# M.E. ENERGY ENGINEERING

## SEMESTER II

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**TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 70**
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AIM:
This course is intended to study the ways and means of electrical energy conservation in lighting systems and rotating machineries.

OBJECTIVES:
- To study the concepts of power factor, harmonics and load management.
- To study the energy monitoring and DSM techniques.
- To study the various measures for energy conservation in electrical devices

UNIT I  ELECTRICAL ENERGY - INTRODUCTION  8

UNIT II  ENERGY MONITORING / TARGETING AND DEMAND SIDE MANAGEMENT  8

UNIT III  PERFORMANCE STUDY OF UTILITIES – 1  11
Selection, identification, specification drawings – international code followed in electrically operated rotating machineries with specific reference to motors – fans & blowers – pumps and compressed air system – performance evaluation of each scope available for energy saving – methods adopted in industries for ENCON – latest developments

UNIT IV  PERFORMANCE STUDY OF UTILITIES – 2  10

UNIT V  ENERGY EFFICIENT TECHNOLOGIES / DEVICES  8

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

(Could be downloaded from www.energymanagertraining.com)
UNIT I   INTRODUCTION
World energy use – Reserves of energy resources – Environmental aspects of energy utilisation – Renewable energy scenario in India – Potentials – Achievements – Applications.

UNIT II   SOLAR ENERGY

UNIT III   WIND ENERGY

UNIT IV   BIOMASS ENERGY

UNIT V   OTHER RENEWABLE ENERGY SOURCES

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCE BOOKS

AIM:
To enhance the knowledge of the students about various measuring instruments, techniques and importance of error and uncertainty analysis.

OBJECTIVE:
(I) To provide knowledge on various measuring instruments.
(II) To provide knowledge on advance measurement techniques.
To understand the various steps involved in error analysis and uncertainty analysis.

UNIT I  MEASUREMENT CHARACTERISTICS  12
Instrument Classification, Characteristics of Instruments – Static and dynamic, experimental error analysis, Systematic and random errors, Statistical analysis, Uncertainty, Experimental planning and selection of measuring instruments, Reliability of instruments.

UNIT II  MICROPROCESSORS AND COMPUTERS IN MEASUREMENT  5
Data logging and acquisition – use of sensors for error reduction, elements of micro computer interfacing, intelligent instruments in use.

UNIT III  MEASUREMENT OF PHYSICAL QUANTITIES  10
Measurement of thermo-physical properties, instruments for measuring temperature, pressure and flow, use of sensors for physical variables.

UNIT IV  ADVANCE MEASUREMENT TECHNIQUES  8
Shadowgraph, Schlieren, Interferometer, Laser Doppler Anemometer, Hot wire Anemometer, heat flux sensors, Telemetry in measurement.

UNIT V  MEASUREMENT ANALYSERS  10
Orsat apparatus, Gas Analysers, Smoke meters, gas chromatography, spectrometry.

TOTAL : 45 PERIODS

TEXT BOOKS :

REFERENCES :
5. Raman, C.S. Sharma, G.R., Mani, V.S.V., Instrumentation Devices and Systems,

EY 9325  SIMULATION LABORATORY  L T P C
0 0 3 1
1. Introduction to finite element analysis
2. Thermal analysis of a block using conduction, convection and mixed boundary conditions (steady state and transient analysis)
3. Heat transfer analysis through two walls
4. Simulation of solidification
5. Laminar and turbulent flow analysis
6. Melting a metal using element killing
7. Electromagnetic field analysis
8. Thermo mechanical analysis of a block
9. Heat transfer analysis in fins
10. Thermal analysis of a pipe joint
11. Flow analysis in a nozzle
12. Moving heat source simulation
13. Material nonlinearity

Software needed: Modelling and Analysis Software

TOTAL: 45 PERIODS

EY9003 ENERGY SYSTEMS MODELING AND ANALYSIS

AIM:
To provide a comprehensive and rigorous introduction to energy system design and optimization from a contemporary perspective.

OBJECTIVES:
- To learn to apply mass and energy balances for the systems enable to perform enthalpy
- Learn to calculate to size performance and cost of energy equipments turns modeling and simulation techniques.
- Learn to optimize the energy system for its maximum or minimum performance output.

UNIT I INTRODUCTION
Primary energy analysis - dead states and energy components - energy balance for closed and control volume systems - applications of energy analysis for selected energy system design - modeling overview - levels and steps in model development - examples of models - curve fitting and regression analysis.

