SCHEME & SYLLABUS

M.Sc. Electronics & Communication

BATCH 2021-2023

SCHOOL OF ELECTRONICS

(UNIVERSITY TEACHING DEPARTMENT)
DEVI AHILYA VISHWAVIDYALAYA,
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School of Electronics, Devi Ahilya University, Indore

M.Sc. Electronics & Communication, Batch 2021-23 (Scheme)

Semester I — 32 Credits

Sr. No.	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
1	EL51101	Signals and Systems-Continuous	3	1	--	4
2	EL51102	Electromagnetic Theory	3	1	--	4
3	EL51107	Python Programming	3	1	--	4
4	EL51106	Microcontroller & Interfacing	3	1	--	4
5	EL51105	Digital Design with VHDL	3	1	--	4
6	EL51207	Python Programming Lab	0	0	4	2
7	EL51206/05	Microcontroller & Intf. Lab./ Digital Design Lab	0	0	4+4	2+2
8	EL51401	Seminar	0	0	--	2
9	EL51301	Comprehensive Viva-Voce	--	--	--	4

Semester II — 32Credits

Sr. No.	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
1	EL52106	Advance Embedded Microcontroller-ARM	3	1	--	4
2	EL52102	Analog & Digital Communication Systems	3	1	--	4
3	EL52103	Data Communication and Networking.	3	1	--	4
4	EL52104	Signals and Systems-Discrete	3	1	--	4
5	EL52105	Machine Learning	3	1	--	4
6	EL52206	Advance Embedded Microcontroller-ARM Lab	0	0	4	2
6	EL52204/02	MATLAB Lab /Analog & Digital Comm. Lab	0	0	4+4	2+2
7	EL52205/	Machine Learning Lab	0	0	4	2
8	EL52301	Comprehensive Viva-Voce	--	--	--	4

Semester III — 30 Credits

Sr. No.	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
1	EL53101	Control Systems	3	1	--	4
2	EL53102	Embedded Systems Design	3	1	--	4
3	EL53103	Java Programming	3	1	--	3/4
4	EL53104	Wireless Communication.	3	1	--	4
5	EL53105	CMOS Technology & VLSI Design	3	1	--	4
6	EL53202	Embedded Systems Design Laboratory	0	0	4	2
7	EL53203	Java Programming Laboratory	0	0	4	2
8	EL53205	CMOS Technology & VLSI Design Laboratory	0	0	4	2
9	EL53301	Comprehensive Viva-Voce	--	--	--	4

Semester IV — 12 Credits

Sr. No.	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
1	EL54501	Major Project Viva-Voce	-	-	-	12

Total — 106 credits

School of Electronics, DAVV
M.Sc. Electronics & Communication, Batch 2021-23 (Syllabus)
SEMESTER - I

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Signals and Systems-Continuous	**E51101**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- Understanding the fundamental characteristics of signals and systems.
- Understanding the concepts of vector space, inner product space and orthogonal series.
- Understanding signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide.
- Development of the mathematical skills to solve problems involving convolution, filtering, modulation and sampling.

An introduction to signals and systems: Signals and systems as seen in everyday life. Continuous time signal: energy and power signals, signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, ramp, raised, cosine, sine etc.
Continuous Time Systems: system properties: linearity: time-invariance, causality, stability, realizability. Examples.
Continuous time LTI systems: the impulse response and step response, convolution, correlation, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of linear time invariant systems. System representation through differential equations.
Fourier series, Fourier Transform, properties of Fourier series and Fourier Transform, Parsevals theorem.
Laplace Transform : the notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, system functions, poles and zeros of system functions and signals. System analysis using Laplace Transform.
Sampling theorem and its implications.

Some Suggested Textbooks:

1. *B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, 1998.*
2. *Ashok Ambardar, "Analog and Digital Signal Processing", Second Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company), 1999.*

Reference books

1. Hwei P. Hsu, Signals and Systems,Schaums Series, Tata McGraw Hill Publication.

Course outcomes

On completion of this course the students will be,

1. Apply the knowledge of linear algebra topics like vector space, basis, dimension, inner product, norm and orthogonal basis to signals.
2. Analyses the spectral characteristics of continuous-time periodic and a periodic signals using Fourier analysis.
3. Classify systems based on their properties and determine the response of LSI system using convolution.
4. Analyze system properties based on impulse response and Fourier analysis.
5. Apply the Laplace transform for analyze of continuous-time and discrete-time signals and systems.
6. Understand the process of sampling and the effects of under sampling.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Electromagnetic Theory	**EL51102**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To expose the students to the rudiments of Electromagnetic theory and wave propagation essential for subsequent courses on microwave engineering, antennas and wireless communication

Elements of vector calculus: gradient, divergence and curl. Gauss' and stokes' theorems. Maxwell's equations : differential and integral forms. Application to wave propagation in bounded & unbounded media, Wave equation. Poynting vector. Plane waves : propagation through various media, reflection and refraction, phase and group velocity; skin depth. Analysis of electrostatic and magneto static fields; Laplace's and poisson's equations; Boundary value problems and their solutions.

