Department of Mechanical Engineering

III B.Tech I Semester Course Structure & Syllabus (ACE-R22 Regulations)

ACE Engineering College
Ankushapur(V), Ghatkesar(M), Medchal Dist - 501 301
(An Autonomous Institution, Affiliated to JNTUH ,Hyderabad)

Department of Mechanical Engineering
B.Tech. in Mechanical Engineering
COURSE STRUCTURE & SYLLABUS (ACE-R22 Regulations)
Applicable from A.Y. 2022-23 Batch

III YEAR II SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1.	ME601PC	Machine Design	3	0	0	3
2.	ME602PC	Heat Transfer	3	0	0	3
3.	ME603PC	Finite Element Methods	3	0	0	3
4.		Professional Elective - I	3	0	0	3
5.		Open Elective - I	3	0	0	3
6.	ME604PC	Heat Transfer Lab	0	0	2	1
7.	ME605PC	Computer Aided Engineering Laboratory	0	0	2	1
8.	EN608HS	Advanced English Communication Skills Laboratory	0	0	2	1
9.	ME607PC	Industry Oriented Mini Project/ Internship	0	0	4	2
10.	*MC609	Environmental Science	3	0	0	0
		Total Credits	**18**	**0**	**10**	**20**

Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students Only.

ME601PC MACHINE DESIGN

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Note: Design Data Book is permitted. Design of all components should include design for strength and rigidity apart from engineering performance requirements.

Pre-requisites: Study of engineering mechanics, design of machine members-I and theory of machines.

Course objectives:

- To gain knowledge about designing the commonly used important machine members such as bearings, engine parts, springs, belts, gears etc.
- To design the components using the data available in design data books.

Course Outcomes: At the end of the course, the student will be able to

- Understand the types of bearings, bearing material, bearing design using different empirical relations.
- Estimate the life of rolling element bearings and their selection for given service conditions.
- Design of engine components like piston, connecting rod
- Design of springs, pulleys and belts
- Design of gears

UNIT – I:

Sliding contact bearings: Types of Journal bearings – Lubrication – Bearing Modulus – Full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design.

UNIT – II:

Rolling contact bearings: Ball and roller bearings – Static load – dynamic load – equivalent radial load – design and selection of ball & roller bearings.

UNIT – III:

Engine Parts: Connecting Rod: Thrust in connecting rod – stress due to whipping action on connecting rod ends –Pistons, Forces acting on piston – Construction, Design and proportions of piston.

UNIT – IV:

Mechanical Springs: Stresses and deflections of helical springs – Extension and compression springs

– Design of springs for fatigue loading – natural frequency of helical springs – Energy storage capacity

– helical torsion springs – Design of co-axial springs, Design of leaf springs.

Belts & Pulleys: Transmission of power by Belt and Rope Drives, Transmission efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives.

UNIT – V:

Gears: Spur gears& Helical gears- Brief introduction involving important concepts – Design of gears using AGMA procedure involving Lewis and Buckingham equations. Check for wear.

TEXT BOOKS:

1. Design of Machine Elements / Spotts/ Pearson
2. Machine Design / Pandya & Shah, 21st Edition, 2022 / Charothar

REFERENCE BOOKS:

1. Design of Machine Elements-II / Annaiah, Suresh kumar, chandrappa / New Age
2. Design of Machine Elements / Sharma and Purohit/PHI
3. Design Data Book/ P.V. Ramana Murti & M. Vidyasagar/ B.S. Publications.
4. Design Data Handbook/ S. Md. Jalaludeen/ Anuradha Publishers.

ME602PC HEAT TRANSFER

B.Tech. III Year II Sem.

Note: Heat Transfer Data Book is permitted.