UNIT II MODELLING AND SYSTEMS SIMULATION

UNIT III OPTIMISATION TECHNIQUES

UNIT IV ENERGY-ECONOMY MODELS
UNIT V APPLICATIONS AND CASE STUDIES

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

EY9008 ADVANCED THERMAL STORAGE TECHNOLOGIES L T P C
3 0 0 3

AIM:
This course is intended to build up the necessary background to model and analyze the various types of thermal storage systems

OBJECTIVES:
- To learn the various types of thermal storage systems and the storage materials
- To develop the ability to model and analyze the sensible and latent heat storage units
- To study the various applications of thermal storage systems

UNIT I INTRODUCTION
Necessity of thermal storage – types-energy storage devices – comparison of energy storage technologies - seasonal thermal energy storage - storage materials.

UNIT II SENSIBLE HEAT STORAGE SYSTEM
Basic concepts and modeling of heat storage units - modeling of simple water and rock bed storage system – use of TRNSYS – pressurized water storage system for power plant applications – packed beds.

UNIT III REGENERATORS

UNIT IV LATENT HEAT STORAGE SYSTEMS
9
Modeling of phase change problems – temperature based model - enthalpy model - porous medium approach - conduction dominated phase change – convection dominated phase change.

UNIT V APPLICATIONS
Specific areas of application of energy storage – food preservation – waste heat recovery – solar energy storage – green house heating – power plant applications – drying and heating for process industries.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES

EY9009 ENERGY CONVERSION TECHNIQUES

AIM:
To detail on the different technologies in vogue for converting one form of energy to another.

OBJECTIVE:
• To analyze the pros and cons of
• Conventional energy conversion techniques
• Direct energy conversion systems
• Need and necessity of energy storage systems and their desirable characteristics
• Detail on thermodynamics and kinetics of fuel cells

UNIT I INTRODUCTION

UNIT II DIRECT CONVERSION OF THERMAL TO ELECTRICAL ENERGY

UNIT III CHEMICAL AND ELECTROMAGNETIC ENERGY TO ELECTRICAL ENERGY

UNIT IV ENERGY STORAGE SYSTEMS
Introduction – storage of mechanical energy, electrical energy, chemical energy, thermal energy.
UNIT V  FUEL CELLS

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

EY9010       ELECTRICAL DRIVES AND CONTROLS  L T P C
                          3 0 0 3

AIM:
To expose the students to the fundamentals of electrical drives and their applications in electrical machines.

OBJECTIVES:
To impart knowledge on:

- Characteristics, starting, speed control and breaking of DC and AC motors.
- Concepts of various losses and harmonics effects.
- Super conducting generators and motors, which have improved power system stability and higher efficiency, compared with conventional machines.
- Applications of solid-state devices in speed control of electrical machines.

UNIT I          CONVENTIONAL MOTOR DRIVES  9
Characteristics of DC and AC motor for various applications - starting and speed control - methods of breaking.

UNIT II  PHYSICAL PHENOMENA IN ELECTRICAL MACHINES  9
Various losses in motors-Saturation and Eddy current effects - MMF harmonics and their influence of leakage-stray losses - vibration and noise.

UNIT III  SOLID STATE POWER CONTROLLERS  9

UNIT IV  SUPERCONDUCTIVITY  9
Super conducting generators-motors and magnets - Super conducting magnetic energy storage (SMES).

UNIT V  SOLID STATE MOTOR CONTROLLERS  9

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:

EY9011 POWER GENERATION, TRANSMISSION AND UTILIZATION

UNIT I CONVENTIONAL POWER GENERATION
Steam power plant - Selection of site - Generated Layout - coal and Ash Handling - Steam Generating Plants - Feed Make Circuit - Cooling Towers - Turbine Governing - Hydro Power Plant-Selection of Site - Classification Layout Governing of Turbines - Nuclear Power Plants - Selection of Site - Classification Layout Governing of Turbines - Nuclear Power Plants - Selection of Site - Nuclear Fuels - Nuclear reactors - Nuclear disposal - Gas Turbine Plants.

