

MBA [Energy Management]

By

Distance Education

2017-2020



Syllabus

School of Energy & Environmental Studies

Devi Ahilya Vishwavidyalaya,
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M.B.A. (ENERGY MANAGEMENT) 2017-2020

Eligibility: Graduate Degree in Engineering or M Sc. Physics with minimum of 55% marks
Duration : 6 Semesters
Seats : 60

I Semester:

Course No.	Subjects	Faculty	Credits
EM – 801	Principals and Practices of Management	MF	4
EM – 802	Solid Waste Management	RNS	4
EM – 803	Water and waste water Pollution & Control Management	RC	4
EM – 804	Heat Transfer	SPS	4
EM – 805	Heat Transfer Laboratory	SPS	2
	Comprehensive Viva – Voce	External + Internal Examiner	4
		Total	22

II Semester:

Course No.	Subjects	Faculty	Credits
EM – 806	Financial Management	MF	4
EM – 807	Air Pollution and Control Management	RC	4
EM – 808	Wind Energy Technologies	RNS	4
EM – 809	Solar Energy Technologies	SPS	4
EM – 810	Solar Energy Laboratory	SPS	2
	Comprehensive Viva – Voce	External + Internal Examiner	4
		Total	22

III Semester:

Course No.	Subjects	Faculty	Credits
EM – 811	Energy Action Planning and Project Management	RNS	4
EM – 812	Environmental Impact Assessment and Auditing	RC	4
EM – 813	Process Integration and Engineering Thermodynamics	SPS	4
EM – 814	Energy Auditing Management Techniques	SPS	3
EM – 815	Site Visits (Renewable / Industrial)	SPS/RNS/RC	3
	Comprehensive Viva – Voce	External + Internal Examiner	4
		Total	22

IV Semester:

Course No.	Subjects	Faculty	Credits
EM-816	Organization Behaviour	MF	4
EM-817	Geothermal and Ocean Energy Conservation	RNS	4
EM-818	Instrumentation and Data Base Management	BSB	4
EM-819	Biomass Conversion Technologies	SPS	4
EM-820	Biomass Laboratory	SPS	2
	Comprehensive Viva – Voce	External + Internal Examiner	4
		Total	22

V Semester:

Course No.	Subjects	Faculty	Credits
EM –821	Energy Conservation in Industrial Buildings	SPS	4
EM –822	Electrical Energy Management	Bhalavi	4
EM –823	Thermal Energy Management	SPS	4
EM – 824	Energy Conservation Management in Process of Designated Industries	Bhalavi	4
EM – 825	Energy Auditing & Energy Conservation Laboratory	SPS	2
	Comprehensive Viva – Voce	External + Internal Examiner	4
		Total	22

VI Semester:

Course No.	Subject	Faculty	Credits
EM –826	Major Project	SPS/RNS/RC	20
-	Comprehensive Viva – Voce	External + Internal Examiner	4
		Total	24
	GRAND TOTAL		133

* Minor Project can be started from III Semester.

* Minimum requirement to get M. B.A. (Energy Management) degree is pass in each subjects.

* After each semester, theory examinations would be conducted. Candidates supposed to appear for a comprehensive viva -voce examination which, would not be counted in number of passed credits, however will be counted for CGPA/ GGPA calculations.

First Assignment Part

Fundamental of Management: Function and Responsibilities of Managers, Fayol's Principal of Management thought; the classical School, the Human Relation School, Systems theory, Contingency Management Development Excellent Managers.

Second Assignment Part

Planning: Nature and Purpose of planning process, principles of planning, Types of planning, Advantage And Limitations of planning.

Third Assignment Part

Concept and Nature of Objective: Types of Objective, Importance of Objective, Setting objectives, Management by Objective (MBO) benefits and weaknesses of MBO.

Fourth Assignment Part

Strategies and Policies: Concept of Corporate strategy, Formulation of strategy, Types of Strategies, Types of policies, Principles of formulation of policies, Decision Making Process, Individual Decision Making Models.

Fifth Assignment Part

Organizing: Nature and Purpose of Organizing, Base of Departmentation, Span Relationship Line Staff Conflict, Base of Delegation, Kind of Delegation and Decentralization, Method of Decentralization.

Sixth Assignment Part

Controlling: Concept and Process of Controlling Control Techniques, Human Aspects of Control, Control As a feedback system, feed forward Control, preventive Control, Profit and Loss Control, Control through Return on Investment, the use of Computer of Controlling & Decision Making, the challenges created by IT a Control Tool

Recommended Books:

1. Dr. Neeru Vasishth – Principal of Management, 3rd edi. 2010, Taxmann's.
2. Organization and Management- R.D. Agrawal, Tata Mc Graw Hill.

First Assignment Part

Waste Management

Different Option, Integrated Waste Management Strategies, Collection, Transportation And Environmental Impact.

Second Assignment Part

Generation and Disposal Methods

Resources, Disposal and Recovery, Material and Products in Solid Waste.

Third Assignment Part

Characterization of Different Types Of Solid Waste

Municipal Solid Waste, Agro – Waste, Others

Fourth Assignment Part

Hazardous Waste

Characterization, Collection, Transportation, Treatment, Storage and Disposal.

Fifth Assignment Part

Control Technologies

Issues, Techniques and Economics, Sources Reduction, Recycling, Non-incineration Technology, Incineration, Landfill, Refused Derived Fuels

Six Assignment Part

Landfill output utilization

Such as Electric Generation, Medium Btu (Direct Use) use, High Btu (Processed to Natural Gas)use, R&D Efforts, Fuel Cells, Vehicle Fuel, Active and passive control of landfill gas, estimation of landfill gas potential, IPCC, 2006 Model for CH₄ generation, LandGem Model for Estimation of CH₄ Generation in Land Fill.

Case Studies

Recommended Books

1. Handbook of solid management” Frank Kerith, McGraw Hill, Inc. USA (1994).
2. Handbook of Environmental Engineering Vol. 2, Lawrence K. Wang and Worman C. Pereira, THE HUMAN Press, Clifton, New Jersey, (1990)
3. Hazardous Waste Management – Charles A. Wentz
4. T V Ramchandra- Management of Municipal Waste

First Assignment Part:

Introduction: Definition, Classification, Sources of Pollution, Water quality Standards. Water Chemistry: - Theory of Acid Base Titration, Indicators, Alkalinity, Acidity and Hardness.

