	**Generic Elective II**	3-1-0	Generic
6.	AM3PR3	Computer Lab-III (Research Tools)	0-0-2	Practical
7.	AM3CV3	Comprehensive Viva III	0-0-4	Viva
Total Credit for SEM III			**20 actual + 4 Virtual credits**	
		List of Generic Elective II	3-1-0	
1.	AM3GE1	OS/Microprocessor	3-1-0	
2.	AM3GE2	Integral Transforms	3-1-0	
3.	AM3GE3	Financial Management		

SEM IV				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM4PC1	Complex Analysis	3-1-0	Core
2.	AM4PC2	Analysis of Algorithm	3-1-0	Core
3.	AM4PC3	Functional Analysis	3-1-0	Core
4.	AM4EC**x**	**Discipline Elective III ***	3-0-0	Disc. Elec.
5.	AM4EM**x**	**Discipline Elective IV ***	3-0-0	Disc. Elec.
6.	AM4D**xx**	**Discipline Elective V ***	0-2-4	Diss. Work
7.	AM4PR4	Computer Lab-IV (**Of Subject of Discipline Elective -III**)	0-0-2	Practical
8.	AM4CV4	Comprehensive Viva IV	0-0-4	Viva
Total Credit for SEM IV			**20 actual + 4 Virtual credits**	
		List of Discipline Elective III		
1.	AM4EC1	Advanced Java	3-0-0	
2.	AM4EC2	Unix / Linux Administration	3-0-0	
3.	AM4EC3	Computer Network/ Internet & Web Technology	3-0-0	
		List of Discipline Elective IV		
1.	AM4EM1	Operations Research-II	3-0-0	
2.	AM4EM2	Mathematical Modeling	3-0-0	
3.	AM4EM3	Number Theory/Cryptography	3-0-0	
		List of Discipline Elective V		
1.	AM4DW1	**Dissertation (Minor)***	0-0-4	
2.	AM4DS1	Seminar	0-2-0	

* Student will select either **Discipline Elective III and IV or Discipline Elective V.** Internal evaluation of Dissertation work will be based on monthly Seminars (showing progress of work done) and Attendance of students. Final marking will be a combination of Internal and External evaluation.

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<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">MSc – I Year
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with Specialization in Computing & Informatics
Semester- III</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM3PC1: Topology</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To study the properties of space, dimension, and transformation that are preserved under continuous deformations including stretching and bending, but not tearing or gluing.
- It includes properties such as connectedness, continuity, compactness and boundary.

Prerequisites: Basics of sets and functions.

COURSE OF CONTENTS

UNIT I

Countable and uncountable sets, Axiom of choice, Cardinal numbers, Schroeder-Bernstein theorem, Cantor's theorem, continuum hypothesis, Zorn's lemma, Well-ordering theorem. Definition and examples of Topological spaces, Bases and subbases, relative topology, Kuratowski closure operator, neighbourhood systems. Closed sets and limit points, Closure of a set, Dense subsets, Interior, exterior and boundary of a subset, derived sets, continuous functions and homomorphism.

UNIT II

Connected spaces, Connectedness on the real line, Components, Locally connected spaces, Connectedness and product spaces.

UNIT III

Compactness, Continuous functions and compact sets, Basic properties of compactness, Compactness and finite intersection property, Sequentially and Countably compact sets, Local compactness, Countable compactness and Sequential compactness in metric spaces.

UNIT IV

First and second countable spaces, Lindelof’s theorem, separable spaces, second countability and separability, Separation axioms. T_0, T_1, T_2, T_3, T_4, their characterization and basic properties, Urysohn's lemma, Tietze extension theorem.

UNIT V

Nets and Filters: Definition of Net, topology and convergence of Nets, Filters and their convergence, Ultra filters and compactness.

Learning Outcomes:

Upon completing the course, students will be able to:

- Work with sets and functions, images and preimages, and you can distinguish between finite, countable, and uncountable sets.
- Define and illustrate the concepts of the separation axioms, connectedness and compactness, and describe different examples distinguishing general, geometric, and algebraic topology.
- Are familiar with the construction of the fundamental group of a topological space and applications to covering spaces and homotopy theory.
- The student is able to apply his or her knowledge of general topology to formulate and solve problems of a topological nature in mathematics and other fields where topological issues arise.

BOOKS RECOMMENDED:

[1] George F. Simmons, Introduction to topology and modern analysis, McGraw Hill Book Company Inc., 2004.

[2] K. D. Joshi, Introduction to topology, Wiley Eastern, 1983.

[3] James R. Munkres, Topology, Prentice-Hall of India, 2nd Ed., 2000.

[4] K. P. Gupta, Topology, Pragati Prakashan, 2006.

[5] H.K. Pathak, Topology, Shiksha Sahitya Prakashan , Meerut, 2003.

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Semester- III</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM3PC2: Database Theory</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- The course aims to familiarize the students with Database Management System
- To develop skill for developing and managing database applications.
- Define the terminology, features, classifications, and characteristics embodied in database systems.
- To provide an understanding of the relational data model.
- Formulate, using relational algebra, solutions to a broad range of query problems.

Prerequisite(s): Knowledge of lists, hash tables, arrays, search trees and programming experience.

COURSE OF CONTENTS

UNIT-I

Database Environment: Basic concepts, Comparison with Traditional file processing system, Merits & demerits of database approaches, Ranges of Database applications; Components of Database Environment;
Database Development Process: Systems development process, Three-Schema Architecture for Database Development.

UNIT-II

Database Analysis: Business Rules; E-R Model Construct; Cardinality Constraints; Enhanced E-R Model & business Rules, Modeling Enhanced relationship – Specialization & Generalization, specifying constraints in Supertype/Subtype Relationship, Entity Clustering; Case Studies.

UNIT-III

Database Design: Relational Data Model – Codd’s Rules, Integrity Constraints; Transforming EER Diagram into Relations; Functional Dependencies. Normalization and Denormalization.
Physical Database Design: File Organization, Physical Database Design Process, Index - Primary Key Index; Secondary Key Index; When to use Index;Improving file access performance; RAID Levels;

UNIT-IV

SQL: DDL, DML, DCL commands; processing single Table, Processing Multiple Table, Join operations;
Advanced SQL: PL/SQL Constructs – View, Triggers, Cursor, Exception Handling and Routines; Embedded SQL and Dynamic SQL, Transaction Processing – Properties, Schedules & Serializability Issues.

UNIT-V
Relational algebra: introduction, Selection and projection, set operations, renaming,Joins, Division, syntax, semantics. Operators, grouping and ungrouping,relational comparison. **Calculus:** Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities.

Learning Outcomes :
Upon successful completion of the course, the student will be able to:

- Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
- Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.
- Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.
- Use a desktop database package to create, populate, maintain, and query a database.
- Demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface.

BOOKS REOMMENDED:
[1] J. Hoffer, M. Prescott, and F McFadden, Modern Database Management, 6/e, Pearson Education, 2006.
[2] S. B. Navathe, R. Elmasri, S.K.Gupta, D.V.L.N. Somayajulu, Fundamentals of Database System, 4/e, Pearson Education, 2004.
[3] A. Silberschatz, H. Korth, and S. Sudarshan, Database System Concepts, 5/e, McGraw-Hill, 2005.
[4] C.J. Date, An Introduction to Database Systems, 7/e, Pearson Education, 2006.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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Semester- III</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM3PC3: Mathematical Statistics</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
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</table>

Learning Objectives:

- To equip the student with the mathematical theory of statistics underlying the modern practices and applications of statistics to engineering, physics & astronomy, quality assurance & reliability, drug development, public health & medicine, the design of agriculture or industrial experiments, experiments of psychology and so forth.
- To provide an understanding for the student on statistical concepts to include measurements of location and dispersion, probability, probability distributions, sampling, estimation, hypothesis testing, regression, and correlation analysis, basic methods of statistical quality control and stochastic process.

Prerequisites: Knowledge of Elementary probability, matrices, determinants and statistics.

COURSE OF CONTENTS

UNIT I

Review of probability –Random variable and Distribution function. Marginal and joint Probability distribution, Mathematical expectation of sum and product of random Variables. Moments, Cumulates and their interpolationship. Moment generating function and cumulate generating function, Binomial Normal and Poisson distribution with their properties.

UNIT II

Correlation and Regression; definition, regression coefficient; lines of regression; partial and multiple correlations, concept of estimation, definition of unbiasedness, Consistency and Efficiency, Statistical Decision making: Risk function, loss function; baye's approach.

UNIT III

Theory of Sampling, Standard error, Population and Sample Survey Methods, Test of significance for Mean, Variance, Proportion and correlation Coefficient., Sampling distribution- Chi-square test, t-test and F-distribution, Test of Hypothesis, Type I and II Error, Neyman's Pearson's Carpell Pearson's Lemma for Best Critical Region, Construction of test for mean and variance based on Neyman's Pearson's Lemma.

UNIT IV

Analysis of variance for one and two way classified data, Statistical Quality Control, Definitions, Control Charts, process capability, Acceptance Sampling: Single, Double and sequential sampling plans, O.C. curves, producer's and consumer's risk, A brief idea of Taguchi method.

UNIT V

Stochastic Process: Classification of stochastic processes, Autocorrelation function Poissonian Process-Queuing and birth and death process; Markovian process. Renewal theory. Reliability: Basic Concepts, Evaluation of system reliability.

Learning Outcomes:

Upon completing the course, students will be able to:

- To design experiments and surveys for efficiency to perform complex data management and analysis.
- Provide a conclusion to the study including a discussion of limitations of the analysis.
- To apply discrete and continuous probability distributions to various business problems.
- Successfully relate theoretical concepts to a real-world problem.
- Understand how a control chart is used to detect assignable causes and how to apply pattern analysis.
- Apply essential stochastic modelling tools including Markov chains and queuing theory;
- Students will execute statistical analyses with professional software.

BOOKS RECOMMENDED:

[1] S.C.Gupta & V.K.Kapoor, Fundamentals of Mathematical statistics, Sultan Chand & Sons., 2000.

[2] Freund John E, Mathematical statistics, PHI, N.D., 7th Ed., 2010.

[3] Papoulis Athanasios & S. Unnikrishna Pillai, Probability, Random variables and Stochastic processes, Mc-graw Hill Book Co., 4th Ed. 2002.

[4] S.C.Gupta, Fundamentals of Statistics, Himalaya Publishing House, Mumbai, 6th Ed., 2009.

[5] K. S. Trivedi, Probability and statistics with reliability, queuing, and computer science applications, John Wiley & Sons, 2006.

[6] T. Veerarajan, Probability, Statistics And Random Processes, Tata McGraw-Hill Education, 2002.

Soft -Skill

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
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Semester- III</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM3SS2: Life Management Skills</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">2</td></tr>
<tr><td>Duration of Theory Paper:
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</table>

Learning Objective:

- To make students aware of various skills that are needed to express themselves properly to the society such as social and thinking skills.
- To provide students the methods for self-analysis in order to improve themselves.
- To make students learn various leadership skills along with negotiation skills.

Pre-requisites: Nil.

COURSE CONTENTS

UNIT I

Personality: Defining Personality, Personality Determinants, Personality Traits, The Big 5 Model, Personality Attributes, Types of Personality, Personality Development.
Motivation- Maslow's Needs Hierarchy, Theory X- Theory Y, Herzberg's Two-factor theory, ERG theory, Vroom's Expectancy theory

UNIT II

Life Skills for Personality Development: Life Skills- Generic, Problem Specific and Area Specific Skills, Types - Social Skills,Thinking Skills, and Coping Skills.
Social Skills and Negotiation Skills: Self-Awareness: Definition, Types of Self- Self Concept, Body Image, Self Esteem, Techniques used for Self Awareness-Johari Window, SWOT Analysis, Empathy- Sympathy, Empathy & Altruism, Interpersonal Relationship- Definition, Factors affecting Relationships.

UNIT III

Thinking Skills: Thinking, Nature, Elements of Thought, Types of Thinking,Concept Formation, Reasoning,Creative & Critical Thinking - Definition, Nature, Stages, Problem Solving: Definition, Steps and Factors Influencing Problem Solving.
Perception& Decision Making: Importance of Perception, Factors influencing perception – Selective Perception, Halo effect, Projection, Stereotyping. Decision Making–Definition, Need, Process, Consequences.

UNIT IV

Coping Skills: Emotions - Definition, Characteristics, Types, Classification: Wheel Model, Two-Dimensional Approach, Emotional Intelligence & EQ.

Coping Strategies: Coping with Stress, Definition, Stressors, Sources of Stress, the General Adaptive Syndrome Model of Stress. Conflict Management- Sources, Impacts of Conflict and Conflict Resolution.

UNIT V

Leadership: Definition of Leadership Classification: Types of Leaders and Styles of Leadership, Managerial Grid, Characteristics and Functions of Leadership Values and Ethics of Leadership.

Theories of leadership: Leader Member Exchange Theory, Contingency Theory, Path- Goal Leadership Theory, Transformational Leadership Theory, Charismatic Theory.

Leaning Outcomes:

- Upon completion of the syllabus, students will be able to:
- Understand how to think in logical way to take right decisions.
- Various traits that separate leader from a non-leader; and develop these into self.
- Understand basics of how emotions control our decisions and use them in a positive way.
- Gain knowledge of how they could groom their personality by improving basic thoughts and skills.