UNIT II NON CONVENTIONAL POWER GENERATION
Wind power generation - characteristics of wind power-design of windmills - Tidal power generation - Single and two-basin systems -Turbines for tidal power - Solar power generation - Energy from biomass, biogas and waste

UNIT III ECONOMICS OF POWER GENERATION
Daily load curves - load factor - diversity factor - load deviation curve - load management - number and size of generating unit, cost of electrical energy – tariff - power factor improvement

UNIT IV ELECTRICAL POWER TRANSMISSION
Online diagram of transmission - substation and distribution systems - comparison of systems (DC and AC) - EHVAC and HVDC transmission - layout of substations and bus bar arrangements - Equivalents circuit of short, medium and long lines - Transmission efficiency-regulation-reactive power - compensation-transmission - loss minimization

UNIT V UTILISATION OF ELECTRICAL ENERGY
Selection of Electrical Drives - Electrical characteristics and mechanical considerations -size, rating and cost, Transformer characteristics – illumination - laws of illumination-polar curve - incandescent-fluoroscent and vapour lamps - Design of OLTC lighting Scheme of industry-electrical welding - energy efficient aspects of devices
REFERENCES:

EY9012 WASTE MANAGEMENT AND ENERGY RECOVERY L T P C
                                               3 0 0 3

AIM:
To motivate the students by highlighting the importance of waste management, high-grade energy generation from waste and hygienic waste disposal options.

OBJECTIVES:
• To provide information on various methods of waste management
• To familiarize students with recent energy generation techniques
• To detail on the recent technologies of waste disposal and
• To make student realize on the importance of healthy environment.

UNIT I SOLID WASTE – CHARACTERISTICS AND PERSPECTIVES 6
Definition - types – sources – generation and estimation. Properties: physical, chemical and biological – regulation

UNIT II COLLECTION, TRANSPORTATION AND PROCESSING TECHNIQUES 8
Onsite handling, storage and processing – types of waste collection mechanisms - transfer Stations : types and location – manual component separation - volume reduction : mechanical, thermal – separation : mechanical, magnetic electro mechanical

UNIT III ENERGY GENERATION TECHNIQUES 16

UNIT IV HAZARDOUS WASTE MANAGEMENT 8
UNIT V  ULTIMATE DISPOSAL

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

EY9013  CLEAN DEVELOPMENT MECHANISM

AIM:
To create awareness on eco-cess, Kyoto protocol, Clean Development Mechanism,Joint Implementation and Emissions Trading

OBJECTIVE:
- To present the case of global warming, its cause and its present and foreseen impacts on human community.
- Details on the factors led to Kyoto protocol and its resolution
- Comprehensive study on clean development mechanism and its impact on Indian energy scenario.

UNIT I  CLIMATE SCIENCE
World energy scenario - observed and modeled changes in climate - role of Aerosols - climate change scenarios - global warming – factors contributing – comparison of global warming potential of GHG - impacts

UNIT II  KYOTO PROTOCOL: FORMATION
Historical perspectives from the industrial revolution to the United Nations framework convention on climate change and the Kyoto protocol, the intergovernmental panel on climate change (IPCC)

UNIT III  KYOTO PROTOCOL
Article 1 through 28 - accounted GHGs in Kyoto protocol – source categorization of GHG emissions – reduction commitment of Annexe B countries – C D M, joint implementation and emissions trading

UNIT IV  CLEAN DEVELOPMENT MECHANISM AND BASELINE STUDY CENARIO

**UNIT V RECENT ADVANCEMENTS**
Recent advancements in the CDM technologies, issues and protocols, Emission certification norms and methods

**TEXT BOOKS:**

**REFERENCES:**
1. Counting Emissions and Removals Greenhouse Gas Inventories Under The UNFCCC
2. Climate Change – Information Kit: Published by UNEP and UNFCCC
4 Understanding Climate Change: A beginner’s guide to UNFCC and its Kyoto Protocol 2002

**EY9014 SOLAR ENERGY SYSTEMS**

**AIM:**
To understand the fundamentals of solar energy and its conversion techniques for both thermal and electrical energy applications.