Second Assignment Part:

Water Treatment: Determination of DO BOD, COD of Water, Water Pollution due to heavy metals and Organic Pollutants. Water Treatment: Surface water: Water Purification Processes In Natural Systems (Physical, Chemical, Bio-Chemical Processes) And Its Application, Response Of Stream To Bio-Degradable Organic Wastes.

Third Assignment Part:

Water Treatment Methods: Sedimentation: principles of sedimentation, Aeration,: Theory of Aeration, factor affecting oxygen transfer oxygenation and mixing requirements and types of Aeration. Filtration: Slow And Rapid Sand Filter, Filter Operation, Cleaning And Back Washing Process And Under Drainage System.

Fourth Assignment Part:

Coagulation: Process, Mechanism, Methods for determining Optimum coagulant dose, Jar Test Method. Chlorination Temporary and Permanent Hardness Removal and Different Methods, Chemicals and Ion Exchange.

Fifth Assignment Part:

Waste Water: Types (Domestic and Industrial), Characterization, Objectives and Planning Effluents Standards, Different Treatment Processes with Analysis, Flow Sheets Diagrams
Design Parameters: Waste Water Flow Rates, Source, Components and Estimation.
Mass Loading Factors, Impacts, Estimation and Their Unit Loading.
Biological Unit Process: 'Principle of Biological Treatment; Microbial Growth Rates, Treatment Kinetics, Food/Micro Organism Ratio, Substrate Removal Efficiency

Sixth Assignment Part:

Aerobic Suspended Growth Systems: Principles factor affecting design parameters and problems Activated Sludge, Aerated Lagoon, Oxidation Pond. Different Types of Industrial Effluent Treatment Plants: Characteristics, standards ETP, and Waste minimization Cement, Tanneries, Dairies and Sugar, Case Studies

Recommended Books:

1. Environmental Pollution And Its Control Jeffrey J. and P.A. Vesilind
2. Chemistry for Environmental Engineering Clair N. Sawyer & McCarty, TATA McGraw Hill International Publication IIIrd Edition.1986
3. Environmental Engineering - Howard S.Peavy et.al, TATA McGraw Hill International Publication 1st Edition. 1986
4. Water & Waste Water Technology --- Marle J. Hammer, Prentice Hall of India Ltd. New Delhi 2nd.
5. Water Treatment Principal and Design, Second Edition, Kerry J. Howe, David W. hand. John Wiley & sons, Inc, 2005.
6. Introduction to Environmental Engineering and Science, Second Edition, Gilbert M. Master 2005.

First Assignment Part

Steady-State Conduction-One Dimension

Plane Wall, Insulation and R Values, Radial System, Overall Heat-Transfer Coefficient, Critical Thickness of Insulation, Optimum Thickness of Insulation, Conduction-Convection Systems, Thermal Contact Resistance

Second Assignment Part

Steady-State Conduction-Multiple Dimensions

Mathematical Analysis of Two-Dimensional Heat Conduction, Graphical Analysis, the Conduction Shape Factor, Electrical Analog for Two-Dimensional Conduction, Effectiveness and Efficiency of Fins, Area Weighted Fins Efficiency.

Unsteady-State Conduction

Lumped-Heat –Capacity System, Transient Heat Flow in a Semi-Infinite Solid, Convection Boundary Conditions, Charts for Semi Infinite Medium, Infinite Slab, Cylinder and Sphere, Multidimensional Systems

Third and Fourth Assignment Part

Principals of Convection

Energy Equation of the Boundary Layer, The Thermal and hydrodynamic Boundary layer on a flat plate
The Relation between Fluid Friction and Heat Transfer, Heat Transfer in Laminar Flow, Turbulent Boundary-Layer and Heat Transfer, Laminar and Turbulent Flow and Heat Transfer in a Tube. Empirical Relation for Pipe and Tube Flow, Flow across Cylinders and Sphere, Flow across Tube Banks

Forth Assignment Part

Natural Convection System

Free-Convection Heat Transfer on a Vertical Plate and Vertical cylinders, Empirical Relations for Free Convection
Free Convection from Horizontal Cylinders, Free Convection from Horizontal Plates, Simplified Free Convection Equations for Air, Free Convection from Spheres.

Radiation Properties, Radiation Shape Factor, Relation between Shape Factors, Infinite Parallel Planes

Radiation Shields, Radiation Heat-Transfer Coefficient

Fifth Assignment Part

Condensation and Boiling Heat Transfer

Condensation Heat-Transfer Phenomena, Condensation Number, Film Condensation inside Horizontal Tubes

Boiling Heat Transfer, Simplified Relations for Boiling Heat Transfer with Water, Heat Pipe

Six Assignment Part

Heat Exchangers

The Overall Heat-Transfer Coefficient, Fouling Factors, Types of Heat Exchangers, The Log Mean Temperature Difference, Effectiveness-NTU Method, Compact Heat Exchangers, Heat Exchangers Design Considerations

Recommended Books

1. M.N. Oziesik, Heat Transfer - A Basic Approach, McGrew Hill Book Co., New Delhi.
2. M. Becter, Heat Transfer: A Modem Approach
3. S.P. Shukatme, Heat Transfer, Orient Longman, New Delhi.
4. W.H. Giedt, Principles of Engineering Heat Transfer, D.Van Norstand Company Inc.(1961)
5. F. Kireth, Radiation Heat Transfer, International Text book Co., Semton, USA (1962).
6. Yunus A. Cengel, Introduction to Thermodynamic and Heat Transfer, McGrew Hill Company, Inc. (1997).

1. Determine the radiation, convection loss and opening in boiler or furnace
2. To determine the heat transfer coefficient in natural convection and forced convection.
3. To determine temperature distribution, heat transfer and fin efficiency of a pin fin in natural and forced convection.
4. To determine and compare LMTD, Overall Heat transfer coefficient, efficiency and effectiveness of a heat exchanger in parallel flow and counter flow mode (Water to water).
5. To determine and compare LMTD, Overall Heat transfer coefficient, efficiency and effectiveness of a heat exchanger in parallel flow and counter flow mode (Water to air).
6. To determine and compare LMTD, Overall Heat transfer coefficient, efficiency and effectiveness of a heat exchanger in parallel flow and counter flow mode (Shell & Tube).
7. To determine heat transfer coefficient for drop and film wise condensation.
8. To determine the performance of heat pipe.