Referred Books:

1. Electromagnetic waves and Radiating Systems : Jordan and Balmain.
2. Elements of Electromagnetics 3rd Ed: Mathew N. O. Sadiku, Publisher: Oxford Press.
3. Schaum's Outlines Electromagnetics 2nd Ed. : J. A. Edminister, Publisher : McGraw Hill.
4. Introduction to Electrodynamics: Griffiths
5. Engineering Electromagnetics : Hayt.
6. Electromagnetics : Kraus.

Course outcomes

On completion of this course the students will be,

1. Recognize and classify the basic Electrostatic theorems and laws and to derive them.
2. Discuss the behavior of Electric fields in matter and Polarization concepts.
3. Classify the basic Magneto static theorems and laws and infer the magnetic properties of matter.
4. Summarize the concepts of electrodynamics &to derive and discuss the Maxwell's equations.
5. Students are expected to be familiar with Electromagnetic wave propagation and wave polarization.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Python Programming	**EL51107**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- The course is designed to provide complete knowledge of Python language. Students will be able to develop logics which will help them to create programs, applications in Python. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Introduction to Python, What is Python and history of Python? Unique features of Python. Python-2 and Python-3 differences. Install Python and Environment Setup. First Python Program. Python Identifiers, Keywords and Indentation. Comments and document interlude in Python. Command line arguments. Getting User Input. Python Data Types. What are variables? Python Core objects and Functions. Number and Maths. List, Ranges & Tuples in Python Introduction Lists in Python More about Lists Understanding Iterators Generators, Comprehensions and Lambda Expressions o Introduction o Generators and Yield o Next and Ranges Understanding and using Ranges More About Ranges Ordered Sets with tuples. Python Dictionaries and Sets Introduction to the section Python Dictionaries More on Dictionaries Sets Python Sets Examples

Control Statements if-else if-elif-else while loop for loop break continue assert pass return. Input and Output in Python Reading and writing text files writing Text Files Appending to Files and Challenge Writing Binary Files Manually Using Pickle to Write Binary Files. Python built in function Python user defined functions Python packages functions Defining and calling Function The anonymous Functions Loops and statement in Python Python Modules & Packages

Python Object Oriented Overview of OOP The self variable Constructor Types Of Variables Namespaces Creating Classes and Objects Inheritance Types of Methods o Instance Methods o Static Methods o Class Methods Accessing attributes Built-In Class Attributes Destroying Objects Abstract classes and Interfaces Abstract Methods and Abstract class Interface in Python Abstract classes and Interfaces. Exceptions Errors in Python Compile-Time Errors Runtime Errors Logical Errors What is Exception? Handling an exception try….except…else try-finally clause Argument of an Exception Python Standard Exceptions Raising an exceptions User-Defined Exceptions

Python Regular Expressions What are regular expressions? The match Function The search Function Matching vs searching Search and Replace Extended Regular Expressions Wildcard. Python Multithreaded Programming What is multithreading? Difference between a Process and Thread Concurrent Programming and GIL Uses of Thread Starting a New Thread The Threading Module Thread Synchronization o Locks o Semaphore Deadlock of Threads Avoiding Deadlocks Daemon Threads

Using Databases in Python Python MySQL Database Access Install the MySQLdb and other Packages Create Database Connection CREATE, INSERT, READ Operation DML and DDL Oepration with Databases C Fundamentals: Identifiers, Data Types, Keywords, Variables, Expression and Statement, Constants,

Referred Books

1. Programming Python: Mark Lutz
2. Python Cookbook: Recipes for Mastering Python 3: Brian K. Jones and David M. Beazley

Course outcomes

On completion of this course the students will be,

1. Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems.
2. Demonstrate an understanding of computer programming language concepts.
3. Able to define data types and use them in simple data processing applications also he/she must be able to use the concept of OOPs.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Digital Design With VHDL	**EL51105**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To impart the essential knowledge on the fundamentals and applications of digital circuits and digital computing principles.
- To provide an overview on the design principles of digital computing systems.