L	T	P	C
3	0	0	3

Pre-requisite: Thermodynamics

Course Objectives: To provide knowledge about application of conduction, convection and radiation heat transfer concepts to different practical applications

Course Outcome: At the end of this course, student will be able to

- Understand the basic modes of heat transfer
- Compute one dimensional steady state heat transfer with and without heat generation
- Understand and analyze heat transfer through extended surfaces
- Understand one dimensional transient conduction heat transfer
- Understand concepts of continuity, momentum and energy equations
- Interpret and analyze forced and free convective heat transfer
- Understand the principles of boiling, condensation and radiation heat transfer
- Design of heat exchangers using LMTD and NTU methods

UNIT – I:

Introduction: Modes and mechanisms of heat transfer – Basic laws of heat transfer – General discussion about applications of heat transfer.

Conduction Heat Transfer: Fourier rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates – simplification and forms of the field equation – steady, unsteady, and periodic heat transfer – Initial and boundary conditions

One Dimensional Steady State Conduction Heat Transfer: Homogeneous slabs, hollow cylinders, and spheres- Composite systems– overall heat transfer coefficient – Electrical analogy – Critical radius of insulation

UNIT – II:

One Dimensional Steady State Conduction Heat Transfer: Variable Thermal conductivity – systems with heat sources or Heat Generation-Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to error measurement of Temperature

One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers –Infinite bodies- Chart solutions of transient conduction systems- Concept of Semi-infinite body.

UNIT – III:

Convective Heat Transfer: Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham □ Theorem and method, application for developing semi – empirical non- dimensional correlation for convection heat transfer – Significance of non-dimensional numbers – Concepts of Continuity, Momentum and Energy Equations – Integral Method as approximate method -Application of Von Karman Integral Momentum Equation for flat plate with different velocity profiles.

Forced convection: External Flows: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer -Flat plates and Cylinders.

UNIT – IV:

Internal Flows: Concepts about Hydrodynamic and Thermal Entry Lengths – Division of internal flow based on this –Use of empirical relations for Horizontal Pipe Flow and annulus flow.

Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate - Use of empirical relations for Vertical plates and pipes.
Heat Exchangers: Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

UNIT – V:
Heat Transfer with Phase Change:
Boiling: Pool boiling – Regimes – Calculations on Nucleate boiling, Critical Heat flux and Film boiling. **Condensation:** Film wise and drop wise condensation –Nusselt's Theory of Condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.
Radiation Heat Transfer: Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

TEXT BOOKS:

1. Fundamentals of Engineering Heat and Mass Transfer, R.C. Sachdeva, New Age
2. Heat Transfer, J.P. Holman , Tenth Edition, Mc Graw Hill

REFERENCE BOOKS:

1. Heat Transfer by a Practical Approach, Yunus Cengel, Boles, TMH
2. Heat transfer, A conceptual Approach, P. K. Sarma, Rama Krishna, New Age
3. Heat and mass Transfer, Dr. D. S. Kumar, S. K. Kataria & Sons
4. Essential Heat Transfer - Christopher A Long / Pearson.
5. Heat Transfer –Ghoshdastidar / Oxford.
6. Heat and Mass Transfer data book, CP Kodanda Raman, Subramanyan, New Age

ME603PC FINITE ELEMENT METHODS

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Mechanics of Solids

Course Objectives: The aim of the course is to provide the students.

- Basics of Finite Element Analysis.
- Use of available material models for structural materials, soils and interfaces/joints.
- Modeling of engineering systems and Soil–Structure Interaction (SSI).
- Importance of interfaces and joints on the behavior of engineering systems.
- Implementation of material model in finite element method and applications.

Course Outcomes: At the end of the course, the student will be able to

- Apply finite element method to solve problems in solid mechanics, fluid mechanics and heat transfer
- Formulate and solve problems in one dimensional structures including trusses, beams and frames.
- Formulate FE characteristic equations for two dimensional elements and analyze plain stress, plain strain, axi-symmetric and plate bending problems.
- Use of ANSYS, ABAQUS, NASTRAN, etc.