First Assignment Part

Introduction: Concept, Nature, Scope and objective of Financial Management, Finance Functions, Introduction to Short Term and Long Term Sources of Finance (Theory Unit).

Second Assignment Part

Capital Budgeting: Time Value of Money, DCF and Non DCF Methods for Evaluating Projects, Evaluating Mutually Exclusive and Independent Proposals. (Theory and Practical Unit)

Third Assignment Part

Cost of Capital: Cost of Debt, cost of preference, cost of equity, cost of term loan, cost of retained earnings weighted average cost of (Theory and Practical Unit)

Fourth Assignment Part

Working Capital: Concept, Need and Importance, Source of Working Capital Finance, Operating Cycle and Determining Working Capital Need. (Theory and Practical Unit)

Fifth Assignment Part

Statement of Changes in Financial Position: Funds Flow Statement using Total Resource Method, Working Capital Method and cash Method, (Theory and Practical Unit)

Recommended Books

1. M.Y.Khan & P. K. Jain, “Financial Management” Delhi, TATA McGraw hill. 5th edition 2011.
2. I.M. Pandey, “Financial Management” New Delhi, Vikas Publications House, 9th Edition.

First Assignment Part

Air quality and Emission Standards: Clean Air Acts, Pollutants Standards Index, Criteria Pollutants, Sources and their effects.

Definition, Air Quality, Classification of Air Pollutants, Air Pollution Episodes.

Second Assignment Part

Air Pollution Monitoring: Sources of Air pollutants Collection of Gaseous Air Pollutants, Collection of Particulate Pollutants, Measurement of SO₂, NO_x, CO, Oxidants and Ozone.

Third Assignment Part

Air Pollution Dispersion and Meteorology: Adiabatic lapse rates atmospheres stability, Inversions, Mixing Depths, Points source Gaussian Dispersion Model, Line source dispersion model.

Forth Assignment Part

Air pollution control technologies for particulates matter: Gravity settlers, Electrostatic precipitators, bag Filters Scrubbers Cyclone, control for moving sources

Fifth Assignment Part

Air pollution control technologies for gaseous matter: Absorption tower, Adsorption tower and combustion

Six Assignment Part

The Decibel Scale, Sound Intensity Level: Classification of Noise, Noise Standards. Effects of Noise, Noise Control Methods, Acoustical Materials, Acoustical Enclosures, Silencers and Muffle Reverberation Control, Personal Hearing Protection Devices,

Recommended Books:

1. Understanding Environmental Pollution Marquita K.
2. Environmental Pollution And Its Control, COGENT International, 1st edition 1998 S.A. Abbasi
3. Environmental Noise Pollution And Its Control, Anmol Publication 1st edition 1992 Chhatwal G.R. et al
4. Environmental Pollution And Its Control Jeffrey J. and P.A. Vesilind
5. Air Pollution: M. N. Rao & HVN Rao , TATA McGraw Hill Publication, New Delhi, 12th edition, 1998
6. Chemistry for Environmental Engineering Clair N. Sawyer & McCarty, TATA McGraw Hill International Publication IIIrd Edition.1986
7. Environmental Engineering - Howard S.Peavy et.al, TATA McGraw Hill International Publication 1st Edition. 1986

First Assignment Part

World Energy Scenario: Contribution of wind power in Renewable Energy worldwide, scenario of wind power in world, Countries which are blessed by wind power, contribution of wind power in total power requirement of developed and developing country.

Second Assignment Part

India Energy Scenario: Contribution of wind power in Renewable Energy in India, scenario of wind power in India, Indian States which are blessed by wind power, contribution of wind power in total power requirement of India, Future Scenario of wind power in India.

Third Assignment Part

Wind potential in India and world: Basic principle of wind energy Conservation characteristics of wind power, Extractable wind power, Site selection, wind data analysis and predictions, Use of statistical tools.

Forth Assignment Part

Different types of Wind Machines: Electricity generating stand-alone systems & grid connected systems, Performance Estimation of Wind turbines, Aerodynamic construction of rotor blades, wind Farms, wind mills & their applications, Cost economics, case studies.

Fifth Assignment Part

Wind hybrid system: control mechanism, Grid Connection of Wind hybrid system, advantage and disadvantage of hybrid system

Six Assignment Part

Airborne Wind Turbines: Definition, working principle of Airborne Wind Turbines, types of Airborne Wind Turbines, power transmission mechanism in Airborne Wind Turbines, advantage and disadvantage of Airborne Wind Turbines.

Wind Stalk: Definition, working principle of wind stalk, types of wind stalk, power transmission mechanism in wind stalk

Recommended Book:

1. V.D., Hunt, Wind power: A handbook on Wind energy Conversion systems. Van Nostrand Reinhold Company, 1981.
2. Tony Burton, David Sharpe, Nick Jenkins and Ervin Bossanyi (2001) Wind Energy handbook, Published by John Wiley & Sons.
3. G N Tiwari and M K Ghosal (2005) Renewable Energy Recourses: Basic Principle and Applications, Published by Narora Publishing House.
4. G D Rai (2003) Non-Conventional Energy Sources, Published by Khanna Publisher, Delhi

First Assignment Part

Earth & Sun Relation: Solar Angles, Day length, Angle of Incidence on Tilted Surface, Sun path Diagram, Shadow Determination.

Second Assignment Part

Solar Radiation: Extraterrestrial Characteristics, Effect of Earth Atmosphere, Measurement and Estimation on Horizontal and Tilted Surface

Solar Radiations Characteristics : Transparent and Opaque Materials, Selective Coating

Third Assignment Part

Flat Plate Collectors : Effective Energy Losses, Thermal Analysis, Heat Capacity Effect, Evacuated Tubular Collectors

Air Flat Plate Heaters : Types, Thermal Analysis

Concentrating Collectors : Types, Thermal Analysis, Single Axis and Two Axis Solar Tracking

Fourth Assignment Part

Thermal Energy Systems and Storage Systems : Solar Cooker, Solar Pond, Solar Distillation, Solar Detoxification
Sensible Storage (Water, pebble bed and ground storage) Latent Heat Storage

Fifth Assignment Part

Solar Heating System : Liquid Based Solar Heating System (Natural, Forced and Gravity Flow)
: Solar Air Heating System, Solar Drying

Load Estimation : Solar Water Heating Systems, Air Heating Systems.