UNIT - I

Analog Vs. Digital Signals and Circuit. Basics of Digital Circuits. Number System, Transformation in different number system. r's and (r-1)'s Complement, Binary Arithmetic & Codes: Binary Addition, Binary Subtraction, Binary Multiplication, Binary Division, BCD Codes, BCD Subtraction, BCD Addition, ASCII (American Standard Code for Information Interchange), EBCDIC = Extended Binary Coded Decimal Interchange Code, Excess-3 (XS3), Gray Code

UNIT – II

Boolean Algebra; postulates and theorems useful for two-valued Boolean algebra, Two valued Boolean Algebra, Principle of Duality, DeMorgan's Theorem, Simplification of Boolean Expression, Canonical and Standard forms: Canonical Sum of Product Expression, Canonical Product of Sum Expression, Conversion between Canonical Forms

Boolean Algebra: The OR Operation & Gate, The AND Operation & AND Gate, The NOT Operation & Inverter, The NAND Gate, The NOR Gate, Extension to Multiple Inputs, Universal Gates, Positive and Negative Logic

UNIT – III

Minimization of Boolean functions, Karnaugh Map and Applications, Two variable K-map, Three variable K-map, Four variable K-map, Five variable K-map, Don't care combinations.

UNIT – IV

Combinational logic circuits: Arithmetic Circuits – Half adders, Full adders, Half Subtractor, Full Subtractor, Code Converters: Binary to Gray code converters, Gray-to-binary Converter, BCD-to-excess-3 Code Converter, Excess-3 - to – BCD Code Converter, Parity Generator and Parity Checker, Look-ahead Carry Generator, BCD Adder, Magnitude Comparators, Encoders, Decoders: Different type of decoders, BCD-to-seven-segment decoder, Implementation of functions using decoder, Multiplexer, Implementation of functions using decoder, Demultiplexer, Analysis of combinational circuit, Realization of combinational circuit from verbal description

UNIT – V

Sequential circuits : Latches & Flip-flops, RS, JK, D and T flip-flops, and Synthesis of inputs, Race around problem, Master Slave flip flops, Edge Triggering and Level Triggering, Interconversion of flip-flops, Analysis of Sequential circuit on the basis of state equation, state table and state diagram.

Registers: Introduction of Registers, Shift Registers, Types of Shift Registers: SISO, SIPO, PISO, PIPO, Bidirectional Shift Registers, Ring Counter, Johnson Counter

Counters:Asynchronous (Ripple) Counters, Asynchronous Decade Counter, Asynchronous Binary Counters

UNIT – VI

Introduction of Synchronous(Clocked) Sequential Machines, Realization of Flow table from verbal description for designing of sequential circuit, Realization of synchronous sequential circuit using different flip flops, Sequence Detector, Designing of sequence detector using different flip flops., Mealy and Moore model Machines, Inter-conversion between Mealy and Moore machine**..**

Reference Books :

Digital Design III rd edition : M. Morris Mano.

Z. Kohavi (TMH), "Switching & Finite Automata Theroy".

Course outcomes

On completion of this course the students will be,

1. Understand how digital and logic computing is built from the fundamentals of semiconductor electronics and learn the capability to use abstractions to analyze and design digital electronic circuits
2. Gain knowledge on the basic logics and techniques related with digital computing
3. Develop expertise to design and implement various complicated digital systems to be applicable for signal measurement and processing

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Microcontroller & Interfacing	**EL51106**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To teach the students to familiarize with Microcontroller architecture and functioning.
- To train the students to program the Microcontroller for any application.
- To train the students to interface the Microcontroller with sensors and actuators.
- To train the students for designing the Microcontroller based application.

Microprocessor Vs microcontroller, Embedded System, Computer Architectures: RISC/CISC and Harvard/Princeton Architectures. The 8051 Microcontroller, Criteria for choosing a microcontroller, 8051 Family members & block diagram. The 8051 Assembly Language Programming: 8051internal registers, Structure of Assembly Language, Program Counter & ROM Space, Data types & Directives, PSW, Register Banks & Stack. JMP, LOOP & CALL Instructions: Looping, Conditional & unconditional jump, LCALL, ACALL, PUSH, POP instructions & Subroutines. Time Delay Generation & Calculation. I/O Port Programming: Pin description, I/O Ports, Bit addressability & Read-modify-write feature. Addressing Modes: Addressing modes, Indexed addressing & Look up tables, SFR registers and their addresses. Arithmetic & Logical Instructions: Addition, subtraction, BCD numbers and DA A instruction, multiplication and division, signed number and overflow problem in arithmetic operations. Logic & Compare Instructions, Rotate & Swap Instructions, BCD & ASCII conversion programs. Single Bit Instructions: Single bit instructions, Registers & bit addressability, Bit addressable RAM, Reading input pins Vs. Port Latch. 8051Timer /Counter Programming: Timer Registers, TMOD Register, Timer mode 1, mode 2, mode 3 programming. Counter Programming. Boot loader with 8051.
8051 Serial Communication: Basics of serial communication, Asynchronous serial communication & data framing, RS 232 standards, MAX 232. Baud rate selection & T1 register, SBUF, SCON Registers, and Serial port Programming to transmit & receive data serially. 8051 Interrupts Programming: interrupt latency, context switching, 8051 interrupts, IVT for 8051, IE register, TCON register and Timer Interrupts, External H/W Interrupts Programming. Serial Port Interrupts Programming, Interrupt Priority upon reset and IP register.