UNIT – I:

Introduction to Finite Element Methods: General Procedure – Engineering Applications – Stress and Equilibrium, Strain – Displacement relations. Stress – strain relations: Finite Elements: 1-Dimensional, 2 – Dimensional, 3-Dimensional & Interpolation Elements

One Dimensional Problems: 1-D Linear and 1-D Quadratic Elements - Finite element modeling, Coordinates and shape functions. Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT – II:

Analysis of Trusses: Derivation of Stiffness Matrix for Plane Truss, Displacement of Stress Calculations.

Analysis of Beams: Element stiffness matrix for two noded, two degrees of freedom per node beam element, Load Vector, Deflection.

UNIT – III:

Finite element modeling of two-dimensional stress analysis with constant strain triangles and treatment of boundary conditions, Estimation of Load Vector, Stresses

Finite element modeling of Axi-symmetric solids subjected to Axi-symmetric loading with triangular elements. Two dimensional four noded Isoparametric elements and numerical integration.

UNIT – IV:

Steady State Heat Transfer Analysis: one dimensional analysis of Slab, fin and two-dimensional analysis of thin plate.

UNIT – V:

Dynamic Analysis: Formulation of finite element model, element - Mass matrices, evaluation of Eigen values and Eigen vectors for a stepped bar, truss and beam.

Finite element – formulation to 3 D problems in stress analysis, convergence requirements, Mesh generation. techniques such as semi-automatic and fully Automatic use of software such as ANSYS, ABAQUS, NASTRAN using Hexahedral and Tetrahedral Elements.

TEXT BOOKS:

1. Finite Element Methods: Basic Concepts and applications/Alavala/PHI
2. Introduction to Finite Elements in Engineering, Chandrupatla, Ashok and Belegundu /Pearson

REFERENCE BOOKS:

1. An Introduction to the Finite Element Method / J. N. Reddy/ Mc Graw Hill
2. Finite Element Analysis / SS Bhavikatti / New Age.
3. Finite Element Method/ Dixit/Cengage.

ME611PE UNCONVENTIONAL MACHINING PROCESSES
(PROFESSIONAL ELECTIVE – I)

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Course Overview: The objective of this course is to introduce the student to more advanced topics in the machining processes. To bring out the need for Unconventional Machining Processes which will overcome the difficulties associated with Traditional Machining.

Course Objectives:

- To differentiate conventional and Unconventional Machining Processes and Ultrasonic Machining.
- To understand the process capabilities of abrasive, water jet and electro-chemical machining processes.
- To understand the working principle & important features of electrical discharge machining process.
- To understand the process parameters, accuracy and surface finish of electron beam & laser beam machining Processes.
- To understand the working principle & metal removal rate of plasma arc machining and abrasive finishing process.

Course Outcomes: After completion of the course, the student will be able to

- Study the need for unconventional machining processes and explain ultrasonic machining process.
- Describe Abrasive jet, Water jet, and Abrasive water jet machining and electrochemical machining process.
- Describe working principle and process variables of EDM process.
- Explain the process capabilities and process parameters of Electron Beam machining and Laser Beam machining.
- Describe the working of Plasma Arc machining, chemical machining and Abrasive Finishing processes.

UNIT – I:

Introduction – Need for non-traditional machining methods-Classification of modern machining processes – considerations in process selection. Materials. Applications.
Ultrasonic machining – Elements of the process, mechanics of metal removal process, parameters, economic considerations, applications and limitations, recent development.

UNIT – II:

Abrasive Jet Machining, Water Jet Machining And Abrasive Water Jet Machining: Basic principles, equipment, process variable, and mechanics of metal removal, MRR, application and limitations.
Electro – Chemical Processes: Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring processes, metal removal rate in ECM, Tool design, Surface finish and accuracy, economic aspects of ECM – Simple problems for estimation of metal removal rate.