Sixth Assignment Part

Solar Cooling System : Solar Operated Refrigeration Systems, Solar Desiccant Cooling

Solar Thermal Power Generation : Central Receiver Systems, Parabolic Trough Systems, Solar One Power Plant, Solar Furnaces.

Seventh and Eight Assignment Part

Solar Photovoltaic System: Semiconductor Theory, Photovoltaic Principles, Solar Cells: Characteristics, Types and Production, Methods, Series parallel combination, Storage Batteries, Modules, Application of Solar, Photovoltaic System

Recommended Books:

1. Duffie and Beckman, Solar Thermal Engineering Process, John Wiley & Sons, New York
2. J.S. Hsieh, Solar Energy, Prentice Hall Inc. New Jersey
3. P.J. Lunde, Solar Thermal Engineering, John Wiley & Sons, New York
4. N.C. Harris, C.E. Miller and I.E. Thomas, Solar Energy Systems Design, John Wiley & Sons, New York
5. H.P. Garg Advanced in Solar Energy Technology, D. Reidel Publishing Co., Dordrecht.
6. S.P. Sukhatme, Solar Energy, Tata McGraw Hill Company Ltd., New Delhi

1. Determination of Thermal Efficiency of Flat Plate Collector.
2. Thermal Testing of a Box Type Solar Cooker (First and Second Figure of Merit).
3. Performance Evaluation of a Single Basin Solar Still.
4. Study of Thermal Performance of an Air Heater.
5. Drying Performance of a Solar Dryer.
6. Power Load Characteristic of a Photovoltaic Cell.
7. PV System Performance
8. Study the Effect of Solar Irradiance and ambient air Temperature on Module Output.
9. Calibration of Thermocouples, RTD and Pyranometers.
10. Determination of geographical N-S direction.

First Assignment Part

Energy Markets, Planning and Role of Demand Management, Integrated National Energy Plan, Supply and Demand analysis. Energy Balance

Second Assignment Part

Basic Pricing Principles, Growing Demands and Dynamic effects, Short Run versus Long Run Marginal Cost Pricing, Peak load and seasonal pricing, Pricing of Nonrenewable energy resources.

Subsidized Prices and life line rates, Perfect competitive economy, economic second best considerations, life line rates for poor consumers.

Third Assignment Part

Decentralized Energy Planning, Energy Modelling, Data Analysis & Demand management, LP models, Case studies;

Fourth Assignment Part

Key Elements, Force Field Analysis, Energy Policy Purpose, Perspective, Contents, Formulations and Ratification.

Fifth Assignment Part

Organizing Location of Energy Management, Top Management Support, Managerial Functions, Roles and Responsibilities of Energy Manager, Accountability, Motivating – Motivation of Employees.

Six Assignment Part

Project Management Definition and scope of project, Technical Design, Financing, Contracting, Implementation and Performance Monitoring. Implementation Plan for top management, Planning Budget, Procurement procedures, Construction, Measurement and Verification.

Seven Assignment part

Network Analysis: CPM & PERT. Case Studies

Eight Assignment Part

Investment needs Appraisal and Criteria, Financial Methods of Projects evaluations, Network Analysis: CPM & PERT. Case Studies

Recommended Books:

1. D. Deo, S. Modak and P. R. Shukla, Decentralized Energy Planning, Oxford and IBH Publishing Co. Pvt. Ltd.,
2. B. Bukhoo tao et al. Energy, Planning and Policy
3. R.D. Agrawal, Organization and Management, Tata McGraw Hill, New Delhi.
4. Newman and Warren, the Process of Management, Concepts, Behavior and Practice, Prentice Hall of India, Mm Delhi.
5. Prasanna Chandra, Project Management, Appraisal and Implementation, Tata McGraw Hill Publishing Company.
6. M. Mohain, Project Planning and Control, Vikas Publishing House, New Delhi.
7. Akalank's Descriptive Law on Pollution and environment. Both editions Akalank Pub.
8. Energy Management Hand Book, Chapter 2, Milton A. Williams
9. Financial Management, Tata Mc-Graw Hill – Prasanna Chandra.
10. Project Management, Tata McGraw Hill – S. Choudhury

First Assignment Part

Basic Concept of EIA:

Environmental Impact Assessment: Introduction, Principles and Objective. Origin and Development of EIA Types of EIA. Environmental Impact Analysis, Essential Components of EIA, Project Screening, Baseline Study, Impact Identification, Impact Prediction, Evaluation And Mitigation, Life cycle assessment.

Second Assignment Part

EIA notification by Ministry of Environment and Forest (Govt. of India):

Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- evaluation of EIA report. CATEGORY OF PROJECT

Third Assignment Part

EIA Methodologies:

Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis – EIS and EMP.

Forth Assignment Part

Impact Assessment:

The Interlinking: Positive and Negative Impacts, Primary and Secondary Impacts, Impacts on Physical, Chemical Biotic and Social Environment, Environmental Impact Statement and Environmental Management Plan For Selected Industries, Case Studies Case studies and preparation of Environmental Impact assessment statement for various Industries.

Fifth Assignment Part

Concepts of the Environmental Audit: Definition, Benefits, Objectives.

Legislation: Rules and Regulation, Gazette, Notification on Environmental Statement, Latest Amendments. Need for Environmental Audit, Guidelines for Environmental Audit

Six Assignment Part

Methodology for Pre-audit activities; Preliminary Information, Audit Team. Activities at the site; Material Balance Waste Flow, Monitoring, Field Observations, Draft Report. Post-Audit Activities; Synthesis of Data Evaluation of Waste Treatment Facilities, Final report, Action plans, Follow up actions.

Material and Energy Flow Assessment, Preparation of Audit Report: Water Consumption, Guidelines to Environmental Safe Layouts to Minimize Losses & Waste, Control Mechanism, Waste water reduction, Air emission reduction, Preparation of Audit Report, Form V, Case Studies

Recommended Books:

1. Environmental Impact of Industries on Sub Urban Environment S.A. Abbasi, Discovery Publishing House, New Delhi.
2. Global Environmental Negotiations Ist Green, Anil Agrwal And Sunita, CSE, Delhi
3. Environmental Policy in International Context Prospects by Blowers, Andrews, Glas, Scholar Publisher Distributor.
4. Environmental Impact Assessment by Clark Brain, Biset, Mansenn.
5. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
6. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S.
7. Publication, Sultan Bazar, Hyderabad.