Real World Interfacing: LED, Seven segment, Switches, LCD, LED array, ADC, temperature Sensors, , Stepper Motor, DC motor , and Keypad

Working with microcontroller development tools compiler and assembler (Keil.), simulator (proteus), burner.

Reference Books:

1. 8051 Microcontroller and Embedded Systems : M.A. Mazidi & J. G. Mazidi. Pearson Education
2. Microcontrollers: Architecture, Programming & System Design: Rajkama Pearson Education
3. 8051 Microcontrollers Arch., Programming & Applications: K. J. Ayala Penram International

Course outcomes

On completion of this course the students will be,

1. Students are able to program and interface the microcontroller with peripherals.
2. Students completing this course will demonstrate competence and ability to design a stand-alone computing device for real time applications.

SEMESTER – II

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Advanced Embedded Microcontrollers - ARM	**EL52106**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To teach the students to familiarize with microcontroller architecture and functioning.
- To train the students to program the microcontroller for any application.

Introduction: Evolution of Computers, Technological Trends, Measuring performance Speed up, Amdahl's Law. Computer organization: von Neumann Machine Architecture, Functional units and components, Program development tools. Instruction pipelining and parallel processing: Instruction pipeline, hazards, Data forwarding paths, RISC vs. CISC processors.

The ARM Architecture, ARM assembly language programming, ARM organization and implementation, instruction set, Architectural support for system development, ARM processor cores, Embedded ARM applications.

The Embedded Computing Platform: CPU Bus, Memory Devices, I/O Devices, Component Interfacing

REFERENCES

1. ARM System on Chip Architecture 2nd Ed, Published 2000 : Steve Furber, Addison Wesley.
2. ARM Architecture Reference Manual, 2nd Ed, Published 2001, edited by David Seal, Addison-Wesley.
3. ARM Assembly Language, 2009: William Hohl, CRC Press
4. Professional Embedded ARM Development, 2014: J. A. Langbridge, John Wiley & Sons, Inc.
5. Computers as Components : Wayne Wolf, Morgan Kaufmann Publisher

Course outcomes

On completion of this course the students will be,

1. Students completing this course will demonstrate competence and ability to design a stand-alone computing device for Embedded applications.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Analog and Digital Communication	**EL52102**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To introduce the principles of analog and digital communication systems involving different modulation and demodulation schemes.

Communications: Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density.

Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis of these operations, Superheterodyne receivers; elements of hardware, realizations of analog communication systems; signal-to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions.

Digital communication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), matched filter receivers, bandwidth consideration and probability of error calculations for these schemes. Basics of TDMA, FDMA and CDMA and GSM. Fundamentals of information theory and channel capacity theorem. Introduction to Satellite Communication.

1. Required Text(s)

Modern Digital & Analog Comm. System : B.P.Lathi

2. Essential References

1. Principles of Communication Systems : Taub & Schilling
2. Electronic Communication Systems : Kennedy
3. Analog & Digital Communication : Schaum Series

Course outcomes

On completion of this course the students will be,

1. Develop an understanding of need for modulation and generation & detection of Analog modulation techniques.
2. Explore AM and FM Super heterodyne receiver working principle.
3. Discuss the techniques for generation and detection of pulse Analog modulation techniques
4. To understand the basic operation involved in PCM like sampling, quantization & encoding and are able to calculate and derive entropy and channel capacity.
5. To compare different communication system with various modulation techniques in the presence of noise by analytically.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Data Communication & Networking	**EL52103**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To get an understanding on the fundamentals of networks and issues involved.
- To acquire an understanding on the set of rules and procedures that mediates the exchange of information between communicating devices.

UNIT - I

Introduction: Data, Information, Steps to convert data in to information.
Communication System: Elements of Communication System, networks: network criteria, physical topology, types of connection, categories of network , Protocols & Standards Connection Oriented and Connection less services.

UNIT - II

Network Model: layered tasks, OSI Reference Model, TCP/IP Model, addressing.
Network Devices: Repeaters, Hubs, Bridges, Switches, Routers, Gateway

UNIT - III

Physical Layer: Asynchronous and synchronous transmission, TDM, FDM, WDM,
transmission media: guided, unguided, Cross Cables and Straight Cable, switching techniques.

UNIT - IV

Data Link Layer: Introduction, Design Issues: Error Control: Parity Concept, Hamming Codes, CRC, Flow Control, Framing, Sliding Window Protocol. Data Link Layer Protocols. MAC Layer: ALOHA, CSMA, CSMA/CD, Contension free Protocols, IEEE 802 standards for LAN & MAN: 802.3, 802.4,802.5, 802.11.