UNIT – III:

Thermal Metal Removal Processes: General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and

dielectric fluids, methods surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection. Wire EDM, principle, applications.

UNIT – IV:

Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes –General Principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut.

UNIT – V:

Application of plasma for machining, metal removing mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries. Chemical machining – principle - maskants - applications.

Magnetic abrasive finishing, Abrasive flow finishing, Electro stream drilling, shaped tube electrolyte machining.

TEXT BOOKS:

1. Advanced Machining Processes / VK Jain / Allied publishers
2. Modern Machining Processes - P. C. Pandey, H. S. Shan/ Mc Graw Hill

REFERENCE BOOKS:

1. Unconventional Manufacturing Processes/ Singh M.K/ New Age Publishers
2. Advanced Methods of Machining/ J.A. McGeough/ Springer International
3. Non-Traditional Manufacturing Processes/ Benedict G.F./ CRC Press

ME612PE PRODUCTION PLANNING & CONTROL (PROFESSIONAL ELECTIVE – I)

B.Tech. III Year, II Sem.

Pre-requisites: Management Science & Productivity.

L	T	P	C
3	0	0	3

Course Objectives: Understand the importance of Production planning & control. Learning way of carrying out various functions so as to produce right product, right quantity at right time with minimum cost.

Course Outcomes: At the end of the course, the student will be able to

- Understand production systems and their characteristics.
- Evaluate MRP and JIT systems against traditional inventory control systems.
- Describe and apply methods of line balancing and routing techniques..
- Apply various types of scheduling techniques to production systems.
- Apply dispatching and follow up techniques to the production control and management system.

UNIT – I:

Introduction: Definition – Objectives of Production Planning and Control – Functions of production planning and control - Types of production systems - Organization of production planning and control department.

Forecasting – Definition- uses of forecast- factors affecting the forecast- types of forecasting- their uses - general principle of forecasting. Forecasting techniques- quantitative and qualitative techniques. Measures of forecasting errors.

UNIT – II:

Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – Basic EOQ model- Inventory control systems –continuous review systems and periodic review systems, MRP I, MRP II, ERP, JIT Systems - Basic Treatment only. **Aggregate planning –** Definition – aggregate-planning strategies – aggregate planning methods – transportation model.

UNIT – III:

Line Balancing: Terminology, Methods of Line Balancing, RPW method, Largest Candidate method and Heuristic method.

Routing– Definition – Routing procedure – Factors affecting routing procedure, Route Sheet.

UNIT – IV:

Scheduling –Definition – Scheduling Policies – types of scheduling methods – differences with loading – flow shop scheduling **–** job shop scheduling, line of balance (LOB) – objectives - steps involved.

UNIT – V:

Dispatching: Definition – activities of dispatcher – dispatching procedures – various forms used in dispatching.

Follow up: definition – types of follow up – expediting – definition – expediting procedures- Applications of computers in planning and control.

TEXT BOOKS:

1. Operations management/ Heizer/Pearson/13th Edition, 2019
2. Production and Operations Management / Ajay K Garg / Mc Graw Hill, 1st Edition, 2017

REFERENCE BOOKS:

1. Production Planning and Control- Text& cases/ SK Mukhopadhyaya /PHI, 2nd Edition, 2007.
2. Production Planning and Control- Jain & Jain – Khanna publications, 8th Edition, 1999.

ME613PE OPERATIONS RESEARCH (PROFESSIONAL ELECTIVE – I)

B.Tech. III Year, II Sem.

L	T	P	C
3	0	0	3

Course Objectives: To Understand the importance of optimization model and solving it.

Course Outcome: At the end of the course, the student will be able to

- Understand the problem, identify the variables & constants
- Formulate the optimization model and apply appropriate optimization technique

UNIT – I:

Development-definition-characteristics and phases-Types of models-Operations Research models- applications.

Allocation: Linear Programming Problem Formulation-Graphical solution- Simplex method-Artificial variable techniques: Two-phase method, Big-M method.