BOOKS RECOMMENDED:

[1] Stephen P. Robbins, Organizational Behaviour, Pearson Edu., 10th Ed., 2003.

[2] Debra McGregor, Developing Thinking; Developing Learning. A Guide to Thinking Skills in Education, Open University Press, McGraw Hill House, 2007.

[3] Kumar Mahi. Stress Coping Skills Ebook, Health & Medicine, Technology, 2009.

[4] Stephen P. Robbins, Timothy A. Judge, Seema Sanghi, Organizational Behaviour, Dorling Kindersley (India) Pvt. Ltd., Pearson Edu., 2007.

[5] Ryan Carey, The Effective Altruism Handbook, Published in 2015 by the Centre For Effective Altruism Oxford, Oxfordshire United Kingdom.

[6] Life Skills – Skills for Life: A handbook, International Federation of Red Cross and Red Crescent Societies Reference Centre for Psychosocial Support, Paramedia 1662, Denmark. 1st edition, 2013.

[7] Jit S. Chandan , Organizational Behaviour, Vikas Publishing House, 3rd Ed., 2006.

Generic-Electives

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM3GE1: OS/Microprocessor</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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</table>

Learning Objective:

- Aim of this course is to aware students about the hardware of computers, operating system management
- To provide the fundamentals of microprocessor 8085.

Prerequisite(s): Nil

COURSE OF CONTENTS

UNIT-I

Introduction to Operating System

Types of OS: Batch system, Multiprogramming, Time Sharing, Distributed & real time OS. Computer Structures and OS: System Architecture-I/O, Storage, Processor, System Components- OS Service, System Calls, Programs; System Design, Implementation and Generation, Case study.

UNIT-II

Process and Storage Management

Cooperation, Interprocess Communication. CPU Scheduling: Basic idea and Algorithms; Process Synchronization. Swapping, Segmentation, Paging and Contiguous Allocation. Virtual Memory: Demand Paging, Frame Allocation and Thrashing Demand Segmentation. File System: Access method, Directory Structure, File-System Management. Case study.

UNIT-III

I/O Management

I/O Interfacing, I/O Requests and Interrupts. Disk Management: Disk structure & Scheduling, Swapping and Stability Issues. Disk Reliability. Case Study.

UNIT-IV

Introduction of 8085 Microprocessor and Addressing Modes:

Architecture of 8085 processor. Register Architecture: Accumulator, Temporally Register and Flag Register. Program Counter, Stack pointer and Instruction register. Direct addressing mode and Register direct Addressing Mode. Register Indirect Addressing Mode, Immediate Addressing Mode and Implicit or Implied Addressing Mode.

UNIT-V

Processors and Memory Hierarchy: CISC & RISC Architectures – CISC Family – RISC, Scalar processors – Super Scalar Processors and their features – Very Long Instruction word Architecture vector & symbolic processors, Memory hierarchy.

Learning Outcomes:

Upon completing the course, students will be able to:

- Demonstrate understanding of the concept, structure and design of operating system and it's impact on application system design and performance.
- Understand how the operating system manages its resources.
- Describe how computing resources (such as CPU and memory) are managed by the operating system, describe the basic principles used in the design of modern operating systems.
- Summarize the full range of considerations in the design of file systems, summarize techniques for achieving synchronization in an operation system,
- Compare and contrast the common algorithms used for both pre-emptive and non-pre-emptive scheduling of tasks in operating systems, such a priority, performance comparison, and fair-share schemes. Contrast kernel and user mode in an operating system.

BOOKS RECOMMENDED:

[1] Silber Schatz and P.B. Galvin, Operating System Concepts, Addison Wesely, 1998.

[2] P. K. Ghosh, P. R. Sridhar, 0000 to 8085, Introduction to Microprocessor PHI Learning Pvt. Ltd., 2009.

[3] A.S. Godbole, Operating System, Tata McGraw Hill, 2005**.**

[4] Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, Prentice Hall PTR, 2002.

[5] W. Stallings, Operating systems, 4th Edition, Pearson Education, 2003.

[6] Y C Liu and G A Gibson, Microcomputer Systems, PHI, 2nd, Ed., 2003.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM3GE2: Integral Transforms</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- The goals for the course are to gain a facility with using the transform, both specific techniques and general principles, and learning to recognize when, why, and how it is used.
- Explain the concept of integral transforms, e.g., Laplace, Fourier transforms and the related inverse transforms by using the following Partial fractions method, Tables, Convolution theorems and apply these transformation for engineering problems

Prerequisites: Basics of Calculus.

COURSE OF CONTENTS

UNIT I

Laplace transforms: Definitions, properties, Laplace transforms of some elementary functions, Convolution Theorem, Inverse Laplace transformation.

UNIT II

Fourier transforms: Definitions, Properties, Fourier transforms of some elementary functions, Convolution theorems, Fourier transform as a limit of Fourier Series.

UNIT III

Application of Laplace Transform to differential equations, Application of Laplace Transform to integral equation, Application of Laplace Transform to initial and Boundary Value Problems. Application of Fourier Transform to initial and Boundary Value Problems, Finite Fourier Sine and Cosine Transform, Inversion, Operational properties Fourier transform.

UNIT IV

Hankel's Transform: Definition, properties, Parseval's theorem, Finite Hankel's transform, Application of Hankel's transform in initial and boundary value problems.

UNIT V

Mellin's Transform: Definition, Mellin's Inversion theorem, properties, Convolution theorem.

Learning Outcomes:

Upon completing the course, students will be able to:

- Gain a range of techniques employing the Laplace and Fourier Transforms in the solution of ordinary and partial differential equations.
- Apply transform techniques to analyze continuous-time and discrete-time.
- Use the Integral Transforms in Circuit Analysis.

BOOKS RECOMMENDED:

[1] Sneddon I., The Use of Integral Transforms, Tata McGraw Hill, 1979.

[2] Murray R. Spiegel, Laplace Transforms Schaum's Outline Of Theory and Problems Of Laplace Transforms, 1965.

[3] Ram P Kanwal, Linear Integral Equations, Academic Press, 1971.

[4] A. R. Vasishtha and R.K. Gupta, Integral Transforms, Krishna Prakashan Media Ltd, Meerut, India, 2000.

[5] J.K. Goyal and K. P. Gupta, Integral Transforms, Pragati Prakashan, Meerut, India, 2013.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM3GE3: Financial Management</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
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Learning Objectives:

- To give an in-depth knowledge of business finance and how they should be recorded, classified & interpreted to get a meaningful judgment of viability & decision making about the efficiently conduct of the business.
- To equip the students with the Financial Management methods & techniques and their application to business problems. The emphasis will be on the concepts and application rather than derivations. It also focuses on the critical elements of financial decision-making for organizations, including investment decisions, sources of finance, management of working capital and performance appraisal.

Prerequisite(s): Students must be aware about the basics terminology of financial accounting & Financial Statement.

COURSE OF CONTENTS

UNIT I

Scope of Financial Management, Time value of money: Introduction to various sources of finance Leverages, Meaning of leverage, Significance of operating & financial Leverage.

UNIT II

Capital Structure: Meaning of capital Structure Different Capital Structure Theories.

UNIT III

Working Capital Management: Concept of Working Capital, Management of cash Management of Inventories, Management of Account Receivable Management, Accountants Payable Over Trading and Under Trading.

UNIT IV

Long term investment Decision: Capital Budgeting, Cost Volume Profit Analysis.

UNIT V

Marginal Costing Introduction to marginal costing, Decision making in alternative, Choices, Dividend Policy in Practice.

Learning Outcomes:

Upon completing the course, students will be able to:

- Describe the financial environment within which organizations must operate.
- Critically evaluate the financial objectives of various types of organizations and the respective requirements of stakeholders.
- Discuss the function of capital markets.
- Explain alternative sources of finance and investment opportunities and their suitability in particular circumstances.
- Assess the factors affecting investment decisions and opportunities presented to an Organization.
- Select and apply techniques in managing working capital.
- Analyze a company's performance and make appropriate recommendations.

BOOKS REOMMENDED:

1. S. N. Maheshwari , Financial Management: Principles & Practice, Sultan Chand & Sons, 2013.
2. M.Y. Khan & P.K. Jain Financial Management, McGraw Hill Education; Seventh edition, 2017.
3. Arthur J. Keown, John D. Martin, J. William Petty & David F. Scott, Jr., Financial Management. Pearson Education, Limited, 2004.
4. I.M. Pandey, Financial Management, Vikas Publishing House, 11 Ed., New Delhi, 2015.
5. R.P.Rastogi, "Graded Problems and Solutions in Financial Management", Galgotia Publication, 5th Edition, New Delhi, 2000.

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FACULTY OF ENGINEERING

SCHEME OF EXAMINATION (CBCS)
&
COURSE OF CONTENTS

M.Sc. (Applied Mathematics)
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Batch 2015– 2016 and onwards

(www.iet.dauniv.ac.in)

DEVI AHILYA VISHWAVIDYALAYA, INDORE
INSTITUTE OF ENGINEERING & TECHNOLOGY

Proposed Scheme for CBCS of
M.Sc. (Applied Mathematics)
with specialization in Computing and Informatics

Batch 2015– 2016 and onwards

(Subject to Revision)

SEM I				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM1PC1	Algebra	3-1-0	Core
2.	AM1PC2	Discrete Mathematics	3-1-0	Core
3.	AM1PC3	Numerical Analysis / Integral Equations	3-1-0	Core
4.	AM1SS1	Advanced Communication Skills	2-0-0	Skill
5.	AM1GE**x**	**Generic Elective I**	3-1-0	Generic
6.	AM1PR1	Computer Lab-I (MATLAB)	0-0-2	Practical
7.	AM1CV1	Comprehensive Viva I	0-0-4	Viva
Total Credit for SEM I			**20 actual + 4 Virtual credits**	
		List of Generic Elective I		
1.	AM1GE1	Computer Architecture/ Digital Electronics and Computer Organization	3-1-0	
2.	AM1GE2	Advanced Special Functions	3-1-0	
3.	AM1GE3	Financial Accounts	3-1-0	

SEM II				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM2PC1	Real Analysis / Measure Theory	3-1-0	Core
2.	AM2PC2	Advanced Differential Equations	3-1-0	Core
3.	AM2PC3	Theory of Computation	3-1-0	Core
4.	AM2EC**x**	**Discipline Elective I**	3-0-0	Disc. Elec.
5.	AM2EM**x**	**Discipline Elective II**	3-0-0	Disc. Elec.
6.	AM2PR2	Computer Lab-II (**Of Subject of Discipline Elective -I**)	0-0-2	Practical
7.	AM2CV2	Comprehensive Viva II	0-0-4	Viva
Total Credit for SEM II			**20 actual + 4 Virtual credits**	
		List of Discipline Elective I		
1.	AM2EC1	Object Oriented Programming with Core Java	3-0-0	
2.	AM2EC2	Comp. Graphics /Multimedia	3-0-0	
		List of Discipline Elective II		
1.	AM2EM1	Operations Research-I	3-0-0	
2.	AM2EM2	Soft Computing Techniques	3-0-0	

(PTO)

SEM III				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM3PC1	Topology	3-1-0	Core
2.	AM3PC2	Database Theory	3-1-0	Core
3.	AM3PC3	Mathematical Statistics	3-1-0	Core
4.	AM3SS2	Life Management Skills	2-0-0	Skill
5.	AM3GE**x**	**Generic Elective II**	3-1-0	Generic
6.	AM3PR3	Computer Lab-III (Research Tools)	0-0-2	Practical
7.	AM3CV3	Comprehensive Viva III	0-0-4	Viva
Total Credit for SEM III			**20 actual + 4 Virtual credits**	
		List of Generic Elective II	3-1-0	
1.	AM3GE1	OS/Microprocessor	3-1-0	
2.	AM3GE2	Integral Transforms	3-1-0	
3.	AM3GE3	Financial Management		

SEM IV				
S.No.	**Sub Code**	**Sub Name**	**Number of Credits L-T-P**	**Type**
1.	AM4PC1	Complex Analysis	3-1-0	Core
2.	AM4PC2	Analysis of Algorithm	3-1-0	Core
3.	AM4PC3	Functional Analysis	3-1-0	Core
4.	AM4EC**x**	**Discipline Elective III** *	3-0-0	Disc. Elec.
5.	AM4EM**x**	**Discipline Elective IV** *	3-0-0	Disc. Elec.
6.	AM4D**xx**	**Discipline Elective V** *	0-2-4	Diss. Work
7.	AM4PR4	Computer Lab-IV (**Of Subject of Discipline Elective -III**)	0-0-2	Practical
8.	AM4CV4	Comprehensive Viva IV	0-0-4	Viva
Total Credit for SEM IV			**20 actual + 4 Virtual credits**	
		List of Discipline Elective III		
1.	AM4EC1	Advanced Java	3-0-0	
2.	AM4EC2	Unix / Linux Administration	3-0-0	
3.	AM4EC3	Computer Network/ Internet & Web Technology	3-0-0	
		List of Discipline Elective IV		
1.	AM4EM1	Operations Research-II	3-0-0	
2.	AM4EM2	Mathematical Modeling	3-0-0	
3.	AM4EM3	Number Theory/Cryptography	3-0-0	
		List of Discipline Elective V		
1.	AM4DW1	**Dissertation (Minor)***	0-0-4	
2.	AM4DS1	Seminar	0-2-0	

* Student will select either **Discipline Elective III and IV or Discipline Elective V.** Internal evaluation of Dissertation work will be based on monthly Seminars (showing progress of work done) and Attendance of students. Final marking will be a combination of Internal and External evaluation.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM4PC1: Complex Analysis</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
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</table>

Learning Objectives:

- To study the techniques of complex variables and functions together with their derivatives, Contour integration and transformations.
- To study complex power series, classification of singularities, calculus of residues and its applications in the evaluation of integrals, and other concepts and properties.