**OBJECTIVES:**
- To learn and study the radiation principles with respective solar energy estimation
- To learn about PV technology principles and techniques of various solar cells / materials for lister energy conversion
- To learn economical and environmental merits of solar energy for variety applications

**UNIT I SOLAR RADIATION AND COLLECTORS**

**UNIT II APPLICATIONS OF SOLAR THERMAL TECHNOLOGY**

UNIT III SOLAR PV FUNDAMENTALS 9

UNIT IV SOLAR PHOTOVOLTAIC SYSTEM DESIGN AND APPLICATIONS 9
Solar cell array system analysis and performance prediction - Shadow analysis: reliability - solar cell array design concepts - PV system design - design process and optimization - detailed array design - storage autonomy - voltage regulation - maximum tracking - use of computers in array design - quick sizing method - array protection and trouble shooting - centralized and decentralized SPV systems - stand alone - hybrid and grid connected system - System installation - operation and maintenance - field experience - PV market analysis and economics of SPV systems.

UNIT V SOLAR PASSIVE ARCHITECTURE 9

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
AIM:
To understand the fundamentals of wind energy and its conversion techniques for electrical energy applications.

OBJECTIVES:
- To understand the fundamentals of wind energy and its conversion system
- To learn Geo thermal, OTEC, wave energy fundamentals energy conservation techniques, system and design methods
- To learn different classification in Hydropower sources and its energy conservation techniques along with environmental impact.

UNIT - I  
FUNDAMENTALS OF WIND ENERGY
9

UNIT - II  
WIND ENERGY CONVERSION SYSTEMS (WECS)
9

UNIT - III  
GEO, OTEC THERMAL ENERGY SOURCES
9
Introduction – estimates to geo thermal sources – hydro thermal resources – applications for thermal and electricity generation – prime movers – impulse and reaction turbines - small and medium scale hydro power - ocean energy - Introduction – OTEC conversion – thermal electric power generation - energy utilization – heat exchangers – site selection – potential Impacts

UNIT - IV  
TIDES AND WAVES ENERGY SOURCES
9
Introduction – principal of tidal power – power plants – applications - utilization of tidal energy –application - site requirements - storage systems - different methods and potential in India-waves energy – Introduction - basic concepts - wave power devices - wave energy conversion devices.

UNIT - V  
HYDRO POWER RESOURCES
9
Introduction - hydro electric basic concepts - hydro power plant - potential applications- potential development hydro power stations - components of hydro electric scheme- environmental aspects - potential impacts of harnessing the different renewable energy resources.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

EY9016 BIO - ENERGY CONSERVATION TECHNIQUES

AIM:
To disseminate the technologies for utilizing bio-energy and its manifold benefits compared to conventional fossil fuels.

OBJECTIVE:
- To detail on the types of biomass, its surplus availability and characteristics.
- Analyze the technologies available for conversion of biomass to energy in terms of its technical competence and economic implications.

UNIT I INTRODUCTION

UNIT II BIOMETHANATION

UNIT III COMBUSTION

UNIT IV GASIFICATION

UNIT V PYROLYSIS AND CARBONIZATION

TEXT BOOKS:
1. David Boyles, Bio Energy Technology Thermodynamics and costs, Ellis Hoknood Chichester, 1984.

REFERENCES:
2. Tom B Reed, Biomass Gasification – Principles and Technology, Noyce Data Corporation, 1981
5. Iyer PVR et al, Thermochemical Characterization of Biomass, M N E S

EY9018 GREEN BUILDINGS L T P C
3 0 0 3

AIM:
This course provides an introduction to the materials, theories and practices of Green building planning, design, construction, operation and deconstruction

OBJECTIVES:
- To learn green buildings concepts and ecological design concepts applicable to modern buildings
- Acquaint students with the principle theories materials, construction techniques and to create green buildings
- To provide exposure to various national and international rating systems as compliance requirements for green buildings

UNIT I GREEN BUILDING PROCESS AND ECOLOGICAL DESIGN
Conventional versus green building delivery systems - Green building project execution - the integrated design process - green building documentation requirements - design versus ecological design - historical perspective - contemporary ecological design - future ecological design - green design to regenerative design.

UNIT II GREEN BUILDING SYSTEMS

UNIT III GREEN BUILDING IMPLEMENTATION
Site protection planning - health and safety planning - construction and demolition waste management - reducing the footprint of construction operations - maximizing the value of building commissioning in HVAC System, lighting and non mechanical Systems - costs and benefits relevance to LEED / IGBC standards.