UNIT – II:

Transportation problem - Formulation-Optimal solution, unbalanced transportation problem-Degeneracy.

Assignment problem- Formulation-Optimal solution, - Variants of Assignment problem-Travelling salesman problem.

UNIT – III:

Sequencing- Introduction-Flow-Shop sequencing- n jobs through two machines – n jobs through three machines- Job shop sequencing-two jobs through 'm' machines

Replacement: Introduction- Replacement of items that deteriorate with time- when money value is not counted and counted- Replacement of items that fail completely- Group Replacement.

UNIT – IV:

Theory of Games: Introduction- Terminology- Solution of games with saddle points and without saddle points. 2 x 2 games- dominance principle- m x 2 & 2 x n games- Graphical method.

Inventory: Introduction- Single item, Deterministic models- purchase inventory models with one price break and multiple price breaks- Stochastic models _ Demand may be discrete variable or continuous variable- single period model and no setup cost.

UNIT – V:

Waiting lines: Introduction- Terminology- Single channel- Poisson arrivals and Exponential service times with infinite population.

Dynamic Programming: Introduction- Terminology, Bellman's principle of optimality- Applications of Dynamic programming- shortest path problem- linear programming problem.

TEXT BOOK:

1. Operations Research Theory and Applications / J. K. Sharma sixth Edition, Trinity
2. Introduction to Operations Research/ Hillier & Lieberman/MGH

REFERENCE BOOKS:

1. Operations Research: An Introduction, Hamdy A.Taha/PHI
2. Operations Research/NVS Raju/SMS Education/3rd Revised Edition
3. Operations Research /A. M. Natarajan, P. Balasubramaniam, A. Tamilarasi/Pearson Education.
4. Operations Research/ Wagner/ PHI Publications.
5. Operations Research/M.V. Durga Prasad, K.Vijaya Kumar Reddy, J. Suresh Kumar/Cengage Learning.

ME614PE MICROPROCESSORS IN AUTOMATION (PROFESSIONAL ELECTIVE – I)

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

UNIT - I: Basic Concepts of Digital Circuits

Number Systems, Logic Gates, Combinational Circuits, Flip-flops, Sequential Logic Circuits: Counters, Shift Registers.

Basic components and computer architecture- CPU, Memory and Peripherals

UNIT - II: Architecture of Microprocessor

Introduction, Origin, Historical Developments, Introduction to 8085 Functional Block Diagram, Registers, ALU, Bus Systems, Timing and Control Signals, PIN diagram, Machine Cycles, Instruction Cycle and Timing States, Instruction Timing Diagrams, Addressing Modes. Concept of Interrupt, Need for Interrupts, Interrupt structure, Multiple Interrupt requests and their handling, Programmable interrupt controller

UNIT - III: Assembly Language Programming

Instruction Set, Simple programs in 8085 mainly on Addition, Subtraction, Multiplication, Rotation, Ascending and Descending of the given data

UNIT - IV: Memory and I/O Device Interfacing

Memory Interfacing - Memory structure and its requirements, Basic Concept in Memory Interfacing, Address Decoding, Interfacing Circuits, Address Decoding and Memory Addresses, Typical Examples on Memory interfacing: Interface (2k x 8) ROM, (8k x 8) EPROM, and (1k x 8) RAM with 8085.

IO Interfacing – Basic Interfacing Concepts-Peripheral I/O instructions, I/O Execution, Device Selection and data transfer, absolute vs. Partial Decoding, Input Interfacing, Interfacing I/Os using Decoders

UNIT - V: Architecture of Microcontroller

Introduction to Microcontrollers and how they differ from microprocessors, Block diagram of Microcontrollers, Architecture of 8051 microcontroller, Pin Diagram, Instruction set, simple 8051 programming, introduction to ARM microcontroller and its applications.

