T K R COLLEGE OF ENGINEERING &TECHNOLOGY
(Autonomous)

B.TECH. MECHANICAL ENGINEERING –R17

COURSESTRUCTURE & SYLLABUS

IV YEAR I SEMESTER

No S.	Code	Course Title	L	T	P	Credits
1.	**A37PC1**	Operations Research	**3**	**1**	**0**	**3**
2.	**A37PC2**	Power Plant Engineering	**4**	**1**	**0**	**4**
3.	**A37PC3**	CAD/CAM	**4**	**1**	**0**	**4**
4.	**A37PC4**	**Professional Elective -1** A) Computational Fluid Dynamics B)Welding Technology C)Nano-Technology	**3**	**1**	**0**	**3**
5.	**A37PE5**	**Professional Elective- 2** A) Production Planning and Control B) Mechtronics C)Robotics	**3**	**1**	**0**	**3**
6.	**A37PE6**	**Professional Elective- 3** A)Un-Conventional Machinig Process B)|Automation in Manufacturing C)Turbo Machines	**3**	**1**	**0**	**3**
7.	**A37PE7**	Open Elective-3	**3**	**0**	**0**	**3**
8.	**A37PC8**	CAD and CAM lab	**0**	**0**	**3**	**2**
9.	**A37PC9**	Production Drawing Practice and Instrumentation lab	**0**	**0**	**3**	**2**
Total Credits						**27**

IV YEAR II SEMESTER

No.	Code	Course Title	L	T	P	Credits
1.	**A38OE1**	Open Elective-4	**3**	**1**	**0**	**3**
2.	**A38PE2**	**Professional Elective-3** A)Maintenance And Safety Engineering B)Plant Layout and Material Handling C) Total Quality Management	**3**	**1**	**0**	**3**
3.	**A38PE3**	**Professional Elective-4** A) Renewable energy sources B) Jet propulsion and Rocket Engineering. C) I.C. Engines	**3**	**1**	**0**	**3**
4.	**A38MP4**	Industry Oriented Mini Project	**-**	**-**	**-**	**2**
5.	**A38SR5**	Seminar	**-**	**-**	**6**	**2**
6.	**A38PW6**	Project Work			**15**	**9**
7.	**A38CV7**	Comprehensive Viva	**-**	**-**	**-**	**2**
Total Credits						**24**

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B. TECH MECHANICAL ENGINEERING-R17

OPERATIONS RESEARCH -A37PC1

B.Tech. IV Year I Semester. **L/T/P/ C**
3 /1/0/ 3

PRE – REQUISITE: Calculus of Several Variables, Linear or Matrix Algebra

COURSE OBJECTIVES:

1. Understanding the mathematical importance of development of model in a particular optimization model for the issue and solving it.

COURSE OUTCOME: Understanding the problem, identifying variables & constants, formulas of optimization model and applying appropriate optimization Tech

UNIT – I:

Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.

Allocation: Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

UNIT – II:

Transportation Problem – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.

Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling 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-graphical model. **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 –m x 2 & 2 x n games - graphical method – m x n games - dominance principle.

Inventory: Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

UNIT – V:

Waiting Lines: Introduction–Terminology-Single Channel–Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – 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 BOOKS

1. Operations Research / J. K. Sharma / MacMilan
2. Operations Research / ACS Kumar / Yes Dee

REFERENCE BOOKS

1. Operations Research / N.V.S. Raju / SMS.
2. Operations Research /A. M. Natarajan, P. Balasubramaniam, A. Tamilarasi / Pearson.

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B. TECH MECHANICAL ENGINEERING-R17

POWER PLANT ENGINEERING-A37PC2

B.Tech. IV Year I Semester. **L/T/P/ C**
4 /1/0/ 4

COURSE OBJECTIVE: The goal of this course is to become prepared for professional engineering design of conventional and alternative power-generation plants. The learning objectives include.

- Analysis and preliminary design of the major systems of conventional fossil-fuel steam-cycle power plants.
- A working knowledge of the basic design principles of nuclear, gas turbine, combined cycle, hydro, wind, geothermal, solar, and alternate power plants.
- Awareness of the economic, environmental, and regulatory issues related to power generation.

COURSE OUTCOMES: At the end of the course students are able to:

- Understand the concept of Rankine cycle.
- Understand working of boilers including water tube, fire tube and high pressure boilers
  and determine efficiencies.
- Analyze the flow of steam through nozzles.
- Evaluate the performance of condensers and steam turbines
- Evaluate the performance of gas turbines.

UNIT – I:

Introduction to the Sources of Energy – Resources and Development of Power in India. **Steam Power Plant:** Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.

Combustion Process: Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components,

combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

UNIT – II:

Internal Combustion Engine Plant: Diesel Power Plant: Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.

Gas Turbine Plant: Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison.

Direct Energy Conversion: Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

UNIT – III:

Hydro Electric Power Plant: Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage – classification of dams and spill ways.

Hydro Projects And Plant: Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.

Power From Non-Conventional Sources: Utilization of Solar- Collectors- Principle of Working, Wind Energy – types – HAWT, VAWT -Tidal Energy.

UNIT – IV:

Nuclear Power Station: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation. **Types of Reactors:** Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

UNIT – V:

Power Plant Economics and Environmental Considerations: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

TEXT BOOKS

1. Power Plant Engineering/ P. K. Nag / Mc Graw Hill.
2. Power Plant Engineering / Hegde / Pearson.

REFERENCES BOOKS

1. Power Plant Engineering / Gupta / PHI.
2. Power Plant Engineering / A K Raja / New age

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B. TECH MECHANICAL ENGINEERING-R17

CAD/CAM-A37PC3

B.Tech. IV Year I Semester. **L/T/P/ C**
4 /1/0/ 4

PRE – REQUISITE: Engineering Mathematics, Machine Tools

COURSE OBJECTIVES:

- To provide an overview of how computers are being used in design, development of manufacturing plans and manufacture.
- To understand the need for integration of CAD and CAM.