First and Second Assignment Part

Principles of Pinch Technology (Utility, Area and Unit Targets), Design of Heat Exchanger Networks, Retrofit Applications

Third & Fourth Assignment Part (Engineering Thermodynamics)

Thermodynamics Properties of Pure substance and Energy Analysis of closed system:

Pure Substance, Phase of a Pure Substance, Phase-Change Process of Pure Substances, Property Diagrams for Phase-Change Process, The Ideal-Gas Equation of State, Moving Boundary Work, Energy Balance for Closed Systems, Internal Energy, Enthalpy, and Specific Heats of Ideal Gases, Internal Energy, Enthalpy and Specific Heats of Solids and Liquids

Fifth Assignment Part (Engineering Thermodynamics)

Mass and Energy Analysis & Control Volumes (First Law Efficiency):

Conservation of Mass, Flow work and the Energy of a Flowing Fluid, Energy Analysis of Steady-Flow Systems, Some Steady-Flow Engineering Devices , Energy Analysis of Unsteady-Flow Processes

Six Assignment Part (Engineering Thermodynamics)

Energy Analysis, (Second Law Efficiency): Energy: Work Potential of Energy, Reversible Work and Irreversibility, Second-Law Efficiency, Exergy Change of a System, Exergy Transfer by Heat, Work, and Mass, The Decrease of Exergy Principle and Exergy Destruction, Exergy Balance Closed Systems
Exergy Balance Control Volumes

Recommended Books:

1. Yunus A. Cengel, Introduction to Thermodynamic and Heat Transfer, McGraw Hill Company, Inc. (1997).
2. Frank W. Schmidt. Robert E. Henderson and Carl H. Wolgemuth, Introduction to Thermal Sciences: Thermodynamics, Fluid Dynamics, Heat Transfer, John Wiley and Sons Inc. (1993).
3. William L. Haberman and Jems E.A. John. Engineering Thermodynamics with Heath Transfer (2nd edition) (1989).

First Assignment Part

Energy Audit: Definition, Need and Objectives.

Types of Energy Audit: Internal Audit, External Audit, Walk through Energy Audit, Preliminary Energy Audit, Detailed Energy Audit, Industrial Energy Audit, Utility (Services) Energy Audit, Commercial Energy Audit, Residential Energy Audit.

Energy Audit Strategies: Monitoring and Control, Questioning the Need, Minimizing the Need of End Use, Minimizing the Losses, Operating the Equipment at Optimum Efficiency, Operating the Most Efficient Equipments from Set of Equipments, Minimizing the Idle Redundant Running, Proper Maintenance of the Equipment, Substitution with Efficient Equipment, Substitution with more Efficient Equipment, Substitution with more Efficient Process, Energy Storage, Fuel Substitutions, Quality Control and Recycling.

Second and Third Assignment Part

Basic Components of Energy Audit: Preparing for Audit Visit, Instrumentation, Data Collection Techno-economic Analysis, Safety Considerations.

Energy Audit Instruments: Combustion Analysis, Temperature Management, Pressure Measurement, Flow Measurement, Humidity Measurement, Energy and Power Measurement, Light Level Measurement, Infrared Equipment, Technometer, P.F. Meter, Ultrasonic Stethoscope, Steam Leak Detector.

Important Survey Items: Buildings, Lightings, HVAC, Furnaces & Ovens, Boilers and Steam Lines, Air Compressor and Compressed Air Distribution Lines, Chillers and Chilled Water Distribution Lines, Process Water Generation & Distribution Lines, Electrical Distributions Transformers and Lines, Pumps, Fans & Blowers, Cooling Towers, Electrical Motors, Waste Heat Sources, Material Transport, Peak Load Equipments.

Fourth Assignment Part

Methodologies of Conducting Energy Audit: Preliminary Questionnaire, Review of Previous Records, Introductory Meeting, Walk through Tour, Flow Chart Construction for Detail Energy Audit, Identification of Required Audit Instruments, Finalization of Audit Schedule with the Company, Getting Detailed Data.

Fifth Assignment Part

Post Audit Analysis: Process Flow Diagram, Material and Energy Balance, Energy Use and Cost Profile of each Fuel Used, Energy Balance Diagram for each Energy Type Used, Identification and Techno-economic Analysis of Energy Conservation Measures, Classification of Energy Conservation Measures, Outlines of Energy Audit Report Format

Sixth Assignment Part

Energy Audit Subsidy Scheme of PCRA, IDBI and IREDA, Useful Forms for Data Collections, Useful Charts for Quick Estimations, Checklists for each Devices and Distribution Lines, Thumb Rules and Specific Energy Indices for Devices and Processes.

Energy Audit Soft wares: Conversion Factors, List of Equipment Suppliers

Recommended Book:

1. Instructions to Energy Auditors, Vol. - I & Vol. - II – National Technical Information Services U. S. Department of Commerce Springfield, VA 22161.
2. Energy Auditing, The Fairmont Press Inc. Published by Atlanta, Georgia
3. Albert Thumann, P.E., C.E.M. , Plant engineers & Managers Guide To Energy Conservation 8th edition-2002, Published By The Fairmont Press , Inc 700 Indian Trail Liburn, GA30047
4. BEE VolumeI –Second Edition 2005
5. G.G. Ranjan: Optimizing Energy Efficiencies in Industry ,Edition-2003 McGraw Hill

First Assignment Part

Foundation of Individual and Organizational Behavior: OB Models, Personality Determinants and Attributes, Values, Job Attitudes, Learning and Learning Theories, Perception Factors affecting Perception and Cognitive Dissonance theory.

Second Assignment Part

Motivation: Needs, Contents and Process, Maslow's Hierarchy of Needs, Herzberg's Two Factor theory, ERG theory, Vroom's Expectancy theory, Reinforcement theory and Behaviour Modification.

Third Assignment Part

Foundations of Group Behaviour: Defining and Classifying Groups, Group Structure and Processes, Process of Group formation, Group Decision Making.

Fourth Assignment Part

Leadership: Trait theories, Behavioral theories- Ohio State Studies, Michigan Studies and Managerial Grid. Contingency theories- Fiedler's Model, Hersey and Blanchard's Situational theory, Leader-member exchange theory, Path Goal theory, Charismatic Leadership.

Fifth Assignment Part

Conflict: Intra-individual Conflict, Interpersonal Conflict, Inter group Conflict, Organizational Conflict, Transitions in Conflict Thought, functional Versus Dysfunctional Conflict, Conflict process, Conflict Management Techniques.