TEXT BOOKS:

1. Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh Gaonkar, PENRAM International Publishers.
2. The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D, Mckinlay, 2nd Edition, Pearson publication, 2007.

REFERENCE BOOKS:

1. Microprocessors and Interfacing: Programming and Hardware, Douglas V. Hall
2. Microcomputer Experimentation with the Intel SDK-85, Lance A. Leventhal, Prentice Hall
3. Introduction to Microprocessors, Aditya P Mathur, Tata McGraw-Hill, Europe; 3rd Edition, 1990.
4. Digital Electronics: An Introduction to Theory and Practice, William H. Gothmann, PHI Learning Private Limited.
5. Digital and microprocessor technology, Patrick J O'Connor, Prentice-Hall, 1983.
6. Digital and Microprocessor Engineering, S.J.Cahill, Wllis Horwood Limited (John Wiley & Sons).
7. Digital Control Systems, Benjamin C. Kuo, Oxford University Press (2/e, Indian Edition, 2007).
8. Digital Computer Electronics: An Introduction to Microcomputers, Albert Pual Malvino, Tata McGraw-Hill Publishing Company Ltd.

ME611OE BASIC MECHANICAL ENGINEERING (OPEN ELECTIVE – I)

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Course objectives: To provide the essential basic knowledge of Mechanical Engineering to the students

Course Outcomes: At the end of the course, student will be able to

- Understand different types of power generation, working of refrigerator
- Summarize different types of manufacturing processes and Power transmission systems
- Discuss about conventional and non-conventional sources of energy
- Identify automation of various manufacturing processes in engineering practice.
- Describe the basic concepts and applications of industrial robotics

UNIT- I:

Energy: Power Generation: External and internal combustion engines-Thermal Power Plants-Working Principle, layouts, element/component description, advantages, disadvantages, applications.

2-Stroke, 4-Stroke Engines and their Components.

Refrigeration: Mechanical Refrigeration and types – units of refrigeration – Air Refrigeration system, Vapour Compression Refrigeration System- Principle of operation.

UNIT- II:

Machine and Mechanisms-Degrees of Freedom, functions of Flywheel and Governors, Types of joints-Riveted, welded and bolted joints. Applications, Merits and Demerits.

Power Transmission Elements: Gears terminology of spur, helical and bevel gears, gear trains. Belt drives (types). Chain drives.

UNIT- III:

Manufacturing Processes: Primary and secondary process. Casting: Types, equipment, applications. Metal forming processes-rolling, extrusion

Welding: Types – Equipment –Techniques employed – advantages / disadvantages – Gas cutting – Brazing and soldering.

UNIT- IV:

Machine Tools: Introduction to lathe, drilling machine, milling machine, grinding machine-Operations performed. CNC Machines- Basic elements, advantages. Limits, fits and tolerances, Surface finish of various manufacturing process.

UNIT- V: Non-conventional sources of energy-Solar, wind, tidal, biogas and nuclear- Principles. Robotics – Joints, end effectors, applications. Introduction to 3D Printing.

TEXT BOOKS:

1. Sadhu Singh, Basic Mechanical Engineering, S. Chand & Co. Ltd, New Delhi, 2013
2. Pravin Kumar, Basic mechanical Engineering, 2018, Pearson

REFERENCE BOOKS:

1. Hajra Choudhary, S.K. and Hajra Choudhary, A. K., Elements of Workshop Technology Vols.I& II, Indian Book Distributing Company Calcutta, 2007.
2. Nag, P.K., Power Plant Engineering, Tata McGraw-Hill, New Delhi, 2008.
3. Rattan, S.S., Theory of Machines, Tata McGraw-Hill, New Delhi, 2010.

ME612OE RENEWABLE ENERGY SOURCES (OPEN ELECTIVE – I)

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To provide an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternate energy sources and their technology and application.
- To explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy.
- To focus on alternate, renewable energy sources such as solar, biomass (conversions), wind power, geothermal, and hydro, Energy conservation methods.