COURSE OUTCOMES:

- Understand geometric transformation techniques in CAD. Develop mathematical models to represent curves and surfaces.
- Model engineering components using solid modeling techniques. Develop programs for CNC to manufacture industrial components.
- To understand the application of computers in various aspects of manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.

UNIT – I:

Fundamentals of CAD, CAM, Automation , design process, Application of computers for design, Benefits of CAD, Computer configuration for CAD applications, Computer peripherals for CAD, Design workstation, Graphic terminal, CAD software- definition of system software and application software ,CAD database and structure. **Geometric Modeling:** 3-D wire frame modeling, wire frame entities and their definitions, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Curve fitting techniques, definitions of cubic spline, Bezier, and B-spline.

UNIT – II:

Surface modeling: Algebraic and geometric form, Parametric space of surface, Blending functions, parametrization of surface patch, Subdividing, Cylindrical surface, Ruled surface,

Surface of revolution Spherical surface, Composite surface, Bezier surface. B-spline surface, Regenerative surface and pathological conditions.

Solid Modelling: Definition of cell composition and spatial occupancy enumeration, Sweep representation, Constructive solid geometry, Boundary representations.

UNIT – III:

NC Control Production Systems: Numerical control, Elements of NC system, NC part programming: Methods of NC part programming, manual part programming, Computer assisted part programming, Post Processor, Computerized part program, SPPL (A Simple Programming Language). CNC, DNC and Adaptive Control Systems.

UNIT – IV:

Group Technology: Part families, Parts classification and coding. Production flow analysis, Machine cell design.

Computer aided process planning: Difficulties in traditional process planning, Computer aided process planning: retrieval type and generative type, Machinability data systems.

Computer aided manufacturing resource planning: Material resource planning, inputs to MRP, MRP output records, Benefits of MRP, Enterprise resource planning, Capacity requirements planning

UNIT – V:

Flexible manufacturing system: F.M.S equipment, FMS layouts, Analysis methods for FMS benefits of FMS.

Computer aided quality control: Automated inspection- Off-line, On-line, contact, Noncontact; Coordinate measuring machines, Machine vision.

Computer Integrated Manufacturing: CIM system, Benefits of CIM

TEXT BOOKS

1. CAD/CAM Concepts and Applications / Alavala / PHI
2. CAD/CAM Principles and Applications / P.N.Rao / Mc Graw Hill

REFERENCE BOOKS

1. CAD/CAM/ Groover M.P/ Pearson.
2. CAD/CAM/CIM/ Radhakrishnan and Subramanian / New Age.

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B. TECH MECHANICAL ENGINEERING-R17

COMPUTATIONAL FLUID DYNAMICS -A37PC4A

B.Tech. IV Year I Semester. **L/T/P/ C**
3 /1/0/ 3

PRE-REQUISITES: Engineering Mathematics, Fluid Mechanics.

COURSE OBJECTIVES:

- Equip students with the knowledge base essential for application of computational fluid dynamics to engineering flow problems.
- Provide the essential numerical background for solving the partial differential equations governing the fluid flow.
- Develop students' skills of using a commercial software package.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

1. Understand solution of aerodynamic flows.
2. Appraise & compare current CFD software. Simplify flow problems and solve them exactly.
3. Define and setup flow problem properly within CFD context, performing solid modelling using CAD package and producing grids via meshing tool
4. Understand both flow physics and mathematical properties of governing Navier-Stokes equations and define proper boundary conditions for solution.

UNIT - I:

Basic Aspects of the Governing Equations – Physical Boundary Conditions – Methods of solutions of Physical Problems – Need for Computational Fluid Dynamics – Different numerical/CFD techniques – FDM, FEM, FVM etc., - Main working principle - CFD as a research and design tool – Applications in various branches of Engineering Mathematical behavior of Partial Differential Equations (Governing Equations): Classification of linear/ quasi linear PDE – Examples - Physical Processes: Wave Equations and Equations of Heat Transfer and Fluid Flow – Mathematical Behavior - General characteristics – Its significance in understanding the physical and numerical aspects of the PDE – One way and Two Way variables – Well posed problems – Initial and Boundary

Conditions.

Solution of Simultaneous Algebraic Equations: Direct Method – Gauss Elimination – LU Decomposition – Pivoting – Treatment of Banded Matrices – Thomas Algorithm Iterative Method: Gauss Seidel and Jordan Methods - Stability Criterion.

UNIT - II:

Finite Difference Method: Basic aspects of Discretization – Finite Difference formulae for first order and second order terms – Solution of physical problems with Elliptic type of Governing Equations for different boundary conditions - Numerical treatment of 1D and 2D problems in heat conduction, beams etc., - Solutions –Treatment of Curvelinear coordinates – Singularities – Finite Difference Discretization – Solution of 1D heat conduction problems in Heat conduction in curve linear coordinates.

UNIT - III:

FDM: Solution of physical problems with Parabolic type of Governing Equations – Initial Condition –Explicit, implicit and semi implicit methods – Types of errors – Stability and Consistency – Von Neumann Stability criterion– Solution of simple physical problems in 1D and 2D – Transient Heat conduction problems- ADI scheme - Simple Hyperbolic type PDE - First order and Second order wave equations – Discretization using Explicit method - Stability criterion – Courant Number – CFL Condition - Its significance - Treatment of simple problems.

UNIT - IV:

Finite Difference Solution of Unsteady Inviscid Flows: Lax – Wendr off Technique – Disadvantages – Maccormack's Technique. Fluid Flow Equations – Finite Difference Solutions of 2D Viscous Incompressible flow problems – Vorticity and Stream Function Formulation – Finite Difference treatment of Lid Driven Cavity Problem - Application to Cylindrical Coordinates with example of flow over infinitely long cylinder and sphere – Obtaining Elliptic Equations.

UNIT - V:

Finite Difference Applications in Fluid flow problems: Fundamentals of fluid Flow modeling using Burger's Equation – Discretization using FTCS method with respect to Upwind

Scheme and Transport Property – Upwind Scheme and Artificial Viscosity Solutions of Navier Stokes Equations for Incompressible Fluid Flows: Staggered Grid – Marker and Cell (MAC) Formulation – Numerical Stability Considerations – Pressure correction method - SIMPLE Algorithm.