UNIT - V

Network Layer: Design Issues, IP protocol:IPv4 & IPv6, classful and classless addressing Routing Algorithms: Optimizing Principle, Shortest Path Finding Algorithm., Flooding, Distance Vector Routing Algorithm, Link State Routing, Hierarchal Routing, Broadcast Routing, Congestion Control Algorithms.
Transport and Application Layer: TCP, UDP, DNS, e-mail, WWW.

Text Books: 1.Data communications and Networking : Behrouz A Forouzan.
2.. Computer Networks: A. S. Tenenbom

Course outcomes

At the end of the course student will be able

1. Compare and examine, OSI and TCP/IP protocol stacks
2. Categorize services offered by all layers in TCP/IP protocol stack
3. Analyze a network under congestion and propose solutions for reliable data transfer
4. Examine the protocols operating at different layers of TCP/IP model

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Signals and Systems-Discrete	**EL52104**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To provide better understanding of discrete-time and digital signal in time and frequency domain
- To provide knowledge to analyse linear systems with difference equations
- To design and implement FIR and IIR filters with different structures.
- To introduce DSP processor and FFT processors.

UNIT-I INTRODUCTION
Scope and Overview, Signals, Signal Processing, Classification of Signals, Advantages of Digital Signal Processing

UNIT-II DISCRETE SIGNALS
Operations on Discrete Signals, Decimation and Interpolation, Some Standard Discrete Signals, Discrete-Time Harmonics and Sinusoids, Sampling Theorem

UNIT-III TIME-DOMAIN ANALYSIS
Discrete-Time Systems, FIR and IIR Digital Filters, Solving Difference Equations, Zero-Input Response and Zero-State Response, System Representation in Various Forms, Moving Average Filters, Inverse Systems, Echo and Reverb, Discrete Convolution, Convolution Properties, Linearity, Shifting Invariance, Stability and Causality of LTI Systems, System Response to Periodic Inputs, Circular Convolution, Deconvolution, Discrete Correlation

UNIT-IV z-TRANSFORM ANALYSIS
Two-Sided and One-Sided z-Transform, Properties of z-Transform, Poles, Zeros, z-Plane & ROC, Transfer Function, Transfer Function Realization, Causality and Stability of LTI Systems, Inverse z- Transform, System Analysis using z-Transform.

UNIT-V FREQUENCY DOMAIN ANALYSIS
The DTFT form and z-Transform, The DTFT of Discrete-Time Periodic Signals, Properties of DTFT, The Inverse DTFT, The Frequency Response, System Analysis using the DTFT, Linear Phase System Analysis

UNIT-VI DISCRETE FOURIER TRANSFORMS AND FAST FOURIER TRANSFORMS
Introduction to DFT, Efficient computation of DFT Properties of DFT, FFT algorithms – Radix-2 FFT algorithm, Decimation in Time, Decimation in Frequency algorithms.

UNIT VII DIGITAL FILTER DESIGN
Structure of IIR, System Design of Discrete time IIR Filter from Continuous Time Filter, IIR Filter Design by Impulse Invariance, Bilinear Transformation, Approximation Derivatives, Design Recipe of IIR Filter.
Symmetric & Antisymmteric FIR filters, Linear Phase Filter, Windowing Technique, Rectangular, Kaiser Windows, Frequency Sampling Techniques, Applications.

Text Books:
Ashok Ambardar, Digital Signal Processing: A Modern Introduction, CENGAGE Learning, 2007
(2) Schaum's Outline of Digital Signal Processing, McGraw-Hill, First Edition, 1998

Reference Book:
John G. Proakis & Dimitris G. Manolakis, *Digital Signal Processing: Principles, Algorithms, and Applications*, Third Edition, Pearson Publicati

Course outcomes
On completion of this course the students will be,

1. To analyse the signals in both time and frequency domain

2. To design FIR and IIR filters for signal pre-processing
3. To implement and realize the filters using different structures.
4. Explain the selection of DSP processor for signal processing applications

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Machine Learning	**EL52105**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- The course is designed to provide complete knowledge of Machine Learning. Students will be able to develop logics which will help them to create programs, for models. Also by learning able to deal with data related real time problems.

Introduction to Python, What is Python and history of Python? Unique features of Python. Python-2 and Python-3 differences. Install Python and Environment Setup. First Python Program. Python Identifiers, Keywords and Indentation. Comments and document interlude in Python. Command line arguments. Getting User Input. Python Data Types. What are variables? Python Core objects and Functions. Number and Maths. List, Ranges & Tuples in Python Introduction Lists in Python More about Lists Understanding Iterators Generators, Comprehensions and Lambda Expressions o Introduction o Generators and Yield o Next and Ranges Understanding and using Ranges More About Ranges Ordered Sets with tuples. Python Dictionaries and Sets Introduction to the section Python Dictionaries More on Dictionaries Sets Python Sets Examples

Learning Problems Perspectives and Issues Concept Learning Version Spaces and Candidate . Various python based libraries used in development of machine learning like numpy, pandas, matplotlib, scikit learning

Mathematics and statistics to fine tune ML models: Mean, median, gaussian distribution, probability distribution, partial differentiation, linear algebra, polynomials, mean square error, cost function, gradient descent algorithm, activation unit, sigmoid function.