Course Outcomes:

At the end of the of course, student will be able to

- Explain the main sources of energy including Solar energy and their primary applications in Global Context.
- Describe the challenges and problems associated with the use of solar energy sources and its Economic Evaluation
- Discuss significance of Wind energy systems and its components with basic working principles
- Elaborate the sources of energy from wate by various means such as OTEC, Tidal energy etc.
- Narrate the importance and potential of geo thermal energy and MHD power generation

UNIT- I:

Solar Radiation And Collecting Devices: Solar Incident Flux, Extra-terrestrial Radiation, Clear Sky Irradiation, Solar Radiation Measurement, Monthly Average Radiation on Tilted Surfaces. Cover plates, Collector Plate Surfaces, Collector Performance, Collector Improvement, Effect of Incident Angle, Heat Transfer to Fluids, Heat Transfer Factors, Concentrating Collectors, Reflectors.

UNIT- II:

Solar System Design And Economic Evaluation Hot water heating, heating and hot water systems

, pumps and fans, sizing pipe and duct work, fundamentals of economic analysis, systems optimization

UNIT- III:

Wind Energy Systems: Orientation systems and Regulating devices, Types of Wind Turbines, Operating Characteristics, Basics of Airfoil Theory, Wind energy for water pumping and generation of electricity, Installation operation and maintenance of small wind energy conversion systems.

UNIT-I V:

Energy From Water: OTEC–Principle of operation, Open and Closed OTEC cycles, Wave energy: Wave energy conversion machines and recent advances Tidal Energy: Single basin and double basin tidal systems Small-Mini-Micro hydro system: Concepts, Types of turbines, Hydrological analysis.

UNIT- V:

Geothermal Energy: Introduction, Classification of Geo-thermal areas, Applications of Geo-thermal energy for power generation, Economics of Geo-thermal energy. MHD POWER GENERATION: Principles of MHD Power Generation, Ideal MHD–Generator Performance, Practical MHD Generator: Faraday and Hall Configurations, MHD Technology.

TEXT BOOKS:

1. Non-Conventional sources of Energy by G. D. Rai, Kanna Publications.
2. Non-conventional Energy resources, BH Khan, McGraw-Hill

REFERENCE BOOKS:

1. Fundamentals of Renewable Energy Sources, G. N. Tiwari, Ghosal, Alpha Science
2. Solar Energy Fundamentals and Applications, H. P Garg, Prakash, TMH.
3. Solar Energy: Principles of thermal storage, S. P Sukhatme, TMH

ME604PC HEAT TRANSFER LAB

B.Tech. III Year II Sem.

L	T	P	C
0	0	2	1

Pre-requisite: Thermodynamics

Course Objectives: To enable the student to apply conduction, convection and radiation heat transfer concepts to practical applications

Course Outcome: At the end of the lab sessions, the student will be able to

- Perform steady state conduction experiments to estimate thermal conductivity of different materials
- Perform transient heat conduction experiment
- Estimate heat transfer coefficients in forced convection, free convection, condensation and correlate with theoretical values
- Obtain variation of temperature along the length of the pin fin under forced and free convection
- Perform radiation experiments: Determine surface emissivity of a test plate and Stefan-Boltzmann's constant and compare with theoretical value

Minimum ten experiments from the following:

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer in pin-fin
6. Experiment on Transient Heat Conduction
7. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzman Apparatus.
12. Critical Heat flux apparatus.
13. Study of heat pipe and its demonstration.
14. Film and Drop wise condensation apparatus

ME605PC COMPUTER AIDED ENGINEERING LAB

B.Tech. III Year, II Sem.

L	T	P	C
0	0	2	1

Course Objectives:

- To be able to understand and handle design problems in a systematic manner.
- To be able to apply CAD in real life applications.
- To understand the basic principles of different types of analysis.