REFERENCE BOOKS

1. Computational Fluid Flow and Heat Transfer – K Muralidharan and T Sudarajan, Narosa Publishers.

2. Computational Fluid Dynamics : The basics with applications – John D Anderson, McGraw Hill Publications

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B. TECH MECHANICAL ENGINEERING-R17

WELDING TECHNOLOGY - A37PC4B

B.Tech. IV Year I Semester. **L/T/P/ C**
3 /1/0/ 3

PRE-REQUISITE: Manufacturing Process.

OBJECTIVE:

- To understand the basics of welding and to know about the various types of welding processes.

OUTCOMES: Upon completion of this course, the students can able

- Understand the construction and working principles of gas and arc welding process.
- Understand the construction and working principles of resistance welding process.
- Understand the construction and working principles of various solid state welding process.
- Understand the construction and working principles of various special welding processes.
- Understand the concepts on weld joint design, weldability and testing of weldments.

UNIT I :

GAS AND ARC WELDING PROCESSES: Fundamental principles – Air Acetylene welding, Oxyacetylene welding, Carbon arc welding, Shielded metal arc welding, Submerged arc welding, TIG & MIG welding, Plasma arc welding and Electroslag welding processes - advantages, limitations and applications.

UNIT II :

RESISTANCE WELDING PROCESSES: Spot welding, Seam welding, Projection welding, Resistance Butt welding, Flash Butt welding, Percussion welding and High frequency resistance welding processes - advantages, limitations and applications.

UNIT III :

SOLID STATE WELDING PROCESSES: Cold welding, Diffusion bonding, Explosive welding, Ultrasonic welding, Friction welding, Forge welding, Roll welding and Hot pressure welding processes - advantages, limitations and applications.

UNIT IV :

OTHER WELDING PROCESSES: Thermit welding, Atomic hydrogen welding, Electron beam welding, Laser Beam welding, Friction stir welding, Under Water welding, Welding automation in aerospace, nuclear and surface transport vehicles.

UNIT V :

DESIGN OF WELD JOINTS, WELDABILITY AND TESTING OF WELDMENTS: Various weld joint designs – Welding defects – causes and remedies - Weldability of Aluminium, Copper, and Stainless steels. Destructive and non destructive testing of weldments.

TEXT BOOKS

1. Little R.L., "Welding and welding Technology", Tata McGraw Hill Publishing Co., Ltd., New Delhi, 34 th reprint, 2008.
2. Parmer R.S., "Welding Engineering and Technology", 1st Edition, Khanna Publishers, New Delhi, 2008.
3. Parmer R.S., "Welding Processes and Technology", Khanna Publishers, New Delhi, 1992.

REFERENCES

1. AWS- Welding Hand Book. 8th Edition. Vol- 2. "Welding Process".
2. Christopher Davis. "Laser Welding- Practical Guide". Jaico Publishing House.
3. Davis A.C., "The Science and Practice of Welding", Cambridge University Press, Cambridge, 1993
4. Nadkarni S.V. "Modern Arc Welding Technology", Oxford IBH Publishers, 1 Edition, 2005.
5. Schwartz M.M. "Metals Joining Manual". McGraw Hill Books, 1979.
6. Tylecote R.F. "The Solid Phase Welding of Metals". Edward Arnold Publishers Ltd. London.

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B. TECH MECHANICAL ENGINEERING-R17

NANOTECHNOLOGY - A37PC4C

B.Tech. IV Year I Semester. **L/T/P/ C**
3 /1/0/ 3

PRE-REQUISITES: Mathematics, Physics and chemistry.

COURSE OBJECTIVES:

- Understand the Nanomaterials and their properties.
- Gain knowledge of different nanostructures of carbon and their properties.
- Know applications of carbon nanotubes.
- Build technologies to design, realize and analyze micro and nano-scale electronic devices, materials and systems, coupled with general and technology management.

COURSE OUTCOMES: After completion of the course the student is able to

1. Create solutions in engineering, biotechnology and manufacturing by identifying current nanotechnology.
2. Apply the fundamental knowledge of science to characterize the Nano Materials.
3. Synthesize carbon Nano tubes and nano materials.
4. Evaluate tools in nanoscience for applications in various sectors.

UNIT – I:

Introduction: History and Scope, Can Small Things Make a Big Difference, Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects.

UNIT – II:

Unique Properties of Nanomaterials: Microstructure and Defects in Nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple and disclinations,

Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility. **Magnetic Properties**: Soft magnetic nanocrystalline alloy, Permanent magnetic nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNIT- III:

Synthesis Routes: Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method ,Self-assembly, **Top down approaches:** Mechanical alloying, Nano-lithography, **Consolidation of Nanopowders**: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing Spark plasma sintering.

UNIT – IV:

Tools to Characterize nanomaterials: X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope(STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nanoindentation.

UNIT – V:

Applications of Nanomaterials: Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, WaterTreatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Defense and Space Applications, Concerns and challenges of Nanotechnology.

TEXT BOOKS:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.

2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

REFERENCES BOOKS:

1. Nano: The Essentials by T. Pradeep, Mc Graw- Hill Education.

2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek.

3. Transport in Nano structures- David Ferry, Cambridge University press 2000

4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S., S. R. Kumar, J. H. Carola.

5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.

6. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press.

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B. TECH MECHANICAL ENGINEERING-R17

PRODUCTION PLANNING AND CONTROL -A37PE5A

B.Tech. IV Year I Semester. **L/T/P/ C**
3 /1/0/ 3

COURSE OBJECTIVES: Understand the importance of Production planning & control. Learning
way of carrying out various functions it 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. Understand basics of variability and its role in the performance of a production system. Analyze aggregate planning strategies. Apply forecasting and scheduling techniques to production systems. Understand theory of constraints for effective management of production systems.

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 proceduresApplications of computers in planning and control.