Prerequisites: Set theory, calculus of real functions, algebra of complex numbers.

COURSE OF CONTENTS

UNIT I

Exponential and Trigonometric functions, Analytic (Holomorphic) functions, Necessary and sufficient condition for analyticity (Cauchy-Riemann equations), Polar form of Cauchy-Riemann equations, Harmonic functions, Harmonic Conjugate.

UNIT II

Complex Integration, Cauchy's theorem, Cauchy's Integral formula, higher order derivative of analytic function, Morera's Theorem, Poisson's integral formula for a circle, Cauchy's Inequality, Liouville's theorem.

UNIT III

Expansion of analytic function as power series : Taylor and Laurent theorem, Zeros of an analytic function, Singularities and types, Meromorphic functions, principle of Argument, Roche's theorem, , fundamental theorem of algebra, Maximum Modulus Principle, Schwarz Lemma.

UNIT IV

Residue, Cauchy's Residue theorem, evaluation of definite integrals, their properties and classification. Definitions and examples of conformal transformation, bilinear transformation, their properties and classification.

UNIT V

Harmonic functions and mappings, Inverse mappings, Schwarz's Reflection principle. Analytic continuation, uniqueness of direct analytic continuation and analytic continuation along a curve, power series method of analytic continuation. Homotopic curves, Monodromy theorem, Picard theorem.

Learning Outcomes:
Upon completing the course, students will be able to:

- Students will be equipped with the understanding of the fundamental concepts of complex variable theory and skill of contour integration to evaluate complicated real integrals via residue calculus.
- Apply problem-solving using complex analysis techniques applied to diverse situations in physics, engineering and other mathematical contexts.

BOOKS REOMMENDED:

[1] Walter Ruddin, Real and Complex Analysis, McGraw-Hill International Editions, 3/e, 1987.
[2] Ahifors.L. V., Complex Analysis., McGraw Hill, New York**,** 2/e**,**1983.
[3] Dr. H. K. Pathak, Complex Analysis, Shiksha Sahitya publication 2/e, 2007.
[4] S.Ponnusamy : Foundations of Complex Analysis, Narosa Pub, `97.
[5] Kasana H.S., Complex Variables: Theory and Applications, Prentice-Hall of India Pvt. Ltd, 2nd edition, 2005.

<table>
<tr><td colspan="4">Devi Ahilya University, Indore, India
Institute of Engineering & Technology</td><td colspan="4">MSc – I Year (Applied Mathematics)
with Specialization in Computing & Informatics
Semester- IV</td></tr>
<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM4PC2: Analysis of Algorithm</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To introduce approaches for analysing algorithms in various domains.
- Techniques for designing efficient algorithms.
- Have a sense of the complexities of various problems in different domains.

Prerequisite: Knowledge of data structures may assist the learning process.

COURSE OF CONTENTS

UNIT-I

Introduction to Algorithms: Design & analysis issues; Types of algorithms; Performance issues - Time and space complexity; Asymptotic analysis. Mathematical preliminaries; functions & their growth rates; Recurrence relations, Methods for solving recurrences.

UNIT-II

Analysis of Some Sorting and Searching Algorithms: Elementary sorting techniques: Selection, Bubble, and Insertion sorts; Advanced sorting techniques: Heap, Merge and Quick sorts; Radix & Bucket sorts. Searching techniques: Linear and binary search; Searching minimum and maximum elements.

UNIT-III

Algorithms Design Techniques: Divide–and-Conquer, Greedy Method, Dynamic programming, Backtracking and Branch-and- Bound; Illustration of above strategies using appropriate examples like; Knapsack problem, Optimal storage on tapes, finding shortest path, all pairs shortest path, finding minimum cost spanning trees, Queens problems, Travelling salesperson problem etc.

UNIT-IV

Analysis of Matrix and Polynomial Algorithms: Boolean Matrix Multiplication's; Strassen's matrix multiplication; Matrix chain multiplication problem; Solving Linear Equations, Computation of polynomials – Horner's method. String matching algorithms.

UNIT-V

Non-deterministic Algorithms: Introduction. Nondeterministic Complexity, Computational classes: – P, NP, NP Complete, and NP-Hard; reducibility, Decision and optimization problems, Some NP and NP-Hard problems: Hamiltonion cycle, Traveling Salseperson (TSP). Satisfiability, Clique problems etc.

Learning Outcomes:

Upon completing the course, students will be able to:

- Apply design principle and concept to algorithm design.
- Knowledge of mathematical foundation in analysis of algorithms.
- Analyse the efficiency of algorithms using time and space complexity theory.
- Learn how to analyse algorithms and estimate their worst-case and average-case behaviour.
- Become familiar with fundamental data structure and with the manner in which these data structure can best be implemented.

BOOKS RECOMMENDED:

[1] T.H. Coreman, C.E. Leiserson and R.L. Rivest, Introduction to Algorithms, Prentice Hall of India, 1990.

[2] E. Horowitz, S. Sahni, S Rajasekaran, Computer Algorithms, Galgotia Publications, ND, 2002.

[3] Saara Base, Computer Algorithms: Introduction to Design and Analysis, Addision Wesley, 2/e, 1988.

[4] Knuth, D, The art of computer programming , Vols. 1-2-3, Addision Wesley, 1968-73.

[5] A V Aho, J E Hopcroft & J D Ullman, The Design and Analysis of Computer Algorithms, Addison Wesley, 1974.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM4PC3: Functional Analysis</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- To study certain topological-algebraical structures and the methods by which the knowledge of these methods can be applied to analytic problems.
- The objectives of the course is the study of the main properties of bounded operators between Banach and Hilbert spaces, the basic results associated to different types of convergences in normed spaces and the spectral theorem and some of its applications.

Prerequisites: Set theory, algebra of functions.

COURSE OF CONTENTS

UNIT I

Linear Space, Normed linear spaces, Quotient norm spaces, linear transformation, Banach spaces, continuous linear transformations, bounded linear transformation, Linear Functional, Riesz lemma.

UNIT II

Conjugate space, Hahn-Banach theorem and its consequences, the natural embedding of the normed linear space in its second conjugate space, open mapping theorem, closed graph theorem, conjugate of an operator, uniform boundedness principle.

UNIT III

Inner product space, definition and examples of a Hilbert space, simple properties, orthogonal sets, orthonormal sets, Bessel inequality, conjugate space, Riesz representation theorem.

UNIT IV

Adjoint operator, self adjoint operators, Normal and unitary operators, Projections, Eigen values and eigenvectors of an operator on a Hilbert space, determinants and spectrum of an operator, spectral theorem on a finite dimensional Hilbert space.

UNIT V

Definition and example of Algebra, Banach Algebra, sub algebra, Normed Algebra, Regular and Singular elements and their properties, Spectrum, Spectral radius, Commutative Banach algebra, Involution in Banach algebra, Gelfand-Neumark representation theorem.

Learning Outcomes:

Upon completing the course, students will be able to:

- To learn to recognize the fundamental properties of normed spaces and of the transformations between them.
- Understand the notions of dot product and Hilbert space and apply the spectral theorem to the resolution of integral equations.
- Correlate Functional Analysis to problems arising in Partial Differential Equations, Measure Theory and other branches of Mathematics.

BOOKS RECOMMENDED:

[1] E. Kreyszig, Introductory Functional Analysis with applications, John Wiley & Sons, 1989.

[2] George F. Simmons, Introduction to topology and modern analysis, McGraw Hill Book Company Inc., 1963.

[3] B. Chaudhary, S. Nanda, Functional Analysis with applications, Wiley Eastern Ltd., 1989.

[4] H.L. Royden, Real Analysis, Macmillan Publishing Co. Inc. New York, 4th Edition, 1993.

[5] Walter Rudin, Functional Analysis, McGraw-Hill Publishing Co., 1973.

[6] H.K. Pathak, Functional Analysis with applications, Shiksha Sahitya Prakashan, 3rd Edition, 2013.

Discipline-Electives-I

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM4EC1: Advanced Java</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objective:

- Learn the fundamentals of JDBC and using the different interfaces in the JDBC API.
- Learn how to use Java servlets in the role of Web application control.
- Identify the options to state management in a Java Web application and understand the pros/cons of each. Understand how JSPs can help to separate Web logic and functionality from page layout.
- Explore how to make JSPs smaller and more powerful with JSTL, custom tags and expression language. Explore strategies in the exchange of data between Web pages (views) and business processing (model).
- Learn the meaning and importance of EJB

Prerequisites: Basic Knowledge of Core Java, an understanding of Web technologies like HTML and HTTP is helpful, prior knowledge of Database will be supportive.

COURSE OF CONTENTS

UNIT I

Advanced I/O Streams: I/O fundamentals, Byte Streams, Character Streams, Node streams, Buffered Streams, Basic Byte Stream Classes, Basic Character Stream Classes. **Networking:** Sockets, Setting up the Connection, Addressing the Connection, Port numbers, Java Networking model, TCP/IP Server and Client, Datagrams, Cookies.

UNIT II

Abstract Windows Toolkit (AWT) : Components and Graphics, Containers, Frames and Panels, Layout Managers, Border layout, Flow layout, Grid layout, Card layout, AWT all components, Event delegation Model, Event source and handler, Event categories, Listeners, interfaces, Anonymous classes, Swing Libraries, Model view Controller design pattern, Different layout, menus dialog boxes, text input.

UNIT III

Introduction to JFC and Swing, Features of the Java Foundation Classes, Swing API Components, JComponent Class, Windows, Dialog Boxes, and Panels, Labels, Buttons, Check Boxes, Menus, Toolbars, Implementing Action interface, Pane, JScrollPane, Desktop pane, Scrollbars, Lists and Combo Boxes, Text-Entry Components, Colors and File Choosers, Tables and Trees, Printing with 2D API and

Java Print Service API. **Servlets:** Overview, Servlet Life Cycle, Servlet API, javax.servlet package, javax.servlet.http Package, JSP Page.

UNIT IV

JDBC: Overview, Types of JDBC drivers, JDBC applications, Types of statement objects (Statement, Prepared Statement and Callable Statement), Types of result set, Result Set Metadata, Inserting and updating records, JDBC and AWT, Connection pooling. **RMI:** Introduction & Architecture of RMI, Java RMI classes and interfaces, writing simple RMI application, Parameter passing in remote methods (marshalling and unmarshalling), Using RMI with Applets, Introduction to CORBA.

UNIT V

Introduction to EJB, Benefits of EJB, Types of EJB, Session Bean, Message-Driven Bean, Client **Access with Interfaces:** Remote Access, Local Access, Local Interfaces and Container-Managed Relationships, Web Service Clients, Method Parameters and Access, The Contents of an Enterprise Bean, Naming Conventions for Enterprise Beans, The Life Cycles of Enterprise Beans, The Life Cycle of a Stateful and Stateless Session Bean, The Life Cycle of a Message-Driven Bean Building Web Services with JAX-WS: Setting the Port, Creating a Simple Web Service and Client with JAX-WS.

Learning Outcomes:

Upon completing the course, students will be able to:

- Develop Swing-based GUI
- Develop client/server applications and TCP/IP socket programming
- Update and retrieve the data from the databases using SQL
- Develop distributed applications using RMI
- Develop component-based Java software using JavaBeans
- Develop server side programs in the form of servlets

BOOKS RECOMMENDED:

[1] Herbert Schildt, Java: The Complete Reference 7th Edition, Tata McGraw Hill, 2006.

[2] Dustine R Callway, Inside Servlets, Addison-Wesley, 2001.

[3] James Goodwill, Developing Java Servlets. 2nd Ed., Sams, 2001.

[4] Chad Darby, John Griffin, Pascal de Haan, Beginning Java Networking, Wrox Press, 2001.

[5] Jim Keogh, Complete Reference- J2EE, ata McGraw-Hill Education, 2002.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM4EC2: Unix/Linux Administration</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objective:
- To provide an introduction to an operating system that is assembled under the model of free and open source software development and distribution.
- To develop software in and for Linux/UNIX environments.
- Understanding the basic set of commands and utilities in Linux/UNIX systems.
- To learn to develop software for Linux/UNIX systems.
- To understand the inner workings of UNIX-like operating systems.

Prerequisites: Basics of DOS.

COURSE OF CONTENTS

UNIT I

Evolution of Unix OS, philosophy. Features of Unix operating system, Basic Architecture of Unix/Linux system, features of Kernel and Shell. Unix File system - Boot block, super block, Inode table, data blocks, How Unix/Linux kernel access files, Unix/Linux standard file system.

UNIT II

Basic UNIX environment: Basic commands, directory management, pipes, tee, I/Oredirection and other utilities. **Advanced commands:** File system and process management commands, Shell, Pattern matching, navigating the File Systems.

UNIT III

Unix editor: VI editor, Creating new files. Text addition, deletion and changes. Dealing with sentences and paragraphs. Searching. Cut, paste and copy. Running C/C++ programs. **Shell programming**: Features of shell. Shell variables. Control statements. **Advance shell programming**: Command line arguments. Interactive shell scripts. Debugging of shell scripts. Communication facilities in Unix, Mathematical commands.