Course Outcomes:

- To understand the analysis of various aspects in design
- To have exposure to usage of software tools for design and manufacturing.
- To acquire the skills needed to analyze and simulate engineering systems.

Note: conduct any TEN excercises from the list given below:

1. Drafting: Development of part drawings for various components in the form of orthographic and isometric. Representation of dimensioning and tolerances.
2. Part Modeling: Generation of various 3D Models through Protrusion, revolve, sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modeling and Assembly Modeling. Study of various standard Translators. Design of simple components.
3. Determination of deflection and stresses in 2D and 3D trusses and beams.
4. Determination of deflections, principal and Von-mises stresses in plane stress, plane strain and Axi-symmetric components.
5. Determination of stresses in 3D and shell structures (at least one example in each case)
6. Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.
7. Study state heat transfer analysis of plane and axi-symmetric components.
8. Development of process sheets for various components based on Tooling and Machines.
9. Development of manufacturing defects and tool management systems.
10. Study of various post processors used in NC Machines.
11. Development of NC code for free form and sculptured surfaces using CAM software.
12. Machining of simple components on NC lathe and Mill by transferring NC Code / from CAM software.

EN508HS ADVANCED ENGLISH COMMUNICATION SKILLS LAB

B.Tech. III Year II Sem.

L	T	P	C
0	0	2	1

1. Introduction

The introduction of the Advanced English Communication Skills Lab is considered essential at the B.Tech 3rd year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

1. Gathering ideas and information to organise ideas relevantly and coherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication.

2. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, with a focus on vocabulary
- To enable them to listen to English spoken at normal conversational speed by educated English speakers
- To respond appropriately in different socio-cultural and professional contexts
- To communicate their ideas relevantly and coherently in writing
- To prepare the students for placements.

3. Syllabus:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Listening and Reading Comprehension:** Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Sub- skills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading — Reading Comprehension – Exercises for Practice.
2. **Activities on Writing Skills**: Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing - Letter Writing –Writing a Letter of Application –Resume vs. Curriculum Vitae
   – Writing a Résumé **–** Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette
   – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.
3. **Activities on Presentation Skills -** Starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation – Dealing with Glossophobia or Stage Fear – Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation
4. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection

Procedure - Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas – Do's and Don'ts - GD Strategies – Exercises for Practice.

5. **Interview Skills**: Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - Mock Interviews.

4. Minimum Requirement:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- One PC with latest configuration for the teacher
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. Suggested Software: The software consisting of the prescribed topics elaborated above should be procured and used.

- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **Oxford Advanced Learner's Dictionary**, 10th Edition
- **Cambridge Advanced Learner's Dictionary**
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech

6. Books Recommended:

1. Rizvi, M. Ashraf (2018). *Effective Technical Communication*. (2nd ed.). McGraw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). *Engineering English.* Orient BlackSwan Pvt. Ltd.
3. Bailey, Stephen. (2018). Academic *Writing: A Handbook for International Students.* (5th Edition). Routledge.
4. Koneru, Aruna. (2016). *Professional Communication*. McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2022). *Technical Communication, Principles and Practice.* (4TH Edition) Oxford University Press.
6. Anderson, Paul V. (2007). *Technical Communication***.** Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). *English Vocabulary in Use*
   Series. Cambridge University Press
8. Sen, Leela. (2009). *Communication Skills.* PHI Learning Pvt Ltd., New Delhi.
9. Elbow, Peter. (1998). *Writing with Power.* Oxford University Press.
10. Goleman, Daniel. (2013). *Emotional Intelligence*: *Why it can matter more than IQ.* Bloomsbury Publishing.

*MC609 ENVIRONMENTAL SCIENCE

B.Tech. III Year II Sem.

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Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures
- Understanding the environmental policies and regulations

Course Outcomes:

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT – I:

Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT – II:

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT – III:

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT – IV:

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT – V:

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act-1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism,

Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4^{th} Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.