TEXT BOOKS

1. Operations management – Heizer- Pearson.
2. Production and Operations Management / Ajay K Garg / Mc Graw Hill.

REFERENCE BOOKS

1. Production Planning and Control- Text & cases/ SK Mukhopadhyaya /PHI.
2. Production Planning and Control- Jain & Jain – Khanna publications

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B. TECH MECHANICAL ENGINEERING-R17

MECHATRONICS - A37PE5B

B.Tech. IV Year I Semester. **L/T/P/ C**
3 /1/0/ 3

PRE-REQUISITES: Basic Electrical Engineering, Mechanical Measurement.

COURSE OBJECTIVES:

- To provide a clear view on key elements of mechatronics system, representation into block diagram.
- To accustom with various sensors, data acquisition system.
- To impart knowledge about microprocessor, microcontrollers used in mechatronics.
- To familiarize with PLC programming

COURSE OUTCOMES: After completing this course, students will have

1. A broad and fundamental understanding of Mechatronics.
2. Topics range from an overview of sensors, Actuators, microcontroller, data acquisition system and an introduction of basic PLC.
3. In addition, students will learn application of mechatronics in industrial automation and career options available within this field.

UNIT – I:

INTRODUCTION : Definition – Trends - Control Methods: Standalone , PC Based (Real Time Operating Systems, Graphical User Interface , Simulation) - Applications: SPM, Robot, CNC, FMS, CIM.

SIGNAL CONDITIONING : Introduction – Hardware - Digital I/O , Analog input – ADC , resolution , sped channels Filtering Noise using passive components – Resistors, capacitors - Amplifying signals using OP amps – Software - Digital Signal Processing – Low pass , high pass, notch filtering.

UNIT – II:

PRECISION MECHANICAL SYSTEMS : Pneumatic Actuation Systems - Electro-pneumatic Actuation Systems - Hydraulic Actuation Systems - Electro-hydraulic Actuation Systems - Timing Belts – Ball Screw and Nut - Linear Motion Guides - Linear Bearings - Harmonic Transmission - Bearings- Motor / Drive Selection.

ELECTRONIC INTERFACE SUBSYSTEMS : TTL, CMOS interfacing - Sensor interfacing – Actuator interfacing – solenoids , motors Isoation schemes- opto coupling, buffer IC's - Protection schemes – circuit breakers , over current sensing , resetable fuses , thermal dissipation - Power Supply - Bipolar transistors / mosfets.

UNIT – III:

ELECTROMECHANICAL DRIVES : Relays and Solenoids - Stepper Motors - DC brushed motors – DC brushless motors - DC servo motors - 4-quadrant servo drives , PWM's - Pulse Width Modulation – Variable Frequency Drives, Vector Drives - Drive System load calculation.

UNIT – IV:

MICROCONTROLLERS OVERVIEW : 8051 Microcontroller , micro processor structure – Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications. Programming –Assembly , C (LED Blinking , Voltage measurement using ADC).

PROGRAMMABLE LOGIC CONTROLLERS : Basic Structure - Programming : Ladder diagram - Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling - Analog input / output - PLC Selection - Application.

UNIT – V:

PROGRAMMABLE MOTION CONTROLLERS : Introduction - System Transfer Function – Laplace transform and its application in analysing differential equation of a control system - Feedback Devices : Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive , Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P , PI , PID Control - Control modes – Position, Velocity and Torque - Velocity Profiles – Trapezoidal - S. Curve - Electronic Gearing - controlled Velocity Profile - Multi axis Interpolation , PTP , Linear , Circular – Core functionalities – Home , Record position , Go to Position - Applications : SPM, Robotics.

TEXT BOOKS

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by W Bolton, Pearson Education Press, 3rd edition, 2005.
2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

REFERENCES

1. Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.
2. Mechatronics – N. Shanmugam / Anuradha Agencies Publisers.
3. Mechatronics System Design / Devdasshetty/Richard/Thomson.

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B. TECH MECHANICAL ENGINEERING-R17

ROBOTICS - A37PE5C

B.Tech. IV Year I Semester. **L/T/P/ C**
3 /1/0/ 3

PRE-REQUISITES: Basic principles of Kinematics and mechanics.

COURSE OBJECTIVES: The goal of the course is to familiarize the students with the concepts
and techniques in robotic engineering, manipulator kinematics, dynamics and control, chose, and incorporate robotic technology in engineering systems.

- Make the students acquainted with the theoretical aspects of Robotics.
- Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.
- Make the students to understand the importance of robots in various fields of engineering.
- Expose the students to various robots and their operational details.

COURSE OUTCOMES: At the end of the course, the student will be able to understand the basic
components of robots. Differentiate types of robots and robot grippers. Model forward and inverse kinematics of robot manipulators. Analyze forces in links and joints of a robot. Programme a robot to perform tasks in industrial applications. Design intelligent robots using sensors.

UNIT – I:

Introduction: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications.

Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end

effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT – II:

Motion Analysis: Basic Rotation Matrices, Equivalent Axis and Angle, Euler Angles, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems.

Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems on Industrial Robotic Manipulation.

UNIT – III :

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion – straight line motion.

UNIT IV:

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors.

UNIT V:

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

TEXT BOOKS

1. Industrial Robotics / Groover M P /Mc Graw Hill.
2. Introduction to Industrial Robotics / Ramachandran Nagarajan / Pearson.

REFERENCE BOOKS

1. Robot Dynamics and Controls / Spony and Vidyasagar / John Wiley.
2. Robot Analysis and control / Asada ,Slotine / Wiley Inter-Science.

T K R COLLEGE OF ENGINEERING & TECHNOLOGY
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B. TECH MECHANICAL ENGINEERING-R17

UNCONVENTIONAL MACHINING PROCESSES- A37PE6A

B.Tech. IV Year I Semester. **L/T/P/ C**
3 /1/0/ 3

PRE-REQUISITES: None.

COURSE OBJECTIVES:

1. To teach the modelling technique for machining processes.
2. To teach interpretation of data for process selection.
3. To teach the mechanics and thermal issues associated with chip formation.
4. To teach the effects of tool geometry on machining force components and surface finish.
5. To teach the machining surface finish and material removal rate.