Sixth Assignment Part

Organizational change and Stress Management: Forces of Change, Resistance to Change and Lewin's Three Step Model, Stress Management-Potential Sources, Consequences and Coping Strategies for Stress.

Seventh Assignment Part

Organizational Culture: Definition, uniform Cultures, Relevance to Culture, Creating and Sustaining Culture, How Employee Learn Culture.

Recommended Book:

1. Stephen P. Robbins, "Organizational Behavior: Concepts, Controversies, and Applications", New Delhi, Prentice Hall, 9th Ed., 2000.
2. Fred Luthans, "Organizational Behaviour", New York, McGraw Hill, 8th Edn., 1998.
3. Bill Scott, "The Skills of Communications", Jaico Publications, Bombay 1995.
4. John W. Newstrom and Keith Davis, "Organizational Behaviour: Human Behaviour at Work" New Delhi, Tata McGraw Hill, 1993.

First Assignment Part

Geothermal Energy: Introduction, Status of Geothermal Energy- Worldwide, Geothermal Potential in India, Earth's Internal Structure, core, mantle and crust layers

Characteristic of Geothermal sites: Geothermal reservoirs, water-dominated (hot water field, wet steam field), vapor dominated, Underground water, Aquifer, Underground water Vs Aquifer, Categories of Geothermal sites: Hyper Thermal Regions, Semi thermal Regions, Normal Regions, Earth's Thermal Engine Classification of geothermal resources: Hot Dry Rock Systems, Geo pressured Reservoirs, Magma Energy, Hot Dry Rock Fracturing Technique, Estimation of Potential from Dry Rocks, and Estimation of potential from hot aquifers.

Second Assignment Part

Use of Geothermal Energy: Direct Use of Geothermal Energy, Technology for Utilization of geothermal Resources (Dry Steam Power Plants, Flash Steam Plants, Binary cycle power plants) Advantages & Disadvantages of Geothermal Energy,

Third Assignment Part

Cost, Price and Challenges: (Drilling Cost, Transmission Cost), Barriers in Geothermal Energy, Geothermal Energy & the Environment, Sources of pollution, Material Selection for Geothermal Power Plants, Operational and Environmental Problems

Fourth Assignment Part

Ocean energy: introduction type of ocean energy, Thermal Energy, Mechanical Energy, OTEC Technology: Closed Cycle System for OTEC, Open Cycle System for OTEC, Hybrid OTEC System, Comparison of three cycles.

Fifth Assignment Part

Plant Design and Location for OTEC: OTEC in India, Applications of OTEC, Global Resource of Ocean Energy, Existing tidal energy plants worldwide, Barriers & Challenges of Ocean Energy, Technology Development Status, and Ocean Current Energy Technologies

Sixth Assignment Part

Ocean Mechanical Energy: Wave Energy, Wave Power Designs, Oscillating Water Columns, Floating or Pitching Devices, Tidal power, Difference between High and Low Tides, Generating Electricity from the Tide, Energy from the Moon, Methods of supporting a tidal turbine rotor against the thrust of the current, Second-generation tidal power plants, Advantages & Disadvantages of Ocean energy, Asia's 1st Tidal Power Plant Coming to India, Tidal Power Calculation, Economics of Tidal, Benefits of Dynamic tidal power, Mathematical modeling of tidal schemes, Global environmental impact Tidal power

Recommended Book:

1. Twidell & AW. Wier, Renewable energy resources, English Language book, Society I E & FN Spon (1986).
2. Grey & O.K. Ganhus, Tidal power, Plenum Press, New York (1972)
3. N.K. Bansal., M. Kleeman & M. Mielee, Renewable Conversion Technology, Tata McGraw Hill, New Delhi
4. E.R. Berman, Geothermal Energy; 'Noyes DATA Corporation, New Jersey, 1975.

First Assignment Part

Measurement & Instrumentation, Classification, static and dynamic characteristics of instruments, Error analysis, Minitab Calibration curve, Combination of component error, Overall System – Accuracy calculations, Sensors and Transducer, classification and selection of transducers.

Second Assignment Part

Displacement Transducers, Strain Gage, LVDT, Piezoelectric transducers, Pressure measurement: Dead weight Gages and Manometers; Elastic Transducers, Resonant Transducer. Low pressure (Vacuum) measurement. Introduction of capacitive and Inductive transducer.

Third Assignment Part

Temperature measurement: Standards and Calibration, Thermal expansion methods, Thermo-electric sensors, Electrical resistance sensors, Digital Thermometer, Radiation and optical pyrometry, Flow measurement: Flow Visualization, Pitot tubes, Obstruction Flow Transducers, Rotameters, Turbine meters, Electromagnetic flow meters, Ultrasonic Flow meters, Vortex-shedding Flow meter.

Fourth Assignment Part

Anemometers: Hot-wire and Hot-Film Anemometer, Hot-Film Shock tube velocity Sensors, Laser-Doppler Anemometer, Liquid Level measurement, Humidity and moisture measurement.

Fifth / Sixth Assignment Part

Intel 8085 microprocessor, Components and basic operations, Block diagram, Pin out Diagram, Instruction set of 8085, Fetching and Executing Instructions, B.C. D Arithmetic 16 bit data operations.

Seven Assignment Part

Control systems: Introduction, Open loop and close loop systems, feedback characteristics of control system. Block diagram, flow graph, Mason gain formula, regenerative feed back. Introduction to PID control, Hydraulic v/s Pneumatic Systems,

Eight Assignment Part

Stability analysis of control systems, Routh Herwitz's criteria, Relative stability. Root locus analysis, Frequency response analysis, Bode Plot Case Studies.

Recommended Book:

1. Mechanical Measurements and Controls By D. S. Kumar
2. Control System Engineering By Nagarath and Gopal
3. Digital Computer Electronics By A. P. Malviya

First Assignment Part

Biomass availability: Characteristics of Biomass or organic wastes, Energy Plantation.

Second Assignment Part

Waste Biomass /Organic utilization Technology options.

Biochemical Process: Aerobic and Anaerobic Bioconversion process, Biogas production process, Effect of Feed and operational parameters, Types of digesters and their suitability, Applications.

Design criterion of some Biomethanation Plants, optimum sizing of landfill digesters & Gas storage systems.

Third Assignment Part

Thermochemical Process: Biomass Gasification Process, Types of Gasifiers and their working, Feed and operational parameters on output Gas production, properties of output gases (mainly producer gas), Design of criterion, design of a Gasifier.

Fourth Assignment Part

Alcoholic Fermentation: Processes, Technologies, applications.

Biomass Pyrolysis: Process of slow and fast pyrolysis for solid and liquid fuel Production, Technologies, Applications.

Bio-diesel: Materials and Methods, Characteristics of Bio-oils, Applications.

Fifth Assignment Part

Biomass Briquetting and Pillarization: Potential, Process and technologies, characteristics of Briquettes and their use.

Six Assignment Part

Composting: Process Material and operational, Parameters, characteristics of manure, applications.

Vermi-composting: Process, Types of Species, Materials and Methods, Characteristics of Manure, Applications.

Recommended Book

1. Biomass – Thermo-chemical Characteristics Edited by PVR Iyer; T R Rao; P D Grover and N P Singh, Published by Biomass gasifier Action Research Centre, Dept of Chemical Engineering , IIT Delhi
2. Kaup and Goss (1984) “Small Scale Gas Producer Engine System” Published by Friedr, Vieweg & Sohn Braunschweig/ Wiesbaden.
3. ABETS, IISc, Bangalore (2003) “Biomass to Energy – The science and technology of the IISc Bio-energy systems” Published by Science & Technology of the Indian Institute of Science, Bangalore
4. Reed, T. B. and Das, A. (1988) “Hand book of biomass down draft gasifier engine systems”. Published by Solar Energy Research Institute, U.S. Dept. of Energy
5. K M Mital ,Biogas System - Principles & Applications Published by new Age international (p) Ltd, New delhi
6. Klaus von Mitzlaff, “Engines for biogas- theory, modification & economic operation” Published by friedr. Vieweg & Sohn Braunschweig/ Wiesbaden
7. Orion Polinsky “A Bio-fuels Handbook” Published by Oasis Publishing 2002.

1. Determination of proximate analysis (Moisture content, Ash, Volatile matter & fixed carbon) for a Given Biomass Sample.
2. Determination of Total solids, volatile Solids and calorific value for a given organic Biomass Sample.
3. Determination of elemental analysis (chemical method) for a Given Biomass Sample.
4. Determination of C/N Ratio for a given organic Biomass Sample.
6. Determination of Chemical Oxygen Demand, BOD, Total dissolved solids (TDS) and pH for a Given Slurry or Liquid Sample.
5. Estimation the calorific value of gaseous fuel using orsate apparatus and comparing your result with Junker gas calorimeter.
6. Determination of Lignin, Cellulose, Hemicelluloses in a Given Biomass Sample.
7. Determination of Crude Protein in a Given Biomass Sample.
8. Study of Gasifier and its performance evaluation with solid and loose biomass.
9. Characterization of liquid biomass (Viscosity, density, flash/fire point, cloud point) and its comparison with diesel
10. Preparation of bio-diesel and determination of it physical properties

First Assignment Part

Energy use in Buildings: Factors effecting Energy use, Energy Conservation options. External Factors – Climate, Climatic Zone, Building Orientation, Shading, Sizing of Shading Devices.

Second Assignment Part

Thermal Comfort: Criteria and various Parameters, Psychometric Chart, Indoor air quality; Requirements in residential, Commercial, Hospital Buildings.

Third Assignment Part

Heat Transmission in Buildings: Surface Coefficient, Air cavity, Internal and External Surface, Overall Thermal Transmittance Walls and Windows, and Packed Roof, Heat Transfer due to ventilation/ infiltration, Internal Heat gains, Solar Temperature, Steady State Method (for Trombe Wall, Water wall and Solarium), Degree Day method.

Fourth Assignment Part

Lighting Fundamentals: Visual Performance, Calculations of Lighting Levels, Energy Efficient Lighting.

Fifth Assignment Part

Day Lighting Use: Estimation of available Daylight, Day lighting Systems, Advantages and Limitations of Day light Use.

Sixth Assignment Part

Building Air Conditioning Systems – Components, Performance, Characteristics, Conservation and Controlling strategies.

Seventh Assignment Part

ASHRAE Methods: Standards for estimates of Heating and cooling and Ventilation, Requirements of Different use Buildings, Air Quality control Equipments, Distribution Systems for Conditioned Air.

Eighth Assignment Part

Typical Designs: Selected Buildings in various Climatic Zones, Thumb Rules for Design of Building systems; Building Codes.

Recommended Book:

1. M S Sodha, N.K. Banaal, P.K.Bansal, A.Rumaar and M.A.S. Malik, Solar Passive: Building Science and Design, Pergamon Preen (1986).
2. Jamee; L. Threlked, Thermal Environment Engineering, Prentice Hall, INC-, Raglewood Cliffs, New Jersey (1970)
3. T.A. Markus and R.N. Morris, Building, Climate and Energy Spott woode Ballantype Ltd-, London U.K. (1980)
4. Solar Thermal Energy Storage, H. P. Garg et.al, D. Reidel Publishing Company (1985)
5. Mathematical Modeling of Melting and Freezing Process, V Alexiades & A.D. Solomon, Hemisphere Publishing Corporation, Washington (1993)
6. Energy storage technologies, a reading material prepared by Dr. D. Buddhi, School Of Energy And Environmental Studies, DAVV, Indore.

First Assignment Part

Electrical Systems: Basis of Energy and its various forms: Electrical Basis-DC & AC, currents active power, reactive power and apparent power, star, delta connection, electricity billing, electrical load management, maximum demand control.

Second Assignment Part

Power Factor: Power factor, Power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors and energy conservation opportunities.

Third Assignment Part

Electric Motors: Types, losses in induction motors, motor efficiency, factor affecting motor performance, rewinding and motor replacement issues, energy saving opportunities in motors, energy efficient motors, soft starter with energy savers.

Fourth Assignment Part

Transformers and Electric Distribution: Types of transformers, transformer losses, energy efficient transformers, factor affecting the performance of transformers and energy conservation opportunities, cables, switch gears, distribution losses, energy conservation opportunities in-house electrical distribution system.

Fifth Assignment Part

Compressed Air Systems: Types of air compressors, compressor efficiency, efficient compressor operation, compressed air systems components, capacity assessment, leakage test, factors affecting the performance and energy savings opportunities.

Sixth Assignment Part

Pumps and Pumping System: types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities.

Fans & Blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities

Seventh Assignment Part

Lighting System: Light source, choice of lighting, energy efficient lighting controls Luminance requirements and energy conservation avenues.

Energy Conservation through: Variable Speed Drives, Occupancy Sensors, Energy Savers, Day Lighting Case studies

Recommended Book:

1. Savings Electricity in Utility Systems of Industrial Plants by B.G. Desai, B.S. Vaidya D.P. Patel and R. Parman.
2. Manual of variable speed drives by CII
3. Efficient use of electricity in industries by B.G. Desai, B.S. Vaidya, M.P. Parmarad R. Parman.
4. Electrical Power Distribution in Industrial Plants by M.D. Parmar.
5. Energy Conservation in electrical systems, a reading material prepared by D. Buddhi.
6. B.R. Gupta, Generation of Electrical Energy Edition 2005, Eurasia Publishing House (PVT.) LTD. Ram Nagar

First Assignment Part

Fuel Analysis: Proximate Analysis, Ultimate Analysis, Calorific Value. Combustion: Theoretical Air Requirement, Efficiency Estimates, Combustion Control, Stability in Flames.

Second Assignment Part

Furnaces: Classification, General Fuel Economy Measures in Furnaces, Excess Air and Heat Distribution Losses, Temperature Control, Draft Control, Case Studies.

Insulation and Refractories: Insulation Type and Applications, Economic Thickness of Insulation, Heat Savings and Application Criteria, Refractory-Types, Selection and Application of Refractories, Case Studies.

Third Assignment Part

Boilers: Types, Analysis of Losses, Performance Evaluation, Feed Water Treatment, Blow Down, Energy Conservation Opportunities, Case Studies. FBC Boilers: Introduction, Mechanism of Fluidized Bed Combustion, Advantages, Types of FBC Boilers, Operational Features, Retrofitting FBC System to Conventional Boilers, Condensing Boilers, Saving Potential, Case Studies.

Fourth Assignment Part

Steam System: Properties of Steam, Mollier Diagram, Assessment of Steam Distribution Losses, Steam Leakages, Steam Trapping, Condensate and Flash Steam Recovery System, Identifying Opportunities for Energy Saving, Case Studies.

Cogeneration: Need, Applications, Advantages, Topping Cycles, Bottoming Cycles, Combined Cycles, Steam Tracking Mode, Electricity Tracking Mode, Saving Potential, Case Studies.

Fifth and Six Assignment Part

Waste Heat Recovery: Availability and Reversibility, First and Second Law Efficiencies, Classification, Advantages and Applications, Commercially Viable Heat Recovery Devices, Saving Potential, Case Studies. Thermal Energy Storage Systems, Advantages & Limitations, Design Strategies, Operating Strategies, Sensible Heat Storage System, Latent Heat Storage Systems, Case Studies.

Seventh & Eight Assignment Part

HVAC and Refrigeration System: Vapor compression Refrigeration Cycle, Refrigerants, Factors Affecting Refrigeration and Air Conditioning System Performance and Savings Opportunities.

Vapor Absorption Refrigeration System: Working Principle, Types and Comparison with Vapor Compression System, Saving Potential, Case Studies. Cooling Towers: Types and Performance Evaluation, Efficient System Operation, Flow Control Strategies; Energy Saving Opportunities, Case Studies.

Recommended Books:

1. G. L. Witte, Phillips S. Schmidt and David R. Brown, Industrial Energy Management and Utilization, Hemisphere Publishing Corporation, Washington.
2. Carig, B. Saith, Energy Management Principles, Applications, Benefit and Saving, Per n Press, New York.
3. Davida, Fuels Of Opportunity, Characteristics and Uses In Combustion Systems, Edition-2004 Publisher- ELSEVIER LTD. UK
4. O.P. Gupta, Element of Fuel Furnaces and Refractories, Edition-Second
5. Gunnar, Anderlind, A Theoretical Analysis of Thermal Insulation

First Assignment Part

General Introduction of Energy conservation, Energy efficiency and substitution of fuels, important utilities and possibilities of Energy conservation.

Second Assignment Part

Energy Conservation Opportunities in Commercial Buildings and their Case Studies

Third Assignment Part

Pulp and Paper, Sugar, Textile, Fertilizer and Textile and their Case Studies

Fourth Assignment Part

Chemical, Petroleum Refineries, Petrochemical Processes, Chlor-Alkali and their Case Studies

Fifth Assignment Part

Aluminium, Iron and Steel, Cement and their Case Studies

Sixth Assignment Part

Railways, Ports, Transport Sector, Power Stations and their Case Studies

Recommended Books

1. Savings Electricity in Utility Systems of Industrial Plants by B.G. Desai, B.S. Vaidya D.P. Patel and R. Parman.
2. Efficient use of electricity in industries by B.G. Desai, B.S. Vaidya, M.P. Parmarad R. Parman.
3. Pump Application Desk Book by P.N. Garagy.
4. Electrical Power Distribution in Industrial Plants by M.D. Parmar.
5. Electronic Energy Utilization and Conservation by S.C. Tripaths.
6. Energy Conservation in electrical systems, a reading material prepared by D. Buddhi
7. G. L. Witte, Phillips S.Schmidt and Daid R. Brown, Industrial Energy Management and Utilization, Hemisphere Publishing Corporation, Washington.
8. Carig, B. Saith; Energy Management Principles, Applications, Benefit and Saving, Per n Press, New York.
9. D. Patrick and S.W. Fardo, Energy Uses and Conservation, Prentice Hall, INC Engleweek Cliffs (NJ) 7632.
10. N.L Lens, Waste gas Treatment for Resource Recovery.
11. S.N.Ghosh and Yadav, Energy conservation and environment control and cement industries.

SYLLABUS CONTENT

EM – 825: ENERGY AUDITING AND ENERGY CONSERVATION LABORATORY - 2 CREDITS

1. Determine the Efficiency and loading of motor
2. Determine the Efficiency of the given Blower, fan and Pump.
3. Determine the performance of Air compressor system
4. Calculate the Coefficient of performance (COP), EER, SPC for given Air condition units (Window AC Conventional, Split AC Conventional), Split AC Energy Efficient.
5. Determine the Installed Load Efficacy Ratio (ILER) for given areas.
6. Determine the efficacy of the given Incandescent v/s compact florescent lamp.
7. Determine the energy consumption of the different electrical appliance for 8, 12 and 24 hour.