UNIT IV GREEN BUILDING ASSESSMENT
USGBC LEED building assessment standard - LEED certification process – green globes building assessment protocol- international building assessment systems -

UNIT V ECONOMICS OF GREEN BUILDINGS 9
Business case for high-performance green buildings - the economics of green building - benefits - managing initial costs - cost barrier in project management - long-term environment benefits.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

EY9020 HYDROGEN AND FUEL CELLS L T P C 3 0 0 3

AIM:
To enlighten the student community on various technological advancements, benefits and prospects of utilizing hydrogen/fuel cell for meeting the future energy requirements.

OBJECTIVE:
• To detail on the hydrogen production methodologies, possible applications and various storage options
• To discuss on the working of a typical fuel cell, its types and to elaborate on its thermodynamics and kinetics
• To analyze the cost effectiveness and eco-friendliness of Fuel Cells

UNIT I HYDROGEN – BASICS AND PRODUCTION TECHNIQUES 9
Hydrogen – physical and chemical properties, salient characteristics. Production of hydrogen – steam reforming – water electrolysis – gasification and woody biomass
conversion – biological hydrogen production – photo dissociation – direct thermal or catalytic splitting of water.

UNIT II HYDROGEN STORAGE AND APPLICATIONS

UNIT III FUEL CELLS
History – principle - working - thermodynamics and kinetics of fuel cell process – performance evaluation of fuel cell – comparison on battery Vs fuel cell

UNIT IV FUEL CELL - TYPES
Types of fuel cells – AFC, PAFC, SOFC, MCFC, DMFC, PEMFC – relative merits and demerits

UNIT V APPLICATION OF FUEL CELL AND ECONOMICS
Fuel cell usage for domestic power systems, large scale power generation, Automobile, Space. Economic and environmental analysis on usage of Hydrogen and Fuel cell. Future trends in fuel cells.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

EY9022 DEMAND SIDE MANAGEMENT OF ENERGY

AIM:
To understand the concept and methods of demand side management and load control both utility side and area side

OBJECTIVES:
• To provide in-depth load management techniques for shifting / leveling the load
• To analyze the impact system load shape, cost benefit and feasibility study of DSM program.
• To learn economic utilization of energy resources

UNIT I CONCEPTS AND METHODS OF DSM, LOAD CONTROL
UNIT II  STRATEGIC CONSERVATION AND LOAD MANAGEMENT TECHNOLOGIES
Strategic conservation via improving building envelope - air-conditioning – lighting - electric motor - and other industrial processes and equipment - load shifting and load leveling through thermal energy storage.

UNIT III  ASSESSMENT OF IMPACT ON SYSTEM LOAD SHAPE
Energy audit and assessment of customers load shape for different customer groups - impact of DSM programs on load shapes in customer groups - categorized in economic sub sectors and by geographical location.

UNIT IV  COST / BENEFIT ANALYSIS AND FEASIBILITY OF DSM PROGRAM
DSM program costing and Load Shape Impact on system - DSM program cost/benefit and feasibility - environmental benefits - type of customer incentives and programs - program design - use of analytic hierarchical process for assessment of customer acceptance and program penetration.

UNIT V  INTEGRATED ELECTRIC UTILITY SERVICE UNDER DEREGULATED SITUATION
Institutional – legal - and political environments and the stages of development of electric utility Service - the mechanism of competition and development of the financial environment for economic utilization of resources for electric service.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

EY9256  DESIGN OF HEAT EXCHANGERS  LT P C
3 0 0 3

AIM:
The course is intended to build up necessary background for the design of the various types of heat exchangers.

OBJECTIVE:
- To learn the thermal and stress analysis on various parts of the heat exchangers
- To analyze the sizing and rating of the heat exchangers for various applications

UNIT I  FUNDAMENTALS OF HEAT EXCHANGER 9

UNIT II FLOW AND STRESS ANALYSIS 9

UNIT III DESIGN ASPECTS 9

UNIT IV COMPACT AND PLATE HEAT EXCHANGERS 9

UNIT V CONDENSERS AND COOLING TOWERS 9
Design of surface and evaporative condensers – cooling tower – performance characteristics.

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES

IC 9262 COMPUTATIONAL FLUID DYNAMICS

AIM
This course aims to introduce numerical modeling and its role in the field of heat and fluid flow, it will enable the students to understand the various discretisation methods and solving methodologies and to create confidence to solve complex problems in the field of heat transfer and fluid dynamics.

OBJECTIVE:
- To develop finite difference and finite volume discretized forms of the CFD equations.
- To formulate explicit & implicit algorithms for solving the Euler Eqns & Navier Stokes Eqns.