UNIT IV

Structure of Unix operating system: Structure of Unix kernel, Unix system calls. **Unix system**: File system calls, Process management calls. **Advance Filter:** Awk: Number processing, Interface with shell, functions.

UNIT V

Unix system administration: Adding and removing users. User accounting. Adding and removing hardware. Performing backups and restore. Disk space management. **Unix system administration**: Configuring the kernel. Network management in Unix. Performance analysis. Unix Desktop. Installation of Unix/Linux system – Unix/Linux Installion requirement, complete Procedure steps, Partitioning the Hard drive, System startup and shut-down process, init and run levels. File system mounting, lpstat, backup strategy, installing software on Unix/Linux.

Learning Outcomes:

Upon completing the course, students will be able to:

- Ability to Plan, Deploy and Linux Server
- Ability Monitor and Manage Linux Server.
- Perform the tasks of a Network Administrator.
- Write programme in using shell programming.

BOOKS RECOMMENDED:

[1] Sumitabh Das, UNIX Operating Systems, Tata McGraw Hills publication, 2006.
[2] Syed Mansoor Sarwar, Robert Kortskey , UNIX, Pearson Education, 2004.
[3] Sumitabha Das, Unix concepts and Application,Tata McHill, 2008.
[4] David Bandel and R. Napier, Using Linux, 6th Ed., Pearson Education, 2014.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM4EC3: Computer Network/ Internet & Web Technology</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- To provide an introduction to concepts of Computer Network
- To provide an understanding of its design issues as well as web technology.

Prerequisite(s): Communication System basics, Knowledge of Java Programming language (core).

COURSE OF CONTENTS

UNIT- I

Introduction: Overview, Goal and Applications of Computer Networks; Network Hardware -LAN, MAN, WAN and topologies; LAN components – File server, Workstations, Network Adapter Cards; Network Software - Protocol hierarchies, Design issues for the layers, Connection Oriented and Connection less services, Service primitives, Relationship between Services and Protocols; Switching Techniques – Circuit Switching and Packet Switching; Reference models – OSI and TCP/IP, comparison and critique of OSI and TCP/IP reference models.

UNIT- II

Data Link Layer: Design issues – Services, Framing, Error Control and Flow Control; Error Detection Techniques - Parity Check and Cyclic Redundancy Check (CRC); Error Correction Technique - Hamming code; Elementary Data Link Protocols - Unrestricted Simplex Protocol, Simplex Stop-and-Wait Protocol, Sliding Window Protocols : One-Bit Sliding Window Protocol, protocol using Go Back N and Selective Repeat; HDLC protocol; Data link layer in the Internet - SLIP and PPP.

UNIT- III

Network Layer: Internetworking: Concepts and Architecture. Routing: different routing algorithms, Congestion Control, Addressing- IP Addressing and subnet masking, CIDR , IPv6, IP protocol and other supporting protocols at IP layer: ARP, RARP, ICMP

Transport Layer: Transport Service; Elements of transport protocols - Addressing, Connection establishment, Connection release, Flow control and Buffering, Multiplexing; The Internet Transport Protocols - UDP and TCP, The TCP Service Model, The TCP Protocol.

Application layer: Client Server Architecture, DNS, WWW and HTTP, E-mail Protocols (SMTP, POP3, IMAP, MIME), FTP, TELNET. Overview of network security.

UNIT-IV

Introduction to HTTP, web Server and application Servers, Installation of Application servers, Config files, Web.xml. Java Servlet, Servlet Development Process, Deployment Descriptors, The Generic Servlet, Lifecycle of Servlet. Servlet Packages, Classes, Interfaces, and Methods, Handling Forms with Servlet.

UNIT -V

Various methods of Session Handling. Various elements of deployment descriptors. Java Database Connectivity: steps in process of connection to the database, types of JDBC Drivers. Introduction to Web Services, MVC Architecture, Struts and Hibernate.

Learning Outcomes:

Upon completing the course, students will be able to:

- Have a good understanding of the OSI Reference Model and in particular have a good knowledge of Layers.
- Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
- Have a basic knowledge of the use of cryptography and network security.
- Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols.
- Understand how the Internet works today.

BOOKS REOMMENDED:

[1] W.Stallings, Data and Computer Communications, Prentice-Hall, 5th Ed., 1997.
[2] Conner Doughlous, Steven, Computer Networks and Internets, 5th Ed., Prentice-Hall, 2009.
[3] A.S. Tanenbaum, Computer Network, 4th Ed., Pearson Education, 2007 .
[4] D.E.Comer, Internetworking with TCP/IP Vol. I, 6th Pearson Education, 2013.
[5] Umesh Kumar Singh, Internet and Web Technology, Images Publication, 2002.
[6] Black Uyless, Computer Network, Prentice-Hall, 2nd Ed., 1993.

Discipline-Electives-II

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM4EM1: Operations Research-II</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

Learning Objectives:

- The course aims at making the students aware of the various techniques, which provides an analytical and objective basis for decisions. These techniques use scientific methods to problems arising from operations involving integrated men, machine and materials and provide a mathematical model to represent complex functional relationships.
- To develop the skills of decision making in dynamic business situations through quantitative analysis using different mathematical models like Strategies formulation with the help of game theory, PERT and CPM etc.

Prerequisite(s): Basic knowledge of differentiation & integration of functions, vector algebra, determinants & matrices and calculus of finite difference.

COURSE OF CONTENTS

UNIT I

Non–Linear Programming: Kuhn Tucker conditions, Quadratic and Convex Programming. Dynamic Programming; Characteristics, Dynamic programming approach, Optimal subdivision problem.

UNIT II

Information Theory: Basic ideas, Mathematical definition of information, Measure of uncertainty and properties of entropy function, Communication system, joint and conditional entropies, Channel Capacity, Efficiency and redundancy Encoding, Shannon Fano Method.

UNIT III

Basic steps in PERT and CPM, PERT computation, CPM computation, critical path, Float, Cost analysis, Crashing the network, Contracting, Updating, Resource Scheduling, application of Network Techniques.

UNIT IV

Game theory-Maxmin-minimax criterion, Two persons zero sum games, Games with Mixed Strategies, Dominance Property, Graphical solution of two persons game, Matrix Game and its Relation with Linear Programming,

UNIT V
LP solutions of bidding models, N-person Non-zero sum games, Cooperative Games.

Learning Outcomes:
On completion of this course you should be able to:

- Know the various strategies required in business decisions using game theory.
- Know the project implementation and control techniques using network analysis.
- Understand how to model and solve problems using dynamic programming.
- Learn optimality conditions for single- and multiple-variable unconstrained and constrained nonlinear optimization problems, and corresponding solution methodologies.

BOOKS RECOMMENDED:

1. Hillier, F. S. and Lieberman, G. J. – Introduction to Operation Research, 8^{th} Ed., New York, McGraw- Hill, 2005.
2. Taha, H. A. – Operations Research: An Introduction, 7^{th} ed., Macmillan Publication Co.,2003.
3. Sharma, S.D. – Operations Research, Kedarnath Ramnath & Co., Meerut, 2004.
4. Dantzig G., Thapa M. Linear programming 1: Introduction, Springer, 1997.
5. P K Gupta & D S Hira, Operations Research, S. Chand., 2008.
6. J.K. Sharma, Operations Research: Theory and Application, 3^{rd} Ed., Macmillan, 2006.
7. E. N. Barron. Game Theory: An Introduction, 2nd Edition, John Wiley & Sons, Inc., 2013.
8. Y. Narahari. Game Theory-Lecture Notes, Department of Computer Science and Automation Indian Institute of Science Bangalore, India, 2012.
9. Martin J. Osborne, Ariel Rubinstein. A Course in Game Theory. Cambridge, MA: MIT, 1994.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td>AM4EM2: Mathematical Modelling</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td><td>3</td><td>1</td><td>-</td><td>3</td><td>1</td><td>-</td><td>4</td></tr>
</table>

Learning Objectives:

- To provide rigorous instruction in fundamental mathematical concepts and skills presented in the context of real-world applications.
- Gain a working knowledge of core techniques behind mathematical modelling and develop a basic ability to quantify certain phenomena associated with the physical sciences.
- Represent real-world systems in a mathematical framework..

Prerequisites: Basics of algebra, differential equation, difference equations and graphs.

COURSE OF CONTENTS

UNIT I

Concept of models: Types of models- Iconic, analogue and symbolic models, Classification of models, Meaning and formulation of mathematical models, example.

Mathematical modeling through algebra: Retail pricing model, Student assessment problems, Electricity tariff model, EOQ model for inventory control.

UNIT II

Mathematical Modelling through Ordinary Differential Equations of First order: Linear Growth and Decay Models – Non-Linear Growth and Decay Models – Compartment Models – Dynamic problems – Geometrical problems. Population Dynamics – Epidemics – Compartment Models. Domar's macro model; Domar's debt model

UNIT III

Mathematical Modelling through Ordinary Differential Equations of Second Order: Planetary Motions – Circular Motion and Motion of Satellites – Mathematical Modelling through Linear Differential Equations of Second Order – Miscellaneous Mathematical Models. Samuelson's capital Investment model, Philips stabilization model for closed economy.

UNIT IV

Mathematical Modelling through Difference Equations: Simple Models – Basic Theory of Linear Difference Equations with Constant Coefficients – Economics and Finance – Population Dynamics and Genetics – Probability Theory. Models based on linear difference equations -Cobweb model, Harrod Domar growth model, Consumption model, Samuelson's multiplier- accelerator model.

UNIT V

Mathematical Modelling through Graphs: Solutions that can be Modelled Through Graphs – Mathematical Modelling in Terms of Directed Graphs, Signed Graphs, Weighted Digraphs and Unoriented Graphs.

Learning Outcomes:

Upon completing the course, students will be able to:

- To create mathematical models of empirical or theoretical phenomena in domains such as the physical, natural, or social science.
- Draw inferences from models using mathematical techniques including problem solving, quantitative reasoning, and exploration using multiple representations such as equations, tables, and graphs;
- Not only take an analytical approach to problems but also use computer programming and statistical analysis skills to efficiently model systems.

BOOKS RECOMMENDED:

[1] J.N. Kapur, Mathematical Modelling, New Age International, 1988.

[2] Martin Brann C.S Coleman, DA Drewc (Eds) differential equation models.

[3] C.L. Liu, Elements of Discrete Mathematics, McGraw-Hill Education, 2nd ed., 1986.

[4] Edward A. Bender, Introduction to Mathematical Modelling, Dover Publications, 1st ed., 2000.

[5] D.N. Burghes, A.D. Wood, Mathematical Models in the social, management, and life sciences, New York: Halsted Press, 1980.

[6] Zafar Ahsan, Differential Equations and Their Applications, 2nd Ed., Prentice-Hall of India Pvt. Ltd, 2004.

[7] Michael D Alder, An Introduction to Mathematical Modelling, HeavenForBooks.com, 2001.

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<tr><td>Subject Code & Name</td><td colspan="3">Instructions Hours per Week</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">AM4EM3: Number Theory/ Cryptography</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">3</td><td rowspan="2">1</td><td rowspan="2">-</td><td rowspan="2">4</td></tr>
<tr><td>Duration of Theory Paper:
3 Hours</td></tr>
</table>

Learning Objectives:

- The course aims to give elementary ideas from number theory which will have applications in cryptology.
- Identify and apply various properties of and relating to the integers including the Well-Ordering Principle, primes, unique factorization, the division algorithm, understand the concept of a congruence,
- To impart the knowledge of encryption and decryption techniques and their applications in managing the security of data.

Prerequisites: Set theory, algebra of functions.

COURSE OF CONTENTS

UNIT I

Divisibility and Euclidean algorithm, congruences, applications to factoring.

UNIT II

Finite fields, Legendre symbol and quadratic reciprocity, Jacobi symbol.

UNIT III

Cryptosystems, diagraph transformations and enciphering matrices, Symmetric key cryptosystem, traditional techniques, Key range and size, Deffie-Hellman key exchange, various types of attacks, algorithm types and modes, various symmetric key algorithms (DES, IDEA, RC5, Blowfish)

UNIT IV

Asymmetric key cryptography, concept, RSA algorithm, digital envelope, concept of message digest, MD5 algorithm, Authentication requirements, Digital signatures, message authentic codes, Knapsack algorithm.

UNIT V

Primality and Factoring, Pseudoprimes, Carmichael number, Primality tests, Strong Pseudoprimes, Monte Carlo method, Fermat factorization, Factor base, Implication for RSA, Continued fraction method. Elliptic curves - basic facts, Elliptic curve cryptosystems.

Learning Outcomes:

Upon completing the course, students will be able to:

- Solve problems in elementary number theory.

- Apply elementary number theory to cryptography.
- Develop a deeper conceptual understanding of the theoretical basis of number theory and identify how number theory is related to and used in cryptography.

BOOKS REOMMENDED:

[1] Neal Koblitz, A Course in Number Theory and Cryptology, Graduate Texts in Mathematics, Springer, 1994.
[2] Williams Stallings, Cryptography & Network Security, Pearson Education 3rd edition, 2004.
[3] Atul Kahate, Cryptography & Network Security, Tata McGraw Hill, New Delhi, 2005.
[4] Thomas Koshy, Elementary Number Theory with Applications, Academic Press, 2007.