ML Models: Linear regression, Polynomial regression, K-means clustering, logistic regression, Descision Tree. Scratch model development by python, fine tuning parameters like learning rate, change in number of iterations, regularization factor. Diagnostic mechanism to deal with errors such as cost function vs degree of polynomials, regularization factor vs degree of polynomials, number of samples vs degree of polynomials.

NEURAL NETWORKS AND GENETIC ALGORITHMS: Neural Network Representation Problems Perceptions Multilayer Networks and Back Propagation Algorithms – Advanced Topics. Reduction in loss and finetuning of weights at each layer.

Referred Books

1. Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems : Geron Aurelien
2. Machine Learning for Absolute Beginners: Oliver Theobald

Course outcomes

On completion of this course the students will be,

1. Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems.
2. Demonstrate an understanding of how to find out insights from the data by applying machine learning

SEMESTER – III

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Control Systems	**EL53101**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To equip the students with the fundamental concepts in control systems.
- To introduce the concept of feedback control system.

Basic control system component block diagrammatic description, reduction of block diagrams.
Open Loop & Close loop (feedback) systems, Effect of feedback on stability and sensitivity, special properties of Linear time invariant (LTI) systems: transfer functions, impulse response, poles, zeros, their significance, stability analysis of the system, signal flow graphs and their use in determining transfer function of systems
Transient and steady state analysis of LTI system and frequency response analysis.
Concepts of gain and phase margins Approximation of transient response from close loop frequency response.
Tools and technique for LTI control systems analysis: rool loci, bode, Nyquist, RH Criteria.
Control system Compensators: Elements of lead & leg compensation, Elements of PID control, steate variable representation and solution of atete equations of LTI control systems.

Referred books:
Control Systems Engg: Nagartah and Gopal
Modern Control Engg: Ogata

Course outcomes
Upon completion of the course, the students will be able to

1. Understand the concepts of closed loop control systems.
2. Analyse the stability of closed loop systems.
3. Apply the control techniques to any electrical systems.
4. Compute and assess system stability.

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Embedded Systems Design	**EL53102**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

For embedded systems, the course will enable the students to:

- Understand the basics of an embedded system.
- Understand the typical components of an embedded system.
- To understand different communication interfaces.
- To learn the design process of embedded system applications.

Unit-I Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems

UNIT-II Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces

UNIT-III Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT-IV Programming the Atmega328p. Basics of version control system – AVR Studio 7. Introduction to Assembly and Embedded C. Interfacing LEDs and Switches with MSP430 using Digital Input and Output, Atmega328p Clock and Reset System. Atmega328p Clock sources and distribution. Types of Reset sources. Handling Interrupts in MSP430. Writing efficient Interrupt Service Routine (ISR).

UNIT-V Interfacing Seven Segment Displays and Liquid Crystal Displays with Atmega328p. Introduction to Atmega328p Timer Module and it's Modes of Operation.Generating Pulse Width Modulation (PWM) using Timer Capture Mode. ADC operation in Atmega328p Interfacing analog inputs. Generating random numbers using LFSR and other methods. Adding DAC to Atmega328p. Measuring frequency and time period of external signals and events. Serial Communication Protocols: UART, SPI, I2C. Interfacing Universal Serial Communication Interface (USCI) Module of the Atmega328p for UART Communication. Advanced Coding Exercises based on Interrupt driven Programming. Building an Electronics Project.

Referred books:

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. AVR Microcontroller and Embedded Systems using Assembly and C- M.A. Mazidi, S Naimi
4. An Embedded Software Primer - David E. Simon, Pearson Education

Course outcomes

On completion of this course the students will be,

- Understand the design process of an embedded system
- Understand typical embedded System & its components
- Understand embedded firmware design approaches

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Wireless Communication	EL53104	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To get an understanding of mobile radio communication principles, types and to study the recent trends adopted in cellular and wireless systems and standards**.**

Unit-I

Wireless Communication:-

Introduction, **History of wireless** communication, Wireless services, Requirements in wireless communication. Wireless Transmission :-Frequencies for radio transmission, signal, antennas. Signal propagation: path loss of radio signal , additional signal propagation effects, multi-path propagation. Spread spectrum: DSSS, FHSS.

Unit-II

Global System for Mobile Communications (GSM) & (ISDN):-

Introduction of GSM and history, GSM service and feature, GSM system architecture, GSM radio sub system, GSM channel type :-GSM traffic channel and GSM control channel, example of GSM call, Frame structure for GSM, Signal processing in GSM, Protocols, Localization and Calling, Handover. Security: Authentication , Encryption. Integrated service digital network (ISDN).