COURSE OUTCOMES:

1. Understand the basic techniques of machining processes modelling.
2. Understand the mechanical aspects of orthogonal cutting mechanics.
3. Understand the thermal aspects of orthogonal cutting mechanics.
4. Ability to extend, through modelling techniques, the single point, multiple point and abrasive machining processes.
5. Estimate the material removal rate and cutting force, in an industrially useful manner, for practical machining 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 Machine: Basic principles, equipments, process variables, and mechanics of metal removal, MRR, application and limitations.

Electro – Chemical Processes: Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy economic aspects of ECM – Simple problems for estimation of metal removal rate. Fundamentals of chemical, machining, advantages and applications.

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.

REFERENCE BOOKS

1. Manufacturing Engineering and Technology by SeropeKalpakjain, Pearson Publications. 2001.
2. Manufacturing Engineering & Technology, Kalpakjain.
3. Unconventional Manufacturing Processes, Singh M.K.

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B. TECH MECHANICAL ENGINEERING-R17

AUTOMATION IN MANUFACTURING - A37PE6B

B.Tech. IV Year I Semester. **L/T/P/ C**
3 /1/0/ 3

Pre-Requisites: Machine Tools, CAD/ CAM

COURSE OBJECTIVES:

1. Describe the basic concepts of automation in manufacturing systems.
2. Acquire the fundamental concepts of automated flow lines and their analysis.
3. Classify automated material handling, automated storage and retrieval systems.
4. Illustrate adaptive control systems and automated inspection methods.

COURSE OUTCOMES: Upon completion of this course the student will be able to:

1. Illustrate the basic concepts of automation in machine tools.
2. Analyze various automated flow lines, Explain assembly systems and line balancing methods.
3. Describe the importance of automated material handling and storage systems.
4. Interpret the importance of adaptive control systems, automated inspection systems.

UNIT – I:

Introduction, Types and strategies of automation, pneumatic and hydraulic components circuits, Automation in machine tools. Mechanical feeding and too changing and machine tool control transfer the automaton.

UNIT – II:

Automated flow lines: Methods or work part transport transfer Mechanical buffer storage control function, design and fabrication consideration.

Analysis of Automated flow lines: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

UNIT – III:

Assembly system and line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

Automated material handling: Types of equipment, functions, analysis and design of material handling systems conveyor systems, automated guided vehicle systems.

UNIT – IV:

Automated storage systems, automated storage and retrieval systems, work in process storage, interfacing handling and storage with manufacturing.

Adaptive control systems: Introduction, adaptive control with optimization, Adaptive control with constraints, Application of A.C. in machining operations. Use of various parameters such as cutting force, Temperatures, vibration and acoustic emission.

UNIT – V:

Business process Re-engineering: Introduction to BPE logistics, ERP, Software configuration of BPE, concurrent Engineering, Techniques of Rapid Proto typing.

TEXT BOOKS

1. Automation, Production Systems and Computer Integrated Manufacturing/M.P. Groover. / Pearson.

2. Computer control of Manufacturing Systems by YoramCoreom / Mc Graw Hill

REFERENCE BOOKS

1. CAD / CAM/ CIM / Radhakrishnan / New Age

2. Advanced Manufacturing Technology/ K VaraPrasada Rao / Kanna Publications

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B. TECH MECHANICAL ENGINEERING-R17

TURBO MACHINES - A37PE6C

B.Tech. IV Year I Semester. **L/T/P/ C**
3 /1/0/ 3

PRE-REQUISITES: None.

COURSE OBJECTIVES:

- Provide students with opportunities to apply basic flow equations.
- Train the students to acquire the knowledge and skill of analyzing different turbo machines.
- How to compare and chose machines for various operations.

COURSE OUTCOMES:

- Ability to design and calculate different parameters for turbo machines.
- Prerequisite to CFD and Industrial fluid power courses.
- Ability to formulate design criteria.
- Ability to understand thermodynamics and kinematics behind turbo machines.

UNIT – I:

Fundamentals of Turbo Machines: Classifications, Applications, Thermodynamic analysis, Isentropic flow. Energy transfer. Efficiencies, Static and Stagnation conditions, Continuity equations, Euler's flow through variable cross sectional areas, Unsteady flow in turbo machines.

UNIT – II :

Steam Nozzles: Convergent and Convergent-Divergent nozzles, Energy Balance, Effect of back pressure of analysis. Designs of nozzles.

Steam Turbines: Impulse turbines, Compounding, Work done and Velocity triangle, Efficiencies, Constant reactions, Blading, Design of blade passages, Angle and height, Secondary flow. Leakage losses, Thermodynamic analysis of steam turbines.

UNIT – III:

Gas Dynamics: Fundamental thermodynamic concepts, isentropic conditions, mach numbers, and area, Velocity relations, Dynamic Pressure, Normal shock relation for perfect gas. Supersonic flow, oblique shock waves.Normal shock recoveries, detached shocks, Aerofoil theory.

Centrifugal compressor: Types, Velocity triangles and efficiencies, Blade passage design, Diffuser and pressure recovery. Slip factor, Stanitz and Stodolas formula's, Effect of inlet mach numbers, Pre whirl, Performance.

UNIT – IV:

Axial Flow Compressors: Flow Analysis, Work, and velocity triangles, Efficiencies, Thermodynamic analysis. Stage pressure rise, Degree of reaction, Stage Loading, General design, Effect of velocity, Incidence, Performance.

Cascade Analysis: Geometrical and terminology. Blade force, Efficiencies, Losses, Free end force, Vortex Blades.

UNIT – V:

Axial Flow Gas Turbines: Work done. Velocity triangle and efficiencies, Thermodynamic flow analysis, Degree of reaction, Zweifels relation, Design cascade analysis, Soderberg, Hawthrone, Ainley, Correlations, Secondary flow, Free vortex blade, Blade angles for variable degree of reaction. Actuator disc, Theory, Stress in blades, Blade assembling, Material and cooling of blades, Performances, Matching of compressors and turbines, off design performance.