Devi Ahilya Vishwavidyalaya, Indore

Institute of Engineering & Technology

Scheme & Syllabus for Ph.D. Course Work (Under the Faculty of Engineering)

(*w.e.f.* Academic Year 2017-18)

Ph.D. (Applied Mathematics)

S No	Course Code	Course Title	Weekly Contact Hours (L-T-P)	Credits
1	1AMR01	Research Methodology	4-0-0	4
2	1AMR02	Computer Applications	3-0-0	3
3	1AMR03	Review of Published Research	3-0-0	3
4	1AMR04	Advance Course in Applied Mathematics	3-0-0	3
5	1AMR05	Comprehensive Viva-Voce	0-0-3	3
			Total Credits	16

Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				**Ph.D. Course Work in Applied Mathematics**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1AMR01 Research Methodology	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	4	**0**	**0**	**4**	**0**	**0**	**4**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Unit 1: Introduction to Research Methodology

Objectives of research, Motivation, Types of research, Research approaches, Significance of research, Research methods versus methodology, Research and scientific methods, Defining the research problem, Selecting the research problem, Necessity of defining problem, Techniques involved in defining a problem.

Unit 2: Research Design

Need for Research design, Concepts & different research design, Exploratory, Descriptive, Diagnostic Research, Basic Principles of experimental designs, Design of Experiments.

Unit 3: Sampling and Data Collection

Sampling design steps and types of sampling design, Measurement and scaling of data, Types of Data, Methods and Techniques of data collection, Primary and secondary data used in data collection.

Unit 4: Probability Theory in Research

General concepts of probability theory, Discrete and continuous random variables, Different probability distributions, Introduction to discrete time Markov chain and continuous time Markov chain. Hypothesis formulation and Testing: Null and Research, Parametric Tests, Regression Analysis.

Unit 5: Simulation in Research

Meaning of simulation, Need of simulation, Appropriateness of simulation, its advantages and disadvantages, its applications in engineering, Simulation of queuing systems.

RECOMMENDED BOOKS

[1] K. S. Trivedi, Probability and Statistics with Reliability, Queuing and Computer Science Applications, Second Edition, John Wiely and Sons Publication, 2002.
[2] J. Banks, J. C. Carson II, B. L. Nelson, D. M. Nicol, Discrete Event System Simulation, Fourth edition, Prentice Hall of India Publication, 2006.
[3] C. R. Kothari, Research Methodology: Methods and Techniques, Second Revised Edition, New Age International Publication, 2004.
[4] K.N. Krishanaswamy, Appa Lyer Sivakumar, M. Mathiranjan, Management Research Methodology: Integration of Principles, Methods and Techniques, Pearson Education New Delhi, 2006.

Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				**Ph.D. Course Work in Applied Mathematics**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1AMR02 Computer Applications	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**0**	**0**	**3**	**0**	**0**	**3**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

MATLAB Basics: Introduction, Environment, Variables, Arrays, Operations, Branching and program design, Script and functions, Files. 2D and 3D Plotting. Advanced Concepts in MATLAB: Symbolic Mathematics.

MS Office and its Applications: File Handling in window, various versions of MS Office, MS Word: text formatting, Mail merge, Macros, MS Excel: Features, various formulas and functions, MS Power Point: Creating presentations and adding effects.

Study of Simulation and Data Analysis Tools:

ProE, ANSYS, IDEA, SPSS, NS-2, Qualnet, NCTUNS, Cadence, Xilings, Tanner, CLEMENTINE, etc.

Note: Study of any one tool from the above mentioned list in the relevant area is compulsory.

RECOMMENDED BOOKS

[1] Programming in MATLAB for Engineers, Stephen J. Chapman, Cengage Learning.
[2] MATLAB Web Site – http://www.mathworks.com
[3] Microsoft Office Word 2007: Complete concepts and techniques by Gary B. Shelly, Thomas J. Cashman, Misty E. Vermaat, Cengage Learning Inc.
[4] How to do everything with Microsoft Office Excell 2007 By Guy Hart-Davis, McGraw Hill.
[5] Learning Microsoft Power Point 2007 By Catherine Skintik, Pearson Education.

Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				**Ph.D. Course Work in Applied Mathematics**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1AMR03 Review of Published Research	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**0**	**0**	**3**	**0**	**0**	**3**
Duration of Theory Paper/ Seminar /Presentation: 3 Hours							

COURSE CONTENTS

Note: *In this course a PhD student has to present seminar/presentation or a series of presentations on a topic(s) chosen by him/her in consultation with his/her PhD Thesis Supervisor.*

Overview: Notion of literature survey, Functions of literature survey, maintaining a notebook, Developing a bibliography. Selection of topic (area) for literature survey.

Related Work: Searching related work, Chronological development in the topic, Review of related work, Weakness, General results. Current trends and future scope.

Searching for publications: Publication databases, search engines and patent databases, Find some/all of the references for a given paper, including those that are not on the web.

Online tools: Google, CiteSeer, ACM Digital Library, IEEE, Survey papers, Finding material not on the web, Searching patents.

Report Writing: Pre writing considerations, Thesis writing, Formats of report writing, Formats of publications in Research journals. Technique of interpretation, Precaution in interpretation, Significance of report writing, Different steps in writing report, Layout of the research report, Types of reports, Report format, Typing instructions, Oral presentation.

RECOMMENDED BOOKS

[1] Lecture Notes and presentations
[2] Journal Papers
[3] Conference Papers
[4] Book Chapters
[5] Scientific Magazines like IEEE Spectrum, Communications of the ACM, CSI Communications, ets.

Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				Ph.D. Course Work in Applied Mathematics			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1AMR04	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Advance Course in Applied Mathematics	**3**	**0**	**0**	**3**	**0**	**0**	**3**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Correlation and Regression Analysis: Linear correlation and regression, Multiple correlation and regression and Partial correlation and regression.
Mathematical Modelling: Concept of Models, Classification of models, Meaning and formulation of Mathematical models, Mathematical modelling through Differential Equations and Difference Equations.

Operations Research: Introduction to LPP and its subclass, Integer LPP, Sensitivity Analysis. Inventory problems and their Analytical structure. Classification of Queues, Queuing models and its Applications. Introduction to Non – Linear Programming, Dynamic Programming and Geometric Programming.

Fixed Point Theory: Fixed Point, Banach Contraction Principle and its Applications, Brouwer's Fixed point theorem and its Application, Schauder's fixed point theorem and related results.

Graph Theory: Introduction, Connectedness, Euler and Hamilton graphs, Matching, Covering and Coloring of graphs, shortest path problem, Minimum Spanning tree algorithms and their applications, Ford-Fulkerson algorithm, Max. flow Min. Cut method, Graph Labeling.

Fuzzy Optimization: Classical (Crisp) Sets, Fuzzy Sets: Basic Concepts and Properties, Fuzzy Arithmetic, Fuzzy Relations, Fuzzy Functions, Fuzzy Graph, Fuzzification and Defuzzification, Possibility theory, Approximate Reasoning, Fuzzy Logic, Fuzzy Inference, Fuzzy Controllers and their applications.

RECOMMENDED BOOKS

1. S.C.Gupta, Fundamentals of Statistics, Himalaya Publishing House, Mumbai, 6^{th} Ed., 2009.
2. Freund John E, Mathematical Statistics, PHI, N.D., 7^{th} Ed., 2010.
3. A. P. Baisnab and M. Jas, Elements of Probability and Statistics, Tata McGraw-Hills Publishing Company Ltd. New Delhi.
4. J.N. Kapur, Mathematical Modelling, Wiley Eastern Limited, New Delhi, 1988.

5. Zafar Ahsan, Differential Equations and their Application, Prentice-Hall of India Pvt.Ltd., New Delhi, 2004.
6. Introduction to Mathematical Modelling, Edward A. Bender, Dover Publications Inc., New York, USA.
7. Hillier, F. S., Lieberman, G. J. – Introduction to Operation Research, 8th Ed., New York, McGraw- Hill, 2005.
8. Taha, H. A. – Operations Research: An Introduction, 7th ed., Macmillan Publication Co., 2003.
9. P. K. Gupta and D. S. Hira, Operations Research, S. Chand., 2008.
10. H.K. Pathak and Pradeep K Joshi, Operations Research, Shiksha Sahitya Prakashan, 2ndEdition, 2015.
11. George F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill Book Company Inc., 1963.
12. Walter Rudin, Functional Analysis, McGraw-Hill Publishing Co., 1973.
13. H.K. Pathak, Functional Analysis with applications, Shiksha Sahitya Prakashan, 3rd Ed., 2013.
14. Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th ed., Tata McGraw-Hill Ed. 2007.
15. C.L.Liu, Introduction to Discrete Mathematics, McGraw Hill, 1986.
16. Graph Theory With Applications to Engineering and Computer Science, Narsingh Deo, Phi Learning,
17. Graph Theory, F. Harary, Narosa Publishing House, 5th Ed., 2001.
18. G. J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PHI, New Delhi, 2005.
19. H.J. Zimmermann, Fuzzy Set Theory and its Applications, Allied Publishers, New Delhi, 1991.
20. Kwang Hyung Lee, First Course on Fuzzy Theory and Applications, Springer, 2005.
21. Timothy J. Ross, Fuzzy Logic with Engineering Applications, Wiley Publication, 2010.

Devi Ahilya Vishwavidyalaya, Indore

Institute of Engineering & Technology

Scheme & Syllabus for Ph.D. Course Work (Under the Faculty of Engineering)

(*w.e.f.* Academic Year 2017-18)

Ph.D. (Computer Engineering)

S No	Course Code	Course Title	Weekly Contact Hours (L-T-P)	Credits
1	1COR01	Research Methodology	4-0-0	4
2	1COR02	Computer Applications	3-0-0	3
3	1COR03	Review of Published Research	3-0-0	3
4	1COR04x	Advance Course in Computer Engineering	x-x-x	3
5	1COR05	Comprehensive Viva-Voce	0-0-3	3
			Total Credits	16
Options available for Advance Course in Computer Engineering				
1	1COR04A	Advance Course in Computer Engineering	3-0-0	3
2	1COR04B	Advance Course in Computer Engineering	3-0-0	3

Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				Ph.D. Course Work in Computer Engineering			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1COR01	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Research Methodology	**4**	**0**	**0**	**4**	**0**	**0**	**4**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Unit 1: Introduction to Research Methodology
Objectives of research, Motivation, Types of research, Research approaches, Significance of research, Research methods versus methodology, Research and scientific methods, Defining the research problem, Selecting the research problem, Necessity of defining problem, Techniques involved in defining a problem.

Unit 2: Research Design
Need for Research design, Concepts & different research design, Exploratory, Descriptive, Diagnostic Research, Basic Principles of experimental designs, Design of Experiments.

Unit 3: Sampling and Data Collection
Sampling design steps and types of sampling design, Measurement and scaling of data, Types of Data, Methods and Techniques of data collection, Primary and secondary data used in data collection.

Unit 4: Probability Theory in Research
General concepts of probability theory, Discrete and continuous random variables, Different probability distributions, Introduction to discrete time Markov chain and continuous time Markov chain. Hypothesis formulation and Testing: Null and Research, Parametric Tests, Regression Analysis.

Unit 5: Simulation in Research
Meaning of simulation, Need of simulation, Appropriateness of simulation, its advantages and disadvantages, its applications in engineering, Simulation of queuing systems.

RECOMMENDED BOOKS

[1] K. S. Trivedi, Probability and Statistics with Reliability, Queuing and Computer Science Applications, Second Edition, John Wiely and Sons Publication, 2002.
[2] J. Banks, J. C. Carson II, B. L. Nelson, D. M. Nicol, Discrete Event System Simulation, Fourth edition, Prentice Hall of India Publication, 2006.
[3] C. R. Kothari, Research Methodology: Methods and Techniques, Second Revised Edition, New Age International Publication, 2004.
[4] K.N. Krishanaswamy, Appa Lyer Sivakumar, M. Mathiranjan, Management Research Methodology: Integration of Principles, Methods and Techniques, Pearson Education New Delhi, 2006.

Devi Ahilya Vishwavidyalaya, Indore **Institute of Engineering & Technology**				**Ph.D. Course Work in Computer Engineering**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1COR02 **Computer Applications**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**0**	**0**	**3**	**0**	**0**	**3**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

MATLAB Basics: Introduction, Environment, Variables, Arrays, Operations, Branching and program design, Script and functions, Files. 2D and 3D Plotting. Advanced Concepts in MATLAB: Symbolic Mathematics.

R Programming Language: Introduction to R: Console, script, graphics window, help file. Basic Computational principles: Loops, Writing functions. Graphical approaches: Choosing the correct graphic for data, Plotting and interpreting graphical summaries of data. Basic data analysis, Regression modelling, Simulation.

Study of any one Simulation and Data Analysis Tool in the Relevant Area of Research: Networking, Soft Computing, Data mining, Computer architecture, Natural language processing, software engineering, Machine learning, AI etc.