Unit-III

Wireless networking :-Introduction to wireless network, Difference between wireless and fixed telephone network:-Public Switched Telephone Network (PSTN),Limitation in wireless network. Development of wireless network: First generation wireless network, Second generation wireless network & Third generation wireless network.

Unit IV

Orthogonal frequency division multiplexing (OFDM):- Introduction, advantages & disadvantages of OFDM transmission scheme , Multiple Access techniques: FDMA,TDMA,CDMA, OFDM system Model: serial to parallel conversion, modulation of data, inverse Fourier transform, OFDM versus single carrier transmission. Code division multiple access (CDMA) :-

Introduction basic principal of spread spectrum, direct sequence spread spectrum, frequency hopped spread spectrum, time hopped spread spectrum, CDMA system overview.

Unit V

Wireless LAN and Bluetooth :- introduction version of WLAN, the benefits of WLAN, Introduction, Bluetooth ,Bluetooth v/s infrared, Bluetooth vs 802.11,Bluetooth features ,Bluetooth technology, Bluetooth application, types of link, comparison of various technology, Bluetooth network topology, Bluetooth stack ,packet data unit, data packet format, operating modes, Establishing network connection, Bluetooth profile, Bluetooth security.

Unit VI

Introduction to 4G technology and Multiantenna system:- introduction evaluation of 4G technology smart antenna switched beam antenna, adoptive antenna,4G tools and techniques, advance technology physical layer enhancement.

Multiantenna system:- Smart antennas , multiple input multiple output system (MIMO): Introduction, Model of MIMO system, MIMO system Channel Capacity.

References:

1.Theodore S. Rappaport:wireless communication , pearson.
2. Jochen Schilling: mobile Communication Systems, pearson.
3. Upena Dalal: Wireless Communication, Oxford University Press.
4. P. M. Chidambara Nathan: Wireless Communication, PHI Learning

Course outcomes

On completion of this course the students will be,

1. Apply the knowledge of basic communication systems and its principles.
2. Describe the cellular concept and analyze capacity improvement Techniques.
3. Mathematically analyze mobile radio propagation mechanisms.
4. Summarize diversity reception techniques.
5. Design Base Station (BS) parameters and analyze the antenna configurations.
6. Analyze and examine the multiple access techniques and its application.

7. Assess the latest wireless technologies. Explain and compare the techniques for chip level and board level testing

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
CMOS Technology & VLSI Design	**EL53105**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To introduce various aspects of CMOS & VLSI circuits and their design including testing**.**
- To expose the students to the low voltage device modeling, low voltage, low power VLSI CMOS circuit design.

Unit-I Introduction

CMOS Logic: Inverter, NAND Gate, Combinational Logic, NOR Gate, Compound Gates, Pass Transistors and Transmission Gates, Tristates, Multiplexers, Latches and Flip-Flops, CMOS Fabrication and Layout: Inverter Crosssection, Fabrication Process, Layout Design rules, Gate Layout, Stick Diagrams. VLSI Design Flow.

MOS Transistor Theory: Ideal I-V Characteristics, C-V Characteristics: MOS Capacitance Models, MOS Gate Capacitance Model, MOS Diffusion Capacitance Model.

Non ideal I-V Effects: Velocity Saturation and Mobility Degradation, Channel Length Modulation, Body Effect, Subthreshold Conduction, Junction Leakage, Tunneling, Temp. and Geometry Dependence. DC Transfer characteristics: Complementary CMOS Inverter DC Characteristics, Beta Ratio Effects, Noise Margin, Ratioed Inverter Transfer Function, Pass Transistor DC Characteristics, Tristate Inverter, Switch- Level RC Delay Models.

Unit -II CMOS Processing Technology

CMOS Technologies: Background, Wafer Formation, Photolithography, Well and Channel Formation, Silicon Dioxide (SiO2), Isolation, Gate Oxide, Gate and Source/Drain Formation, Contacts and Metallization, Passivation, Metrology.

Layout Design Rules: Design Rules Background, Scribe Line and Other Structures, MOSIS Scalable CMOS Design Rules, Micron Design Rules.

CMOS Process Enhancements: Transistors, Interconnect, Circuit Elements, Beyond Conventional CMOS.

Unit -III Circuit Characterization and Performance Estimation

Delay Estimation: RC Delay Models, Linear Delay Model, Logical Effort, Parasitic Delay. Logical Effort and Transistor

Sizing: Delay in a Logic Gate, Delay in Multistage Logic Networks, choosing the Best Number of Stages.

Power Dissipation: Static Dissipation, Dynamic Dissipation, Low-Power Design.