TEXT BOOKS

1. Principles of Turbo Machines/DG Shepherd / Macmillan.
2. Turbines, Pumps, Compressors/Yahya/ Mc Graw Hill.

REFERENCE BOOKS

1. A Treatise on Turbo machines / G. Gopal Krishnan *and* D. Prithviraj/ SciTech.
2. Gas Turbine Theory/ Saravanamuttoo/ Pearson

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B. TECH MECHANICAL ENGINEERING-R17

CAD&CAM LAB - A37PC8

B.Tech. IV Year I Semester. **L/T/P/ C**
0/ 0/3/ 2

PRE REQUISITE: Machine Tools Lab, Engineering Drawing and Machine Drawing and Design

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 be understand the basic principles of different types of analysis.

COURSE OUTCOMES:

- To understand the analysis of various aspects in of manufacturing design.

Note: conduct any TEN exercises 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.

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B. TECH MECHANICAL ENGINEERING-R17

PRODUCTION DRAWING PRACTICE AND INSTRUMENTATION LAB -A37PC9

B.Tech. IV Year I Semester. **L/T/P/ C**
0/ 0/3/ 2

PRE – REQUISITES: Engineering Drawing, Machine Drawing, Metrology.

COURSE OBJECTIVES:

- Understanding of conventional representations of various materials and machine components.
- Understanding limits, fits and tolerances and their representation in drawings.
- Understanding the process of calibration of various instruments.

COURSE OUTCOMES: After completion of this course, the average student is expected to be able to:

1. Understand and prepare the drawing used in manufacturing process.
2. Calibrate the pressure, Strain and displacement measuring instruments.
3. Use the magnetic & speed pickups for the speed measurement.
4. Calibrate of flow measurement by rotameter.
5. Calibrate different instruments used for temperature measurement.

(A) PRODUCTION DRAWING PRACTICE

UNIT – I:

CONVENTIONAL REPRESENTATION OF MATERIALS: conventional representation of parts – screw joints, welded joints, springs, gears, electrical, hydraulic and pneumatic circuits – methods of indicating notes on drawings. **Limits, Fits and Tolerances:** Types of fits, exercises involving selection / interpretation of fits and estimation of limits from tables.

UNIT – II:

FORM AND POSITIONAL TOLERANCES: Introduction and indication of form and position tolerances on drawings, types of run out, total run out and their indication.

UNIT – III:

SURFACE ROUGHNESS AND ITS INDICATION: Definition, types of surface roughness indication – Surface roughness obtainable from various manufacturing processes, recommended surface roughness on mechanical components. Heat treatment and surface treatment symbols used on drawings.

UNIT – IV:

DETAILED AND PART DRAWINGS: Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.

UNIT – V:

PRODUCTION DRAWING PRACTICE: Part drawings using computer aided drafting by CAD software.

TEXT BOOKS

1. Production and Drawing /K.L. Narayana & P. Kannaiah/ New Age.
2. Machine Drawing with Auto CAD/ Pohit and Ghosh, PE.

REFERENCES

1. Geometric dimensioning and tolerancing/James D. Meadows/ B.S Publications.
2. Engineering Metrology/ R.K. Jain/Khanna Publications.

(B) INSTRUMENTATION LAB

1. Calibration of Pressure Gauges.
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.
6. Calibration of capacitive transducer for angular displacement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotameter for flow measurement.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of Mcleod gauge for low pressure.

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B. TECH MECHANICAL ENGINEERING-R17

MAINTENANCE AND SAFETY ENGINEERING -A38PE2A

B.Tech. IV Year I Semester. **L/T/P/ C**
3/ 1/0/ 3

UNIT-I:

Introduction, Need for Maintenance, Facts and Figures, Modern Maintenance, Problem and Maintenance Strategy for the 21st Century, Engineering Maintenance Objectives and Maintenance in Equipment Life Cycle, Terms and Definitions.

Maintenance Management and Control: Maintenance Manual, Maintenance, Facility Evaluation, Functions of Effective Maintenance Management, Maintenance Project Control Methods, Maintenance Management Control Indices.

UNIT-II:

Types of Maintenance: Preventive Maintenance, Elements of Preventive, Maintenance Program, Establishing Preventive Maintenance Program PM Program Evaluation and Improvement, PM Measures, PM Models, Corrective Maintenance, Corrective Maintenance Types, Corrective Maintenance Steps and Downtime Components, Corrective Maintenance Measures, Corrective Maintenance Models.

Inventory Control In Maintenance: Inventory Control Objectives and Basic Inventory Decisions, ABC Inventory Control Method, Inventory Control Models Two-Bin Inventory Control and Safety Stock, Spares Determination Factors Spares Calculation Methods.

UNIT- III:

Quality and Safety In Maintenance: Needs for Quality Maintenance Processes, Maintenance Work Quality, Use of Quality Control Charts in Maintenance Work Sampling, Post Maintenance Testing, Reasons for Safety Problems in Maintenance, Guidelines to Improve Safety in Maintenance Work, Safety Officer's Role in Maintenance Work, Protection of Maintenance

Workers.

Maintenance Costing: Reasons for Maintenance Costing, Maintenance Budget Preparation Methods and Steps, Maintenance Labor Cost Estimation, Material Cost Estimation, Equipment Life Cycle Maintenance Cost Estimation, Maintenance Cost Estimation Models.

UNIT-IV:

Reliability, Reliability Centered Maintenance, RCM: Goals and Principles, RCM Process and Associated Questions, RCM Program Components, Effectiveness Measurement Indicators, RCM Benefits and Reasons for Its Failures, Reliability Versus Maintenance and Reliability in Support Phase, Bathtub Hazard Rate Concept, Reliability Measures and Formulas, Reliability Networks, Reliability Analysis Techniques.

UNIT-V:

Maintainability: Maintainability Importance and Objective, Maintainability in Systems Life Cycle, Maintainability Design Characteristics, Maintainability Functions and Measures, Common Maintainability Design Errors.

TEXT BOOKS

1. Reliability, Maintenance and Safety Engineering/ Dr. A.K.Guptha/ Laxmi Publications.
2. Industrial Safety Management/ L.M. Deshmukh/TMH.