RECOMMENDED BOOKS

[1] Programming in MATLAB for Engineers, Stephen J. Chapman, Cengage Learning.
[2] MATLAB Web Site – http://www.mathworks.com
[3] Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016.
[4] The R Software-Fundamentals of Programming and Statistical Analysis -Pierre Lafaye de Micheaux, Rémy Drouilhet, Benoit Liquet, Springer 2013
[5] A Beginner's Guide to R (Use R) By Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, Springer 2009

<table>
<tr><th colspan="4">Devi Ahilya Vishwavidyalaya, Indore
Institute of Engineering & Technology</th><th colspan="4">Ph.D. Course Work in Computer Engineering</th></tr>
<tr><td>Course Code & Title</td><td colspan="3">Weekly Contact Hours</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">1COR03
Review of Published Research</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td></tr>
<tr><td>Duration of Theory Paper/ Seminar /Presentation: 3 Hours</td></tr>
</table>

COURSE CONTENTS

Note: *In this course a PhD student has to present seminar/presentation or a series of presentations on a topic(s) chosen by him/her in consultation with his/her PhD Thesis Supervisor.*

Overview: Notion of literature survey, Functions of literature survey, maintaining a notebook, Developing a bibliography. Selection of topic (area) for literature survey.

Related Work: Searching related work, Chronological development in the topic, Review of related work, Weakness, General results. Current trends and future scope.

Searching for publications: Publication databases, search engines and patent databases, Find some/all of the references for a given paper, including those that are not on the web.

Online tools: Google, CiteSeer, ACM Digital Library, IEEE, Survey papers, Finding material not on the web, Searching patents.

Report Writing: Pre writing considerations, Thesis writing, Formats of report writing, Formats of publications in Research journals. Technique of interpretation, Precaution in interpretation, Significance of report writing, Different steps in writing report, Layout of the research report, Types of reports, Report format, Typing instructions, Oral presentation.

RECOMMENDED BOOKS

[1] Lecture Notes and presentations
[2] Journal Papers
[3] Conference Papers
[4] Book Chapters
[5] Scientific Magazines like IEEE Spectrum, Communications of the ACM, CSI Communications, ets.

<table>
<tr><td colspan="4">Devi Ahilya Vishwavidyalaya, Indore
Institute of Engineering & Technology</td><td colspan="4">Ph.D. Course Work in Computer Engineering</td></tr>
<tr><td>Course Code & Title</td><td colspan="3">Weekly Contact Hours</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">1COR04A
Advance Course in Computer Engineering</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

COURSE CONTENTS

Computational Complexity: Introduction to research in computational complexity theory. Complexity classes: P, NP, NP-Complete and NP-Hard.

Software Engineering: Advanced theoretical knowledge and technical competences about the topics of current research trends in software Engineering.

Computer Architecture: This course treats a specific advanced topic of current research interest in the area of architecture.

Data Base and Data Mining: Topics involving emerging research trends in the area of Data base and Data mining.

Artificial Intelligence: Topics involving current research in artificial intelligence including its subfields and applications.

RECOMMENDED BOOKS

[1] T.H. Coreman, C.E. Leiserson and R.L. Rivest, Introduction to Algorithms, Prentice Hall of India, 1990.
[2] E. Horowitz, S. Sahni, S Rajasekaran, Computer Algorithms, Galgotia Publications.
[3] D. E. Knuth, the Art of Computer Programming, Vol. 1 and 3, (2nd Edition), Addison-Wesley, 1998.
[4] J.E. Hop croft, R. Motwani, and J. D. Ullman, Introduction to Automata Theory, Languages and Computation, Pearson Education Asia, 2006.
[5] Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Pearson, 2015
[6] David Patterson, John L. Hennessy, Computer Architecture : A Quantitative Approach, 5th Edition, Elsevier India, 2016.
[7] Kai Hwang, Advaned Computer Architecture, Tata McGraw Hill Education, 2003.
[8] Kai Hwang, Faye Briggs, Computer Architecture and Parallel Processing, McGraw Hill Eduction, 1986.
[9] John L. Hennessy, Computer Organization and Design : Hardware and Software Interface, 5th Edition, Elsevier India, 2012.
[10] William Stallings, Computer Organization and Architecture: Designing for Performance, PHI, 2012.

[11] Any other Books, Journals, Conference Proceedings etc. suggested by the respective instructors of the topics.

Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				**Ph.D. Course Work in Computer Engineering**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1COR04B	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
Advance Course in Computer Engineering	**3**	**0**	**0**	**3**	**0**	**0**	**3**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Computational Complexity: Introduction to research in computational complexity theory. Complexity classes: P, NP, NP-Complete and NP-Hard.

Computer Networks: Advanced theoretical knowledge and technical competences about the topics of current research trends in Computer Networks.

Information Security: This course treats a specific advanced topic of current research interest in the area of information security.

Visualization and Image Processing: Topics involving current research in Visualization & Image Processing and applications.

Artificial Intelligence: Topics involving current research in artificial intelligence including its subfields and applications.

RECOMMENDED BOOKS

[1] T.H. Coreman, C.E. Leiserson and R.L. Rivest, Introduction to Algorithms, Prentice Hall of India, 1990.
[2] E. Horowitz, S. Sahni, S Rajasekaran, Computer Algorithms, Galgotia Publications.
[3] D. E. Knuth, the Art of Computer Programming, Vol. 1 and 3, (2nd Edition), Addison-Wesley, 1998.
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[6] Any other Books, Journals, Conference Proceedings etc. suggested by the respective instructors of the topics.

Devi Ahilya Vishwavidyalaya, Indore

Institute of Engineering & Technology

Scheme & Syllabus for Ph.D. Course Work (Under the Faculty of Engineering)

(*w.e.f.* Academic Year 2017-18)

Ph.D. (Electronics & Instrumentation Engineering)

S No	Course Code	Course Title	Weekly Contact Hours (L-T-P)	Credits
1	1EIR01	Research Methodology	4-0-0	4
2	1EIR02	Computer Applications	3-0-0	3
3	1EIR03	Review of Published Research	3-0-0	3
4	1EIR04x	Advance Course in Electronics & Instrumentation Engineering	x-x-x	3
5	1EIR05	Comprehensive Viva-Voce	0-0-3	3
			Total Credits	16
Options available for Advance Course in Electronics & Instrumentation Engineering				
1	1EIR04A	VLSI System Design	3-0-0	3
2	1EIR04B	Advanced Communication System	3-0-0	3

Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				**Ph.D. Course Work in Electronics & Instrumentation Engineering**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1EIR01 Research Methodology	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	4	**0**	**0**	**4**	**0**	**0**	**4**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Unit 1: Introduction to Research Methodology
Objectives of research, Motivation, Types of research, Research approaches, Significance of research, Research methods versus methodology, Research and scientific methods, Defining the research problem, Selecting the research problem, Necessity of defining problem, Techniques involved in defining a problem.

Unit 2: Research Design
Need for Research design, Concepts & different research design, Exploratory, Descriptive, Diagnostic Research, Basic Principles of experimental designs, Design of Experiments.

Unit 3: Sampling and Data Collection
Sampling design steps and types of sampling design, Measurement and scaling of data, Types of Data, Methods and Techniques of data collection, Primary and secondary data used in data collection.

Unit 4: Probability Theory in Research
General concepts of probability theory, Discrete and continuous random variables, Different probability distributions, Introduction to discrete time Markov chain and continuous time Markov chain. Hypothesis formulation and Testing: Null and Research, Parametric Tests, Regression Analysis.

Unit 5: Simulation in Research
Meaning of simulation, Need of simulation, Appropriateness of simulation, its advantages and disadvantages, its applications in engineering, Simulation of queuing systems.

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[2] J. Banks, J. C. Carson II, B. L. Nelson, D. M. Nicol, Discrete Event System Simulation, Fourth edition, Prentice Hall of India Publication, 2006.
[3] C. R. Kothari, Research Methodology: Methods and Techniques, Second Revised Edition, New Age International Publication, 2004.
[4] K.N. Krishanaswamy, Appa Lyer Sivakumar, M. Mathiranjan, Management Research Methodology: Integration of Principles, Methods and Techniques, Pearson Education New Delhi, 2006.

Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				**Ph.D. Course Work in Electronics & Instrumentation Engineering**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1EIR02 Computer Applications	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**0**	**0**	**3**	**0**	**0**	**3**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

MATLAB Basics: Introduction, Environment, Variables, Arrays, Operations, Branching and program design, Script and functions, Files. 2D and 3D Plotting. Advanced Concepts in MATLAB: Symbolic Mathematics.

MS Office and its Applications: File Handling in window, various versions of MS Office, MS Word: text formatting, Mail merge, Macros, MS Excel: Features, various formulas and functions, MS Power Point: Creating presentations and adding effects.

Study of Simulation and Data Analysis Tools:

ProE, ANSYS, IDEA, SPSS, NS-2, Qualnet, NCTUNS, Cadence, Xilings, Tanner, CLEMENTINE, etc.

Note: Study of any one tool from the above mentioned list in the relevant area is compulsory.

RECOMMENDED BOOKS

[1] Programming in MATLAB for Engineers, Stephen J. Chapman, Cengage Learning.
[2] MATLAB Web Site – http://www.mathworks.com
[3] Microsoft Office Word 2007: Complete concepts and techniques by Gary B. Shelly, Thomas J. Cashman, Misty E. Vermaat, Cengage Learning Inc.
[4] How to do everything with Microsoft Office Excell 2007 By Guy Hart-Davis, McGraw Hill.
[5] Learning Microsoft Power Point 2007 By Catherine Skintik, Pearson Education.

<table>
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Institute of Engineering & Technology</th><th colspan="4">Ph.D. Course Work in Electronics & Instrumentation Engineering</th></tr>
<tr><th>Course Code & Title</th><th colspan="3">Weekly Contact Hours</th><th colspan="4">Credits</th></tr>
<tr><td rowspan="2">1EIR03
Review of Published Research</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td></tr>
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COURSE CONTENTS

Note: *In this course a PhD student has to present seminar/presentation or a series of presentations on a topic(s) chosen by him/her in consultation with his/her PhD Thesis Supervisor.*

Overview: Notion of literature survey, Functions of literature survey, maintaining a notebook, Developing a bibliography. Selection of topic (area) for literature survey.

Related Work: Searching related work, Chronological development in the topic, Review of related work, Weakness, General results. Current trends and future scope.

Searching for publications: Publication databases, search engines and patent databases, Find some/all of the references for a given paper, including those that are not on the web.

Online tools: Google, CiteSeer, ACM Digital Library, IEEE, Survey papers, Finding material not on the web, Searching patents.

Report Writing: Pre writing considerations, Thesis writing, Formats of report writing, Formats of publications in Research journals. Technique of interpretation, Precaution in interpretation, Significance of report writing, Different steps in writing report, Layout of the research report, Types of reports, Report format, Typing instructions, Oral presentation.

RECOMMENDED BOOKS

[1] Lecture Notes and presentations
[2] Journal Papers
[3] Conference Papers
[4] Book Chapters
[5] Scientific Magazines like IEEE Spectrum, Communications of the ACM, CSI Communications, ets.

Devi Ahilya Vishwavidyalaya, Indore **Institute of Engineering & Technology**				**Ph.D. Course Work in Electronics & Instrumentation Engineering**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1EIR04A **VLSI System Design**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**0**	**0**	**3**	**0**	**0**	**3**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Unit I: Digital system Design, Basics and vulnerabilities, Design intellectual property protection, Physical attack and Modular Exponentiations, Side channel attacks and countermeasures, Hardware Trojen Detection, and Trusted IC design, Good Practice and emerging technologies.

Unit II: Challenges in Digital IC design, CMOS Inverters, Components of Energy and Power, Switching, Short circuit and leakage components, Leakage power Dissipation, SPICE Simulation, Logical Effort sizing- Performance Optimization of Digital Circuits, Memory, SRAM cell design, Differential sense amplifier, Self timing, DRAM design, Single Ended sense Amplifier, CMOS scaling, Power reduction through switching activity reduction.

Unit III: Analog signal processing , CMOS digital to analog convertor, Scaling and serials, cyclic, Analog to digital convertors, Serial,SAR, Prallel, pipelined,sigma-delta converters, mixed signal Layout issues, Continuous time filters, Switched capacitor filters, Modulators and multipliers, PLL.

Unit IV: Introduction to Verilog, Module, delays, description language elements, Expressions, Gate level modeling, User defined primitives, Dataflow modeling, Behavioral modeling, Structural modeling,Task and functions.

Unit V: Tutorial on CADENCE Design tools – Layout of a CMOS Gate, Extraction, SPICE, LS, Tutorial on Xilinx Design tool- Digital Syatem design on FPGA with security and BIST.

BOOKS RECOMMENDED

[1]. Sung-mo Kang and Yusuf Leblebici, CMOS Digital Integrated Circuit analysis and Design, Tata McGraw-Hill, 3/e.
[2]. R. Jacob Baker, Harry W. Li and David E. Boyce, CMOS Circuit design, layout and Simulation, PHI,IEEE press, Series Edition,
[3]. Yuan Taur and Tak H. Ning, Fundamentals of Modern VLSI Devices, Cambridge university Press, Special Edition, 1998
[4]. Neil H.E. Weste and Kamran Esharhian, Principal of CMOS VLSI design, PHI, 2/e
[5]. Jan M. Rabaey, Digital Integrated Circuit, PHI, 2/e
[6]. Samir Palnitkar, Verilog-HDL, Pearson Education, 2/e.

<table>
<tr><td colspan="4">Devi Ahilya Vishwavidyalaya, Indore
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<tr><td>Course Code & Title</td><td colspan="3">Weekly Contact Hours</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">1EIR04B
Advanced Communication System</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

COURSE CONTENTS

Unit I - A brief overview of Transceiver techniques used in advanced communication systems: Modulation and demodulation formats, Spread spectrum modulation, Speech coding, Channel coding, Modulation and coding trade-offs, Multiple Access Techniques.

Unit-2 Statistical description of wireless channels: Propagation mechanisms, large scale fading &Small scale fading, Fading channel parameters, channel models – Tapped delay line models, Path loss models. Fading mitigation techniques – Multiple Antenna systems & space Diversity, OFDM, Equalization.

Unit-3 Standard Communication Networks: GSM, CDMA, WCDMA/UMTS, LTE their Architecture and working, Principles of 5G mobile systems, WLAN, WiMax. Concepts of Relaying, Multi-hop and co-operative communication, Cognitive Radio.

Unit-4 Optical Networks: Basics of optical network, WDM Optical network architectures and design issues, routing, wavelength/spectrum allocation, survivability, Fiber Wireless Access Networks, Elastic optical networks.

Unit-5 Methodology for simulating a communication system: Modelling and simulation of time- varying channels, Simulation of discrete channel models.Case Studies on Simulation of communication systems.

BOOKS RECOMMENDED:

[1]. A F Molisch, Wireless communication, Second Edition, Wiley Publication, 2014.
[2]. I S Misra, Wireless Communication and Networks 3G and beyond, Second Edition, MGH Publication, 2013.
[3]. D Tse & P Viswanath, Fundamentals of Wireless Communication, Cambridge, 2010.
[4]. B Skalar, Digital Communication, Second Edition, P Hall Publication,
[5]. M Mayer, Optical Switching Networks, first edition, 2014.
[6]. W Tranter, K S Shanmugan, T S Rappaport, K L Kosbar, Principles of Communication Systems Simullation, Pearson education, 2004.

Devi Ahilya Vishwavidyalaya, Indore

Institute of Engineering & Technology

Scheme & Syllabus for Ph.D. Course Work (Under the Faculty of Engineering)

(*w.e.f.* Academic Year 2017-18)

Ph.D. (Electronics & Telecommunication Engineering)

S No	Course Code	Course Title	Weekly Contact Hours (L-T-P)	Credits
1	1ETR01	Research Methodology	4-0-0	4
2	1ETR02	Computer Applications	3-0-0	3
3	1ETR03	Review of Published Research	3-0-0	3
4	1ETR04x	Advance Course in Electronics & Telecommunication Engineering	x-x-x	3
5	1ETR05	Comprehensive Viva-Voce	0-0-3	3
			Total Credits	16
Options available for Advance Course in Electronics & Telecommunication Engineering				
1	1ETR04A	VLSI System Design	3-0-0	3
2	1ETR04B	Advanced Communication System	3-0-0	3

Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				Ph.D. Course Work in Electronics & Telecommunication Engineering			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1ETR01 **Research Methodology**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	4	**0**	**0**	**4**	**0**	**0**	**4**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Unit 1: Introduction to Research Methodology
Objectives of research, Motivation, Types of research, Research approaches, Significance of research, Research methods versus methodology, Research and scientific methods, Defining the research problem, Selecting the research problem, Necessity of defining problem, Techniques involved in defining a problem.

Unit 2: Research Design
Need for Research design, Concepts & different research design, Exploratory, Descriptive, Diagnostic Research, Basic Principles of experimental designs, Design of Experiments.

Unit 3: Sampling and Data Collection
Sampling design steps and types of sampling design, Measurement and scaling of data, Types of Data, Methods and Techniques of data collection, Primary and secondary data used in data collection.

Unit 4: Probability Theory in Research
General concepts of probability theory, Discrete and continuous random variables, Different probability distributions, Introduction to discrete time Markov chain and continuous time Markov chain. Hypothesis formulation and Testing: Null and Research, Parametric Tests, Regression Analysis.

Unit 5: Simulation in Research
Meaning of simulation, Need of simulation, Appropriateness of simulation, its advantages and disadvantages, its applications in engineering, Simulation of queuing systems.

RECOMMENDED BOOKS

[1] K. S. Trivedi, Probability and Statistics with Reliability, Queuing and Computer Science Applications, Second Edition, John Wiely and Sons Publication, 2002.
[2] J. Banks, J. C. Carson II, B. L. Nelson, D. M. Nicol, Discrete Event System Simulation, Fourth edition, Prentice Hall of India Publication, 2006.
[3] C. R. Kothari, Research Methodology: Methods and Techniques, Second Revised Edition, New Age International Publication, 2004.
[4] K.N. Krishanaswamy, Appa Lyer Sivakumar, M. Mathiranjan, Management Research Methodology: Integration of Principles, Methods and Techniques, Pearson Education New Delhi, 2006.

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Institute of Engineering & Technology</td><td colspan="4">Ph.D. Course Work in Electronics & Telecommunication Engineering</td></tr>
<tr><td>Course Code & Title</td><td colspan="3">Weekly Contact Hours</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">1ETR02
Computer Applications</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
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COURSE CONTENTS

MATLAB Basics: Introduction, Environment, Variables, Arrays, Operations, Branching and program design, Script and functions, Files. 2D and 3D Plotting. Advanced Concepts in MATLAB: Symbolic Mathematics.

MS Office and its Applications: File Handling in window, various versions of MS Office, MS Word: text formatting, Mail merge, Macros, MS Excel: Features, various formulas and functions, MS Power Point: Creating presentations and adding effects.

Study of Simulation and Data Analysis Tools:

ProE, ANSYS, IDEA, SPSS, NS-2, Qualnet, NCTUNS, Cadence, Xilings, Tanner, CLEMENTINE, etc.

Note: Study of any one tool from the above mentioned list in the relevant area is compulsory.

RECOMMENDED BOOKS

[1] Programming in MATLAB for Engineers, Stephen J. Chapman, Cengage Learning.
[2] MATLAB Web Site – http://www.mathworks.com
[3] Microsoft Office Word 2007: Complete concepts and techniques by Gary B. Shelly, Thomas J. Cashman, Misty E. Vermaat, Cengage Learning Inc.
[4] How to do everything with Microsoft Office Excell 2007 By Guy Hart-Davis, McGraw Hill.
[5] Learning Microsoft Power Point 2007 By Catherine Skintik, Pearson Education.

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<tr><td>Course Code & Title</td><td colspan="3">Weekly Contact Hours</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">1ETR03
Review of Published Research</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td></tr>
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COURSE CONTENTS

Note: *In this course a PhD student has to present seminar/presentation or a series of presentations on a topic(s) chosen by him/her in consultation with his/her PhD Thesis Supervisor.*

Overview: Notion of literature survey, Functions of literature survey, maintaining a notebook, Developing a bibliography. Selection of topic (area) for literature survey.

Related Work: Searching related work, Chronological development in the topic, Review of related work, Weakness, General results. Current trends and future scope.

Searching for publications: Publication databases, search engines and patent databases, Find some/all of the references for a given paper, including those that are not on the web.

Online tools: Google, CiteSeer, ACM Digital Library, IEEE, Survey papers, Finding material not on the web, Searching patents.

Report Writing: Pre writing considerations, Thesis writing, Formats of report writing, Formats of publications in Research journals. Technique of interpretation, Precaution in interpretation, Significance of report writing, Different steps in writing report, Layout of the research report, Types of reports, Report format, Typing instructions, Oral presentation.

RECOMMENDED BOOKS

[1] Lecture Notes and presentations
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[3] Conference Papers
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Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				**Ph.D. Course Work in Electronics & Telecommunication Engineering**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1ETR04A VLSI System Design	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**0**	**0**	**3**	**0**	**0**	**3**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Unit I: Digital system Design, Basics and vulnerabilities, Design intellectual property protection, Physical attack and Modular Exponentiations, Side channel attacks and countermeasures, Hardware Trojen Detection, and Trusted IC design, Good Practice and emerging technologies.

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<tr><td>Course Code & Title</td><td colspan="3">Weekly Contact Hours</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">1ETR04B
Advanced Communication System</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td></tr>
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COURSE CONTENTS

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Unit-2 Statistical description of wireless channels: Propagation mechanisms, large scale fading &Small scale fading, Fading channel parameters, channel models – Tapped delay line models, Path loss models. Fading mitigation techniques – Multiple Antenna systems & space Diversity, OFDM, Equalization.

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Devi Ahilya Vishwavidyalaya, Indore

Institute of Engineering & Technology

Scheme & Syllabus for Ph.D. Course Work (Under the Faculty of Engineering)

(*w.e.f.* Academic Year 2017-18)

Ph.D. (Information Technology)

S No	Course Code	Course Title	Weekly Contact Hours (L-T-P)	Credits
1	1ITR01	Research Methodology	4-0-0	4
2	1ITR02	Computer Applications	3-0-0	3
3	1ITR03	Review of Published Research	3-0-0	3
4	1ITR04	Advance Course in Information Technology	3-0-0	3
5	1ITR05	Comprehensive Viva-Voce	0-0-3	3
			Total Credits	16

Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				**Ph.D. Course in Information Technology**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1ITR01 Research Methodology	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	4	**0**	**0**	**4**	**0**	**0**	**4**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Unit 1: Introduction to Research Methodology
Objectives of research, Motivation, Types of research, Research approaches, Significance of research, Research methods versus methodology, Research and scientific methods, Defining the research problem, Selecting the research problem, Necessity of defining problem, Techniques involved in defining a problem.

Unit 2: Research Design
Need for Research design, Concepts & different research design, Exploratory, Descriptive, Diagnostic Research, Basic Principles of experimental designs, Design of Experiments.

Unit 3: Sampling and Data Collection
Sampling design steps and types of sampling design, Measurement and scaling of data, Types of Data, Methods and Techniques of data collection, Primary and secondary data used in data collection.

Unit 4: Probability Theory in Research
General concepts of probability theory, Discrete and continuous random variables, Different probability distributions, Introduction to discrete time Markov chain and continuous time Markov chain. Hypothesis formulation and Testing: Null and Research, Parametric Tests, Regression Analysis.

Unit 5: Simulation in Research
Meaning of simulation, Need of simulation, Appropriateness of simulation, its advantages and disadvantages, its applications in engineering, Simulation of queuing systems.

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[1] K. S. Trivedi, Probability and Statistics with Reliability, Queuing and Computer Science Applications, Second Edition, John Wiely and Sons Publication, 2002.
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Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				**Ph.D. Course Work in Information Technology**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1ITR02 Computer Applications	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**0**	**0**	**3**	**0**	**0**	**3**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

MATLAB Basics: Introduction, Environment, Variables, Arrays, Operations, Branching and program design, Script and functions, Files. 2D and 3D Plotting. Advanced Concepts in MATLAB: Symbolic Mathematics.

R Programming Language: Introduction to R: Console, script, graphics window, help file. Basic Computational principles: Loops, Writing functions. Graphical approaches: Choosing the correct graphic for data, Plotting and interpreting graphical summaries of data. Basic data analysis, Regression modelling, Simulation.

Study of any one Simulation and Data Analysis Tool in the Relevant Area of Research: Networking, Soft Computing, Data mining, Computer architecture, Natural language processing, software engineering, Machine learning, AI etc.

RECOMMENDED BOOKS

[1] Programming in MATLAB for Engineers, Stephen J. Chapman, Cengage Learning.
[2] MATLAB Web Site – http://www.mathworks.com
[3] Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016.
[4] The R Software-Fundamentals of Programming and Statistical Analysis -Pierre Lafaye de Micheaux, Rémy Drouilhet, Benoit Liquet, Springer 2013
[5] A Beginner's Guide to R (Use R) By Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, Springer 2009

<table>
<tr><td colspan="4">Devi Ahilya Vishwavidyalaya, Indore
Institute of Engineering & Technology</td><td colspan="4">Ph.D. Course Work in Information Technology</td></tr>
<tr><td>Course Code & Title</td><td colspan="3">Weekly Contact Hours</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">1ITR03
Review of Published Research</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td></tr>
<tr><td>Duration of Theory Paper/ Seminar /Presentation: 3 Hours</td></tr>
</table>

COURSE CONTENTS

Note: *In this course a PhD student has to present seminar/presentation or a series of presentations on a topic(s) chosen by him/her in consultation with his/her PhD Thesis Supervisor.*

Overview: Notion of literature survey, Functions of literature survey, maintaining a notebook, Developing a bibliography. Selection of topic (area) for literature survey.

Related Work: Searching related work, Chronological development in the topic, Review of related work, Weakness, General results. Current trends and future scope.

Searching for publications: Publication databases, search engines and patent databases, Find some/all of the references for a given paper, including those that are not on the web.

Online tools: Google, CiteSeer, ACM Digital Library, IEEE, Survey papers, Finding material not on the web, Searching patents.

Report Writing: Pre writing considerations, Thesis writing, Formats of report writing, Formats of publications in Research journals. Technique of interpretation, Precaution in interpretation, Significance of report writing, Different steps in writing report, Layout of the research report, Types of reports, Report format, Typing instructions, Oral presentation.

RECOMMENDED BOOKS

[1] Lecture Notes and presentations
[2] Journal Papers
[3] Conference Papers
[4] Book Chapters
[5] Scientific Magazines like IEEE Spectrum, Communications of the ACM, CSI Communications, ets.

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<tr><td>Course Code & Title</td><td colspan="3">Weekly Contact Hours</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">1ITR04
Advance Course in Information Technology</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
</table>

COURSE CONTENTS

Security of Blockchain protocols: Study of various Blockchain based protocols and their mechanism, i.e., Bitcoin, Ethereum and other systems.

Automatic Vulnerability Predication and Discovery: Software vulnerabilities, Tools help to find problems, Penetration Testing, Vulnerability scanners.

Secure Remote Authentication: Biometric based, Schemes based on dynamic ID for the multi-server environment, Using Machine learning technique.

Consensus protocols with quantum technologies: To explore consensus protocols, such as Blockchain and Byzantine Agreement, application of quantum technologies in it.

Privacy compliance in big data / distributed / cloud systems: Endpoint input validation/filtering, Scalable and composable privacy-preserving, Secure computation in distributed programming frameworks.

Pervasive security / Security of internet-enabled host devices. Secure booting, access control, device authentication, Tamper Detection techniques and design, Nest thermostats, i.e., Tesla cars and Microsoft's HoloLens.

Establishing Trust in Cloud Computing: Control, Ownership, Security, Remote access, various Certifications.

Cryptocurrency security issues: Transaction and proof of work, the blockchain, and mining, Consensus Protocol, Infrastructure involved.

User-centric privacy technologies and privacy in social media: what are the technologies available and how it is used for social media.

Context-aware security: for Smart spaces, Smartphone, Social networking sites, IOT Devices.

Devi Ahilya Vishwavidyalaya, Indore

Institute of Engineering & Technology

Scheme & Syllabus for Ph.D. Course Work (Under the Faculty of Engineering)

(*w.e.f.* Academic Year 2017-18)

Ph.D. (Mechanical Engineering)

S No	Course Code	Course Title	Weekly Contact Hours (L-T-P)	Credits
1	1MER01	Research Methodology	4-0-0	4
2	1MER02	Computer Applications	3-0-0	3
3	1MER03	Review of Published Research	3-0-0	3
4	1MER04x	Advance Course in Mechanical Engineering	x-x-x	3
5	1MER05	Comprehensive Viva-Voce	0-0-3	3
			Total Credits	16
Options available for Advance Course in Mechanical Engineering				
1	1MER04A	Design Engineering	3-0-0	3
2	1MER04B	Thermal Engineering	3-0-0	3
3	1MER04C	Industrial Engineering & Management	3-0-0	3

<table>
<tr><td colspan="4">Devi Ahilya Vishwavidyalaya, Indore
Institute of Engineering & Technology</td><td colspan="4">Ph.D. Course Work in Mechanical Engineering</td></tr>
<tr><td>Course Code & Title</td><td colspan="3">Weekly Contact Hours</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">1MER01
Research Methodology</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">4</td></tr>
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COURSE CONTENTS

Unit 1: Introduction to Research Methodology
Objectives of research, Motivation, Types of research, Research approaches, Significance of research, Research methods versus methodology, Research and scientific methods, Defining the research problem, Selecting the research problem, Necessity of defining problem, Techniques involved in defining a problem.

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Need for Research design, Concepts & different research design, Exploratory, Descriptive, Diagnostic Research, Basic Principles of experimental designs, Design of Experiments.

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Sampling design steps and types of sampling design, Measurement and scaling of data, Types of Data, Methods and Techniques of data collection, Primary and secondary data used in data collection.

Unit 4: Probability Theory in Research
General concepts of probability theory, Discrete and continuous random variables, Different probability distributions, Introduction to discrete time Markov chain and continuous time Markov chain. Hypothesis formulation and Testing: Null and Research, Parametric Tests, Regression Analysis.

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Meaning of simulation, Need of simulation, Appropriateness of simulation, its advantages and disadvantages, its applications in engineering, Simulation of queuing systems.

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[1] K. S. Trivedi, Probability and Statistics with Reliability, Queuing and Computer Science Applications, Second Edition, John Wiely and Sons Publication, 2002.
[2] J. Banks, J. C. Carson II, B. L. Nelson, D. M. Nicol, Discrete Event System Simulation, Fourth edition, Prentice Hall of India Publication, 2006.
[3] C. R. Kothari, Research Methodology: Methods and Techniques, Second Revised Edition, New Age International Publication, 2004.
[4] K.N. Krishanaswamy, Appa Lyer Sivakumar, M. Mathiranjan, Management Research Methodology: Integration of Principles, Methods and Techniques, Pearson Education New Delhi, 2006.

Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				**Ph.D. Course Work in Mechanical Engineering**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1MER02 Computer Applications	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**0**	**0**	**3**	**0**	**0**	**3**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

MATLAB Basics: Introduction, Environment, Variables, Arrays, Operations, Branching and program design, Script and functions, Files. 2D and 3D Plotting. Advanced Concepts in MATLAB: Symbolic Mathematics.

MS Office and its Applications: File Handling in window, various versions of MS Office, MS Word: text formatting, Mail merge, Macros, MS Excel: Features, various formulas and functions, MS Power Point: Creating presentations and adding effects.

Study of Simulation and Data Analysis Tools:

ProE, ANSYS, IDEA, SPSS, NS-2, Qualnet, NCTUNS, Cadence, Xilings, Tanner, CLEMENTINE, etc.

Note: Study of any one tool from the above mentioned list in the relevant area is compulsory.

RECOMMENDED BOOKS

[1] Programming in MATLAB for Engineers, Stephen J. Chapman, Cengage Learning.
[2] MATLAB Web Site – http://www.mathworks.com
[3] Microsoft Office Word 2007: Complete concepts and techniques by Gary B. Shelly, Thomas J. Cashman, Misty E. Vermaat, Cengage Learning Inc.
[4] How to do everything with Microsoft Office Excell 2007 By Guy Hart-Davis, McGraw Hill.
[5] Learning Microsoft Power Point 2007 By Catherine Skintik, Pearson Education.

Devi Ahilya Vishwavidyalaya, Indore **Institute of Engineering & Technology**				**Ph.D. Course Work in Mechanical Engineering**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1MER03 **Review of Published Research**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**0**	**0**	**3**	**0**	**0**	**3**
Duration of Theory Paper/ Seminar /Presentation: 3 Hours							

COURSE CONTENTS

Note: *In this course a PhD student has to present seminar/presentation or a series of presentations on a topic(s) chosen by him/her in consultation with his/her PhD Thesis Supervisor.*

Overview: Notion of literature survey, Functions of literature survey, maintaining a notebook, Developing a bibliography. Selection of topic (area) for literature survey.

Related Work: Searching related work, Chronological development in the topic, Review of related work, Weakness, General results. Current trends and future scope.

Searching for publications: Publication databases, search engines and patent databases, Find some/all of the references for a given paper, including those that are not on the web.

Online tools: Google, CiteSeer, ACM Digital Library, IEEE, Survey papers, Finding material not on the web, Searching patents.

Report Writing: Pre writing considerations, Thesis writing, Formats of report writing, Formats of publications in Research journals. Technique of interpretation, Precaution in interpretation, Significance of report writing, Different steps in writing report, Layout of the research report, Types of reports, Report format, Typing instructions, Oral presentation.

RECOMMENDED BOOKS

[1] Lecture Notes and presentations
[2] Journal Papers
[3] Conference Papers
[4] Book Chapters
[5] Scientific Magazines like IEEE Spectrum, Communications of the ACM, CSI Communications, ets.

<table>
<tr><td colspan="4">Devi Ahilya Vishwavidyalaya, Indore
Institute of Engineering & Technology</td><td colspan="4">Ph.D. Course Work in Mechanical Engineering</td></tr>
<tr><td>Course Code & Title</td><td colspan="3">Weekly Contact Hours</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">1MER04A
Design Engineering</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
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COURSE CONTENTS

Elastohydrodynamic Lubrication:

Introduction, General Iterative Procedure, Fundamental Parameters, Normal approach, Relative Sliding, Pressure spike, Elastohydrodynamics Number, Macro Elastohydrodynamics, Elastohydrodynamics and hysteresis.

Noise Measurement & Control Procedure:

Introduction, Objective and Subjective noise measurement, frequency analysis bandwidth, free field techniques, reverberant field techniques, semi reverberant field techniques, basic industrial noise control methods, economic factor, acoustic enclosures and barriers, sound absorbing materials.

Vibration Analysis of Multi degree-of-Freedom Systems:

Introduction, Modal Analysis , Applications of Modal Analysis, Modal Testing, introduction to Excitation and Response Sensors, Modeling and Modal Analysis of Multi degree-of-freedom Systems , Vibration Analysis of gears and bearings.

RECOMMENDED BOOKS

[1] S. S. Rao, *Mechanical Vibrations*, Pearson Education., 2011.
[2] Ambekar A. G., *Mechanical Vibrations and Noise Engineering* , Prentice Hall of India Pvt. Ltd.,2010
[3] Thomson, W.T., *Theory of Vibration with Applications*. Pearson Education,2011.
[4] Rao J S & Gupta K. *Introductory Course on Theory and Practice of Mechanical Vibration* ,New Age Publisher, New Delhi, 2e, 2002

Devi Ahilya Vishwavidyalaya, Indore Institute of Engineering & Technology				**Ph.D. Course Work in Mechanical Engineering**			
Course Code & Title	**Weekly Contact Hours**			**Credits**			
1MER04B Thermal Engineering	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**0**	**0**	**3**	**0**	**0**	**3**
Duration of Theory Paper: 3 Hours							

COURSE CONTENTS

Advanced Thermodynamic Analysis of Heat Exchangers:

Classification of Heat Exchangers, LMTD and NTU approach for determining the effectiveness, Heat Exchanger efficiency, Heat exchanger analogy number, Entropy generation rate for heat exchangers, Expression for entropy generation rate for the balanced type heat exchangers, relationship between efficiency and effectiveness of heat exchangers, Thermodynamic design of shell and tube type heat exchangers using efficiency approach..

Advanced Vapour Absorption and other Technologies

Vapor Absorption Systems: Ammonia-Water, Three fluid, Water-Lithium bromide; Solar-Powered Absorption Refrigeration System, Multi Stage Absorption Systems, Energy and Exergy analyses of Vapour Absorption Systems Single Stage System; Multistage Refrigeration: Two-stage with given Intermediate Pressure, Optimum Interstage PressureLoad Estimation, Air-conditioning Systems: Classification-All Air, Air and water, All water Systems; Decentralized Cooling and Heating; Individual systems; Evaporative; Dessicant; Thermal storage; Clean room; Space systems; Packaged; Central systems .

Thermodynamic Analysis of Air standard cycles

Thermodynamic design of endoreversible and irreversible air standard cycles under maximum power, maximum power density and maximum efficient power, ecological optimization of thermodynamic cycles, thermal efficiencies under maximum power output and maximum power density, Second law efficiency determination.

RECOMMENDED BOOKS

1. W.F. Stoecker, *Refrigeration and Air conditioning*, McGraw-Hill Book Company, 4e, 1985
2. Prasad M, *Refrigeration and Air conditioning*, New Age International, 2e, 2011
3. Arora C P *Refrigeration and Air conditioning*, McGraw-Hill Book Company, 1e, 1985
4. W.F. Stoecker, *Refrigeration and Air conditioning*, McGraw-Hill Book Company, 1e, 1985
5. Shan Wang, *Handbook of Air-Conditioning and. Refrigeration,* McGraw-Hill Book Company, 2e, 2000
6. McQuiston F C., Parker J.D. and Spitler J. D., *Heating, Ventilating, and Air-Conditioning Analysis and Design,* John Wiley& Sons, 6e, 2005

<table>
<tr><th colspan="4">Devi Ahilya Vishwavidyalaya, Indore
Institute of Engineering & Technology</th><th colspan="4">Ph.D. Course Work in Mechanical Engineering</th></tr>
<tr><td>Course Code & Title</td><td colspan="3">Weekly Contact Hours</td><td colspan="4">Credits</td></tr>
<tr><td rowspan="2">1MER04C
Industrial Engineering & Management</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">3</td></tr>
<tr><td>Duration of Theory Paper: 3 Hours</td></tr>
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COURSE CONTENTS

Diagnosing a Process:

Introduction, diagnostic tools & techniques like Brainstorming, Affinity Diagram, Cause & Effect Diagram, Interrelationship Digraph, Pareto Analysis, Systematic Diagram, Matrix Diagram, Program Decision Process Chart(PDPC) Analysis, Gantt Chart, Change Concepts, Design of Experiments.

Advanced Research Techniques In Quality Management:

Analytical Hierarchy Process (AHP), Quality Function Deployment (QFD), Green Quality Function Deployment (GQFD), Analytical Network Process (ANP), Models of Total Quality Management Implementation, Fork Model for Quality Management, Interpretive Structure Modelling (ISM).

Advanced Research Techniques In Supply Chain And Operations Management:

Supply Chain Concepts, Designing of Supply Chain network, Performance Measurement of Supply Chain, Supply Chain drivers. Concept of Lean Manufacturing & different tools of it. Overview of synchronous manufacturing,WCM overview, JIT purchasing, KANBAN, KAIZEN concepts, modern trends in operations management.

RECOMMENDED BOOKS

1. ‘Operations Management(2006)’ by Richard B Chase, Nicholas J Aquilano, The McGraw- Hill companies,11e.
2. ‘Quality Management (2009)’by Howard S Gitlow, Alan J Oppenheim, McGraw- Hill companies,3e.
3. ‘Supply Chain Management: Strategy, Planning & Operation’ (2010) by Sunil Chopra, Peter Meindel, Pearson Education, 4e