Interconnect: Resistance, Capacitance, Delay, Crosstalk. Design Margin: Supply Voltage, Temperature, Process Variation, Design Corners. Reliability, Scaling.

Unit -IV Analog CircuitsMOS Small-signal Model, Common Source Amplifier, The CMOS Inverter as an Amplifier, Current Mirrors, Differential Pairs,

References:

1. Neil H.E. Weste, David Harris, Ayan Banerjee: CMOS VLSI Design, Third Edition, Pearson Education.

2. Neil H.E. Weste, Kamran Eshraghian: Principle of CMOS VLSI Design, Pearson Education.

3. J. P. Uyemura: Chip Design for Submicron VLSI, Cengage Learning.

4. Philip E. Allen and Douglas R Holberg: CMOS Analog Circuit Design, Oxford

5. Carver Mead and Lynn Conway: Introduction to VLSI systems, BS Publication

6. J. P. Uyemura: Introduction to VLSI Circuits and Systems, Wiley.

Course outcomes

On completion of this course the students will be,

1. Acquire the knowledge about various CMOS fabrication process and its modeling.
2. Infer about the second order effects of MOS transistor characteristics.
3. Analyze and implement various CMOS static logic circuits and CMOS dynamic logic circuits.
4. Learn the design techniques low voltage and low power CMOS circuits for various applications..
5. Describe the techniques used for VLSI fabrication, design of CMOS logic circuits, switches and memory
6. Describe the techniques used the design of CMOS logic circuits, switches and memory in VLSI
7. Generalize the design techniques and analyze the characteristics of VLSI circuits such as area, speed and power dissipation
8. Explain and compare the architectures for FPGA, PAL and PLDs and evaluate their characteristics such as area, power dissipation and reliability

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Microcontroller & Interfacing	**EL53103**	L	T	P	Max.Marks-100
		3	1	--	

Course Learning Objectives

- To teach the students to familiarize with Microcontroller architecture and functioning.
- To train the students to program the Microcontroller for any application.
- To train the students to interface the Microcontroller with sensors and actuators.
- To train the students for designing the Microcontroller based application.

Microprocessor Vs microcontroller, Embedded System, Computer Architectures: RISC/CISC and Harvard/Princeton Architectures. The 8051 Microcontroller, Criteria for choosing a microcontroller, 8051 Family members & block diagram. The 8051 Assembly Language Programming: 8051internal registers, Structure of Assembly Language, Program Counter & ROM Space, Data types & Directives, PSW, Register Banks & Stack. JMP, LOOP & CALL Instructions: Looping, Conditional & unconditional jump, LCALL, ACALL, PUSH, POP instructions & Subroutines. Time Delay Generation & Calculation. I/O Port Programming: Pin description, I/O Ports, Bit addressability & Read-modify-write feature. Addressing Modes: Addressing modes, Indexed addressing & Look up tables, SFR registers and their addresses. Arithmetic & Logical Instructions: Addition, subtraction, BCD numbers and DA A instruction, multiplication and division, signed number and overflow problem in arithmetic operations. Logic & Compare Instructions, Rotate & Swap Instructions, BCD & ASCII conversion programs. Single Bit Instructions: Single bit instructions, Registers & bit addressability, Bit addressable RAM, Reading input pins Vs. Port Latch. 8051Timer /Counter Programming: Timer Registers, TMOD Register, Timer mode 1, mode 2, mode 3 programming. Counter Programming. Boot loader with 8051.
8051 Serial Communication: Basics of serial communication, Asynchronous serial communication & data framing, RS 232 standards, MAX 232. Baud rate selection & T1 register, SBUF, SCON Registers, and Serial port Programming to transmit & receive data serially. 8051 Interrupts Programming: interrupt latency, context switching, 8051 interrupts, IVT for 8051, IE register, TCON register and Timer Interrupts, External H/W Interrupts Programming. Serial Port Interrupts Programming, Interrupt Priority upon reset and IP register.

Real World Interfacing: LED, Seven segment, Switches, LCD, LED array, ADC, temperature Sensors, , Stepper Motor, DC motor , and Keypad

Working with microcontroller development tools compiler and assembler (Keil.), simulator (proteus), burner.

Reference Books:

4. 8051 Microcontroller and Embedded Systems : M.A. Mazidi & J. G. Mazidi. Pearson Education
5. Microcontrollers: Architecture, Programming & System Design: Rajkama Pearson Education
6. 8051 Microcontrollers Arch., Programming & Applications: K. J. Ayala Penram International

Course outcomes

On completion of this course the students will be,

3. Students are able to program and interface the microcontroller with peripherals.
4. Students completing this course will demonstrate competence and ability to design a stand-alone computing device for real time applications.

SEMESTER – IV

COURSE TITLE	COURSE CODE	CREDIT-4			THEORY PAPER
Major Project Phase Viva Voce	**EL54501**	L	T	P	
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