REFERENCES:

1. Maintenance Engineering & Management / R.C.Mishra/ PHI.
2. Reliability Engineering / Elsayed/ Pearson.
3. Engineering Maintenance a modern approach/ B.S Dhallon/ C.R.R Publishers.
4. A Text Book of Reliability and Maintenance Engineering/Alakesh Manna/IK International Publishing House.
5. Plant Maintenance and Reliability Engineering/NVS Raju/Cengage Learning

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B. TECH MECHANICAL ENGINEERING-R17

PLANT LAYOUT AND MATERIAL HANDLING- A38PE2B

B.Tech. IV Year II Semester. **L/T/P/ C**
3/ 1/0/ 3

PRE – REQUISITES: None.

COURSE OBJECTIVES:

1. Understand plant layout system, its types and software tools used.
2. Identify and learn elements of various material handling systems.
3. Understand the benefit of an efficient material handling system and storage System

COURSE OUTCOMES:

1. Design an appropriate plant layout for a plant.
2. Flexible Plant layout to accommodate changes in product volume or product type.
3. Organise to handle the material related to the plant operation.
4. Categorize to rrecommended improvements to existing plant layouts from the stand point of material handling and product flow.
5. Modify and related the maintenance of safety in handling the material.

UNIT—I:

Introduction- Classification of Layout, Advantages and Limitations of different layouts, Layout design procedures, Overview of the plant layout. Process layout & Product layout: Selection, specification, Implementation and follow up, comparison of product and process layout.

UNIT —II:

Heuristics for Plant layout — ALDEP, CORELAP, CRAFT, Group Layout, Fixed position layout- Quadratic assignment model. Branch and bound method

UNIT — III:

Introduction, Material Handling systems, Material Handling principles, Classification of Material Handling Equipment, Relationship of material handling to plant layout.

UNIT -IV:

Basic Material Handling systems: Selection, Material Handling method- path, Equipment, function oriented systems.

UNIT-V:

Methods to minimize cost of material handling- Maintenance of Material Handling Equipments, Safety in handling Ergonomics of Material Handling equipment. Design, Miscellaneous equipments.

TEXT BOOKS

1. Operations Management/ PB Mahapatra/PHI.
2. Aspects of Material handling! Dr. KC Arora &Shinde/ Lakshmi Publications.

REFERENCE

1. Facility Layout & Location an analytical approach! RL Francis/ LF Mc Linnis Jr, White/ PHI.
2. Production and Operations Management/ R Panneerselvam/ PHI.
3. Introduction to Material handling! Ray, Siddhartha/ New Age.
4. Plant Layout and Material Handling/RB Chowdary/Khanna.

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B. TECH MECHANICAL ENGINEERING-R17

TOTAL QUALITY MANAGEMENT - A38PE2C

B.Tech. IV Year II Semester. **L/T/P/ C**
3/ 1/0/ 3

PRE – REQUISITES: None.

COURSE OBJECTIVE: To give the students an overview of quality and TQM and explaining the salient contributions of Quality Gurus likeDeming, Juran and Crosby. General barriers in implementing TQM.

COURSE OUTCOMES:

1. Students will be able to gain basic knowledge in total quality management relevant to both manufacturing and service industry including IT sector.
2. Students will be able to implement the basic principles of TQM in manufacturing and service based organization.
3. The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.
4. The students will be able to gain the knowledge on various ISO standards and quality systems

UNIT – I:

Introduction, The concept of TQM, Quality and Business performance, attitude, and involvement of top management, communication, culture and management systems. Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs. Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

UNIT –II:

Customer Focus and Satisfaction: Process vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships. Bench Marking: Evolution of Bench Marking, meaning of bench marking, benefits of bench marketing, the bench marking procedure, pitfalls of bench marketing.

UNIT- III:

Organizing for TQM: The systems approach, organizing for quality implementation, making the transition from a traditional to a TQM organization, Quality Circles, seven Tools of TQM: Stratification, check sheet, Scatter diagram, lshikawa diagram, paneto diagram, Kepner&Tregoe Methodology.

UNIT- IV:

The Cost of Quality: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost information, Accounting Systems and Quality Management.

UNIT –V:

ISO9000: Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQC Q- 90. Series Standards, benefits of ISO9000 certification, the third party audit, Documentation ISO9000 and services, the cost of certification implementing the system.

TEXT BOOK

1. Total Quality Management / Joel E. Ross/Taylor and Franscis Limited.
2. Total Quality Management/P. N. Mukherjee/PHI

REFERENCE BOOKS

1. Beyond TQM / Robert L.Flood.
2. Statistical Quality Control / E.L. Grant.
3. Total Quality Management:A Practical Approach/H. Lal.
4. Quality Management/KanishkaBedi/Oxford University Press/2011.
5. Total Engineering Quality Management/Sunil Sharma/Macmillan.

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B. TECH MECHANICAL ENGINEERING-R17

RENEWABLE ENERGY SOURCES - A38PE3A

B.Tech. IV Year II Semester. **L/T/P/ C**
3/ 1/0/ 3

PRE-REQUISITES: None.

COURSE OBJECTIVES:

- To explain the concepts of Non-renewable and renewable energy systems.
- To outline utilization of renewable energy sources for both domestic and industrial applications.
- To analyse the environmental and cost economics of renewable energy sources in comparison with fossil fuels.

COURSE OUTCOMES:

- Understanding of renewable energy sources.
- Knowledge of working principle of various energy systems.
- Capability to carry out basic design of renewable energy systems

UNIT-I:

Global and National Energy Scenario: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Nonrenewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO2 reduction potential of renewable energy- concept of Hybrid systems.

UNIT-II:

Solar Energy: Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems.

UNIT-III:

Wind Energy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of

the wind, power in the wind, factors influencing wind, wind data and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy – Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Wind mill component design, economics and demand side management, energy wheeling, and energy banking concepts. Safety and environmental aspects, wind energy potential and installation in India.

UNIT-IV:

Biogas: Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications, alcohol production from biomass, bio diesel production, Urban waste to energy conversion, Biomass energy programme in India.

UNIT-V:

Ocean Energy: Ocean wave energy conversion, principle of Ocean Thermal Energy Conversion (OTEC), ocean thermal power plants, tidal energy conversion, Tidal and wave energy its scope and development, Scheme of development of tidal energy.

1. **Small hydro Power Plant:** Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power.
2. **Geothermal Energy**: Geothermal power plants, various types, hot springs and steam ejection.

REFERENCE:

1. Non-Conventional Energy Sources by G.D Rai.
2. Twidell, J.W. and Weir, A., Renewable Energy Sources, EFN Spon Ltd., 1986.
3. Kishore VVN, Renewable Energy Engineering and Technology, Teri Press, New Delhi, 2012.
4. Godfrey Boyle, Renewable Energy, Power for a Sustainable Future, Oxford University Press, U.K, 1996.

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B. TECH MECHANICAL ENGINEERING-R17

JET PROPULSION AND ROCKET ENGINEERING - A38PE3B

B.Tech. IV Year II Semester. **L/T/P/ C**
3/ 1/0/ 3

UNIT-I:

Fundamentals of Gas Turbine theory-Thermo dynamic Cycles, open closed and semi-closed – parameters of performances –cycle modifications for improvement of performance.

UNIT-II:

JET PROPULSION: Historical sketch-reaction principle – essential features of propulsion devices-Thermal Engines, Classification of – Energy flow thrust, Thrust power and propulsion efficiency-Need for Thermal Jet Engines and applications.

UNIT-III:

TURBOPROP AND TURBOJET: Thermo dynamic cycles, plant layout, essential components, principles of operation – performance evaluation. Thrust Augmentation and Thrust reversal-Contrasting with piston Engine Propeller plant.

UNIT-IV:

RAMJET: Thermo dynamic Cycle, plant lay-out, essential components – principle of operation - performance evaluation – comparison among atmospheric thermal jet engines – scram jet and pulse jet, elementary treatment.

ROCKET ENGINES: Need for, applications **–** Basic principles of operation and parameters of performance – classification ,solid and liquid propellant rocket engines ,advantages, domains of application –propellants – comparison of propulsion systems.

UNIT-V:

ROCKET TECHNOLOGY: Flight mechanics, Application Thrust profiles, Acceleration – staging of Rockets, need for – Feed systems, injectors and expansion nozzles – Rocket heat transfer and ablative cooling.

TEXT BOOKS

1. Gas Turbines and propulsive systems/P.Khajuria&S.P.Dubey/ Dhanpat rai pub.
2. Gas Dynamics & Space Propulsion/ M.C.Ramaswamy / Jaico Publishing House.

REFERENCE BOOKS

1. Rocket propulsion Elements / Sutton / John Wiley & sons / 7th Edition.

2. Gas Turbines /Cohen, Rogers &SarvanaMuttoo/Addision Wesley & Longman.

3. Gas Turbines/V. Ganesan /TMH.

4. Elements of Gas Turbine Propulsion / Jock D Mattingly /Mc Grill.

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B. TECH MECHANICAL ENGINEERING-R17

I.C. ENGINES - A38PE3C

B.Tech. IV Year II Semester. **L/T/P/ C**
3/ 1/0/ 3

PRE-REQUISITES: Thermodynamics, Thermal Engineering,

COURSE OBJECTIVES: Objectives of this course are

1. To provide the sufficient knowledge of concept, applications, importance of IC engines
2. To familiarize the students about the IC engines systems, processes, alternative fulesetc
3. To understand the environment aspects of IC engines

COURSE OUTCOMES:

1. Illustrate fundamental and actual thermodynamic cycle analysis in IC engines.
2. Describe and simulate actual heat exchange and gas flows in combustion chamber.
3. Analyze combustion and apply remedial measures to avoid abnormal combustion in IC
   engine.
4. Apply various emission control system and modification to take corrective actions to reduce pollution.
5. Acquire and use knowledge of genetic algorithm to optimize real life problems.
6. Understand Modern trends coming in IC Engine technology.

UNIT - I:

Introduction – Historical Review – Engine Types – Design and operating Parameters.

Cycle Analysis: Thermo-chemistry of Fuel – Air mixtures, properties – Ideal Models of Engine cycles – Real Engine cycles - differences and Factors responsible for – Computer Modeling.

UNIT-II:

Gas Exchange Processes: Volumetric Efficiency – Flow through ports – Supercharging and Turbo
charging. **Charge Motion**: Mean velocity and Turbulent characteristics – Swirl, Squish – Pre-chamber Engine flows.

UNIT –III:

Engine Combustion in S.I engines: Combustion and Speed – Cyclic Variations – Ignition – Abnormal combustion Fuel factors, MPFI, SI engine testing. **Combustion in CI engines**: Essential Features – Types off Cycle. Pr. Data – Fuel Spray Behavior – Ignition Delay – Mixing Formation and control, Common rail fuel injection system

UNIT-IV:

Pollutant Formation and Control: Nature and extent of problems – Nitrogen Oxides, Carbon monoxide, un-burnt Hydrocarbon and particulate – Emissions – Measurement – Exhaust Gas Treatment, Catalytic converter, SCR, Particulate Traps, Lean, NOx, Catalysts.

UNIT –V:

Engine Heat Transfer: Importance of heat transfer, heat transfer and engine energy balance, Convective heat transfer, radiation heat transfer, Engine operating characteristics. Fuel supply systems for S.I. and C.I engines to use gaseous fuels like LPG, CNG and Hydrogen. Modern Trends in IC Engines: Lean Burning and Adiabatic concepts, Rotary Engines, Modification in I.C engines to suit Bio – fuels, HCCI and GDI concepts.

TEXT BOOKS

1. I.C. Engines Fundamentals/Heywood/Mc Graw Hill
2. The I.C. Engine in theory and Practice Vol.I / Teylor / IT Prof. And Vol.II

REFERENCES BOOKS

1. I.C. Engines: Obert/Int – Text Book Co.
2. I.C. Engines: Maleev
3. Combustion Engine Processes: Lichty
4. I.C. Engines: Ferguson
5. Scavenging of Two – stroke Cycle Engines – Switzer.
6. I.C.Engines by V.Ganesan