UNIT I GOVERNING DIFFERENTIAL EQUATION AND FINITE DIFFERENCE METHOD 10
Classification, Initial and Boundary conditions – Initial and Boundary Value problems – Finite difference method, Central, Forward, Backward difference, Uniform and non-uniform Grids, Numerical Errors, Grid Independence Test.
UNIT II CONDUCTION HEAT TRANSFER 10
Steady one-dimensional conduction, Two and three dimensional steady state problems, Transient one-dimensional problem, Two-dimensional Transient Problems.

UNIT III INCOMPRESSIBLE FLUID FLOW 10

UNIT IV CONVECTION HEAT TRANSFER AND FEM 10

UNIT V TURBULENCE MODELS 5
Algebraic Models – One equation model, K – ε Models, Standard and High and Low Reynolds number models, Prediction of fluid flow and heat transfer using standard codes.

TOTAL : 45 PERIODS

TEXT BOOKS :

EY 9001 ADVANCED ENGINEERING FLUID MECHANICS L T P C
3 0 0 3

AIM:
To introduce the advanced concepts of fluid mechanics and aerodynamics with the emphasis on practical applications.

OBJECTIVES:
• To understand the laws of fluid flow for ideal and viscous fluids.
• To represent the real solid shapes by suitable flow patterns and to analyze the same for aerodynamics performances.
• To understand the changes in properties in compressible flow and shock expansion.

UNIT I  BASIC EQUATIONS OF FLOW  6
Three dimensional continuity equation - differential and integral forms – equations of motion momentum and energy and their engineering applications.

UNIT II  POTENTIAL FLOW THEORY  12

UNIT III  VISCOUS FLOW THEORY  9

UNIT IV  BOUNDARY LAYER CONCEPT  9
Boundary Layer - displacement and momentum thickness - laminar and turbulent boundary layers in flat plates - velocity distribution in turbulent flows in smooth and rough boundaries - laminar sub layer.

UNIT V  COMPRESSIBLE FLUID FLOW  9
One dimensional compressible fluid flow – flow through variable area passage – nozzles and diffusers – fundamentals of supersonics – normal and oblique shock waves and calculation of flow and fluid properties over solid bodies (like flat plate, wedge, diamond) using gas tables.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
AIM:
To detail on the importance of Total Energy Concept, its advantages and cost effectiveness

OBJECTIVE:
- To analyze the basic energy generation cycles
- To detail about the concept of cogeneration, its types and probable areas of applications
- To study the significance of waste heat recovery systems and carryout its economic analysis

UNIT I INTRODUCTION

UNIT II COGENERATION TECHNOLOGIES

UNIT III ISSUES AND APPLICATIONS OF COGENERATION TECHNOLOGIES

UNIT IV WASTE HEAT RECOVERY SYSTEMS

UNIT V ECONOMIC ANALYSIS

TOTAL: 45 PERIODS

TEXT BOOKS:


REFERENCES:

TE9223 ENVIRONMENTAL ENGINEERING AND POLLUTION CONTROL

AIM:
To create awareness among the student community on anthropogenic degradation of environment and technologies available to limit the degradation.

OBJECTIVES:
- To impart knowledge on the atmosphere and its present condition, global warming and eco-legislations.
- To detail on the sources of air, water and noise pollution and possible solutions for mitigating their degradation.
- To elaborate on the technologies available for generating energy from waste.

UNIT I INTRODUCTION

UNIT II AIR POLLUTION
Pollutants - sources and effect – air pollution meteorology – atmospheric dispersion – indoor air quality - control methods and equipments - issues in air pollution control – air sampling and measurement.

UNIT III WATER POLLUTION
Water resources - water pollutants - characteristics – quality - water treatment systems – waste water treatment - treatment, utilization and disposal of sludge - monitoring compliance with standards.

UNIT IV WASTE MANAGEMENT

UNIT V OTHER TYPES OF POLLUTION FROM INDUSTRIES

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES

TE9252 TURBOMACHINES L T P C
3 0 0 3

AIM:
To instil the working principles, performance and applications of Turbomachines in the minds of the students.

OBJECTIVES:
- To introduce the energy transfer process in Turbomachines and governing equations of various forms.
- To understand the structural and functional aspects of major components of Turbomachines.
- To understand the applications of Turbomachines to gas turbine power plants and aerospace propulsion.

UNIT I INTRODUCTION

UNIT II CENTRIFUGAL AND AXIAL FLOW COMPRESSORS

UNIT III COMBUSTION CHAMBER
UNIT IV  AXIAL AND RADIAL FLOW TURBINES  

UNIT V  GAS TURBINE AND JET ENGINE CYCLES  
Gas turbine cycle analysis – simple and actual – Reheater, Regenerator and Intercooled cycles. Working principles of Turbojet, Turboprop, Scramjet and Pulsejet Engines and cycle analysis – thrust, specific impulse, sfc, thermal and propulsive efficiencies.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

TE9258  NUCLEAR ENGINEERING  
L T P C
3 0 0 3

AIM:
To provide in-depth knowledge on Nuclear reaction materials reprocessing techniques and also to understand nuclear waste disposal techniques and radiation protection aspects.

OBJECTIVES:
• To describe fundamental study of nuclear reactions
• To learn nuclear fuels cycles, characteristics. Fundamental principles governing nuclear fission chain reaction and fusion
• To discuss future nuclear reactor systems with respect to generation of energy, fuel breeding, incineration of nuclear material and safety.

UNIT I  NUCLEAR REACTIONS  
Mechanism of nuclear fission - nuclides - radioactivity – decay chains - neutron reactions - the fission process - reactors - types of fast breeding reactor - design and construction of nuclear reactors - heat transfer techniques in nuclear reactors - reactor shielding.

UNIT II  REACTOR MATERIALS  
Nuclear Fuel Cycles - characteristics of nuclear fuels - Uranium - production and purification of Uranium - conversion to UF4 and UF6 - other fuels like Zirconium, Thorium - Beryllium.

UNIT III  REPROCESSING  

Nuclear fuel cycles - spent fuel characteristics - role of solvent extraction in reprocessing - solvent extraction equipment.

UNIT IV SEPARATION OF REACTOR PRODUCTS 9

UNIT V WASTE DISPOSAL AND RADIATION PROTECTION 9
Types of nuclear wastes - safety control and pollution control and abatement - international convention on safety aspects - radiation hazards prevention.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

UNIT IV NUCLEAR AND MHD POWER PLANTS 10
Overview of Nuclear power plants - radioactivity - fission process- reaction rates - diffusion theory, elastic scattering and slowing down - criticality calculations - critical heat flux - power reactors - nuclear safety.MHD and MHD - steam power plants.

UNIT V ENVIRONMENTAL ISSUES 7

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

TE9271 STEAM GENERATOR TECHNOLOGY L T P C 3 0 0 3

AIM:
To understand the types, working of steam generator and their major components, along with design principles and calculations.

OBJECTIVES:
- To educate the students on the types of boilers with their constructional and functional significance.
- To understand the working and design of coal preparation units and boilers.
- To introduce the concept of heat transfer surfaces and the boiler design.

UNIT I INTRODUCTION 10

UNIT II COAL PREPARATION SYSTEM OF BOILERS 8

UNIT III DESIGN OF BURNERS 8
Design of oil supply system - tangential fired burners - oil atomizers - air registers - design principles of oil fired boilers

UNIT IV BOILER FURNACE DESIGN 9

UNIT V DESIGN OF CONVECTIVE HEAT TRANSFER SURFACE 10

TOTAL: 45 PERIODS

TEXT BOOKS:
2. Ganapathy, V., Industrial Boilers and Heat Recovery Steam Generators, Marcel Dekker Ink 2003

REFERENCES:

TE9272 FLUIDIZED BED SYSTEMS L T P C
3 0 0 3

AIM:
To inspire the students with the theories of fluidization, heat transfer and design for various applications.

OBJECTIVES:
- To introduce the concepts of fluidization and heat transfer in fluidized beds.
- To understand the design principles and apply the same for industrial applications.

UNIT I FLUIDIZED BED BEHAVIOUR 12

UNIT II HEAT TRANSFER 6

UNIT III COMBUSTION AND GASIFICATION 6
UNIT IV DESIGN CONSIDERATIONS

UNIT V INDUSTRIAL APPLICATIONS
Physical operations like transportation, mixing of fine powders, heat exchange, coating, drying and sizing. Cracking and reforming of hydrocarbons, carbonization, combustion and gasification. Sulphur retention and oxides of nitrogen emission control.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES: