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**SEMESTER-VII**

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## LIST OF ELECTIVES

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## SEMESTER-VIII

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UNIT I  OVERVIEW OF MANAGEMENT

UNIT II  PLANNING

UNIT III  ORGANIZING

UNIT IV  DIRECTING
Creativity and Innovation - Motivation and Satisfaction - Motivation Theories - Leadership Styles - Leadership theories - Communication - Barriers to effective communication - Organization Culture - Elements and types of culture - Managing cultural diversity.

UNIT V  CONTROLLING
Process of controlling - Types of control - Budgetary and non-budgetary control techniques - Managing Productivity - Cost Control - Purchase Control - Maintenance Control - Quality Control - Planning operations.

TOTAL= 45 PERIODS

TEXT BOOKS:

REFERENCES:
AIM:
• To impart knowledge to the students on compressible flow through ducts, jet propulsion and space propulsion.

OBJECTIVE:
• To understand the basic difference between incompressible and compressible flow.
• To understand the phenomenon of shock waves and its effect on flow. To gain some basic knowledge about jet propulsion and Rocket Propulsion.

UNIT I BASIC CONCEPTS AND ISENTROPIC FLOWS 6

UNIT II FLOW THROUGH DUCTS 9
Flows through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) – variation of flow properties – Use of tables and charts – Generalised gas dynamics.

UNIT III NORMAL AND OBLIQUE SHOCKS 10
Governing equations – Variation of flow parameters across the normal and oblique shocks – Prandtl – Meyer relations – Use of table and charts – Applications.

UNIT IV JET PROPULSION 10
Theory of jet propulsion – Thrust equation – Thrust power and propulsive efficiency – Operation principle, cycle analysis and use of stagnation state performance of ram jet, turbojet, turbofan and turbo prop engines.

UNIT V SPACE PROPULSION 10

TUTORIALS: 15 TOTAL: 60 PERIODS

TEXT BOOKS:

REFERENCES:

ME2352 DESIGN OF TRANSMISSION SYSTEMS L T P C 3 1 0 4

OBJECTIVE:
• To gain knowledge on the principles and procedure for the design of power Transmission components. To understand the standard procedure available for Design of Transmission sip terms To learn to use standard data and catalogues

UNIT I DESIGN OF TRANSMISSION SYSTEMS FOR FLEXIBLE ELEMENTS 9
Selection of V belts and pulleys-selection of Flat belts and pulleys-Wire ropes and pulleys – Selection of Transmission chains and Sprockets. Design of pulleys and sprockets.

UNIT II SPUR GEARS AND PARALLEL AXIS HELICAL GEARS 9
Gear Terminology-Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects - Fatigue strength - Factor of safety - Gear materials – Module and Face width-power rating calculations based on strength and wear considerations - Parallel axis Helical Gears – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces and stresses. Estimating the size of the helical gears.

UNIT III BEVEL, WORM AND CROSS HELICAL GEARS 9

UNIT IV DESIGN OF GEAR BOXES 9
Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of sliding mesh gear box -Constant mesh gear box. – Design of multi speed gear box.

UNIT V DESIGN OF CAM CLUTCHES AND BRAKES 9
Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses. Design of plate clutches –axial clutches-cones clutches-internal expanding rim clutches-internal and external shoe brakes.

TUTORIALS: 15 TOTAL: 60 PERIODS

NOTE: (Usage of P.S.G Design Data Book is permitted in the University examination)
TEXT BOOKS:

REFERENCES:

STANDARDS:
1. IS 4460 : Parts 1 to 3 : 1995, Gears – Spur and Helical Gears – Calculation of Load Capacity.
2. IS 7443 : 2002, Methods of Load Rating of Worm Gears

ME2353 FINITE ELEMENT ANALYSIS L T P C
3 1 0 4
INTRODUCTION (Not for examination) 5

UNIT I FINITE ELEMENT FORMULATION OF BOUNDARY VALUE PROBLEMS 5+3

UNIT II ONE DIMENSIONAL FINITE ELEMENT ANALYSIS 8+4
UNIT III   TWO DIMENSIONAL FINITE ELEMENT ANALYSIS  10+4

UNIT IV   DYNAMIC ANALYSIS USING FINITE ELEMENT METHOD  8+4

UNIT V   APPLICATIONS IN HEAT TRANSFER & FLUID MECHANICS  6+3
One dimensional heat transfer element – application to one-dimensional heat transfer problems– scalar variable problems in 2-Dimensions – Applications to heat transfer in 2-Dimension – Application to problems in fluid mechanics in 2-D

L=42, T=18 TOTAL:60 PERIODS

TEXT BOOK:

REFERENCES:
UNIT I VEHICLE STRUCTURE AND ENGINES

Types of automobiles, vehicle construction and different layouts, chassis, frame and body, resistances to vehicle motion and need for a gearbox, components of engine-their forms, functions and materials.

UNIT II ENGINE AUXILIARY SYSTEMS

Electronically controlled gasoline injection system for SI engines, Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system, Turbo chargers, Engine emission control by three way catalytic converter system.

UNIT III TRANSMISSION SYSTEMS

Clutch-types and construction, gear boxes-manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel-torque converter, propeller shaft, slip joints, universal joints, Differential, and rear axle, Hotchkiss Drive and Torque Tube Drive.

UNIT IV STEERING, BRAKES AND SUSPENSION SYSTEMS

Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System and Traction Control.

UNIT V ALTERNATIVE ENERGY SOURCES


Note: A Practical Training in dismantling and assembling of engine parts and transmission systems may be given to the students.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
LIST OF EXPERIMENTS

HEAT TRANSFER

Thermal conductivity measurement by guarded plate method
Thermal conductivity of pipe insulation using lagged pipe apparatus
Natural convection heat transfer from a vertical cylinder
Forced convection inside tube
Heat transfer from pin-fin (natural & forced convection modes)
Determination of Stefan-Boltzmann constant
Determination of emissivity of a grey surface
Effectiveness of parallel/counter flow heat exchanger

REFRIGERATION AND AIR CONDITIONING

Determination of COP of a refrigeration system
Experiments on air-conditioning system
Performance test on single/two stage reciprocating air compressor.

TOTAL: 45 PERIODS

LIST OF EQUIPMENT
(for a batch of 30 students)

1. Guarded plate apparatus – 1 No.
2. Lagged pipe apparatus – 1 No.
3. Natural convection-vertical cylinder apparatus – 1 No.
5. Pin-fin apparatus – 1 No.
7. Emissivity measurement apparatus – 1 No.
8. Parallel/counter flow heat exchanger apparatus – 1 No.
9. Single/two stage reciprocating air compressor. – 1 No.
10. Refrigeration test rig – 1 No.
11. Air-conditioning test rig – 1 No.
The objective of this project is to provide opportunity for the students to implement their skills acquired in the previous semesters to practical problems. The students in convenient groups of not more than 4 members have to take one small item for design and fabrication. Every project work shall have a guide who is the member of the faculty of the institution and if possible with an industry guide also.

The item chosen may be small machine elements (Example-screw jack, coupling, machine vice, cam and follower, governor etc), attachment to machine tools, tooling (jigs, fixtures etc), small gear box, automotive appliances, agricultural implements, simple heat exchangers, small pumps, hydraulic /pneumatic devices etc.

The students are required to design and fabricate the chosen item in the college and demonstrate its working apart from submitting the project report. The report should contain assembly drawing, parts drawings, process charts relating to fabrication.

Globalisation has brought in numerous opportunities for the teeming millions, with more focus on the students’ overall capability apart from academic competence. Many students, particularly those from non-English medium schools, find that they are not preferred due to their inadequacy of communication skills and soft skills, despite possessing sound knowledge in their subject area along with technical capability. Keeping in view their pre-employment needs and career requirements, this course on Communication Skills Laboratory will prepare students to adapt themselves with ease to the industry environment, thus rendering them as prospective assets to industries. The course will equip the students with the necessary communication skills that would go a long way in helping them in their profession.

OBJECTIVES:

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

<table>
<thead>
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<th>24 periods</th>
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A. ENGLISH LANGUAGE LAB (18 Periods)
1. **LISTENING COMPREHENSION:** (6)
   Listening and typing – Listening and sequencing of sentences – Filling in the blanks -
   Listening and answering questions.

2. **READING COMPREHENSION:** (6)
   Filling in the blanks - Close exercises – Vocabulary building - Reading and answering
   questions.

3. **SPEAKING:** (6)
   Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition
   exercises – Common Errors in English.

   Conversations: Face to Face Conversation – Telephone conversation – Role play
   activities (Students take on roles and engage in conversation)

**B. DISCUSSION OF AUDIO-VISUAL MATERIALS** (6 PERIODS)

   (Samples are available to learn and practice)

1. **RESUME / REPORT PREPARATION / LETTER WRITING** (1)
   Structuring the resume / report - Letter writing / Email Communication - Samples.

2. **PRESENTATION SKILLS:** (1)
   Elements of effective presentation – Structure of presentation - Presentation
   tools – Voice Modulation – Audience analysis - Body language – Video samples

3. **SOFT SKILLS:** (2)
   Time management – Articulateness – Assertiveness – Psychometrics –
   Innovation and Creativity - Stress Management & Poise - Video Samples

4. **GROUP DISCUSSION:** (1)
   Why is GD part of selection process ? - Structure of GD – Moderator – led and
   other GDs - Strategies in GD – Team work - Body Language - Mock GD -Video
   samples

5. **INTERVIEW SKILLS:** (1)
   Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews-
   Video samples.

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<tr>
<td>2. Presentation Skills: Students make presentations on given topics.</td>
<td>(8)</td>
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<tr>
<td>3. Group Discussion: Students participate in group discussions.</td>
<td>(6)</td>
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<tr>
<td>4. Interview Skills: Students participate in Mock Interviews</td>
<td>(8)</td>
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TEXT BOOKS

REFERENCES:

LAB REQUIREMENTS:
1. Teacher console and systems for students.
2. English Language Lab Software
3. Career Lab Software

### Requirement for a batch of 60 students

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<td>3.</td>
<td>Handicam Video Camera (with video lights and mic input)</td>
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<td>5.</td>
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<td>6.</td>
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</table>
UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II

UNIT V QUALITY SYSTEMS

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCE BOOKS:
ME2401  MECHATRONICS  L T P C  3 0 0 3
(COMMON TO MECHANICAL AND PRODUCTION- VI SEMESTER)

UNIT I   MECHATRONICS, SENSORS AND TRANSDUCERS  9
Microprocessor based Controllers. Sensors and Transducers – Performance
Terminology – Sensors for Displacement, Position and Proximity; Velocity, Motion,
Force, Fluid Pressure, Liquid Flow, Liquid Level, Temperature, Light Sensors – Selection
of Sensors

UNIT II   ACTUATION SYSTEMS  9
Mechanical Actuation Systems – Cams – Gear Trains – Ratchet and pawl – Belt and
Chain Drives – Bearings. Electrical Actuation Systems – Mechanical Switches – Solid
State Switches – Solenoids – Construction and working principle of DC and AC Motors
– speed control of AC and DC drives, Stepper Motors-switching circuitries for stepper
motor – AC & DC Servo motors

UNIT III  SYSTEM MODELS AND CONTROLLERS  9
Building blocks of Mechanical, Electrical, Fluid and Thermal Systems, Rotational –
Continuous and discrete process Controllers – Control Mode – Two – Step mode –
Controllers – Velocity Control – Adaptive Control – Digital Logic Control – Micro
Processors Control.

UNIT IV   PROGRAMMING LOGIC CONTROLLERS  9
Programmable Logic Controllers – Basic Structure – Input / Output Processing –
Programming – Mnemonics – Timers, Internal relays and counters – Shift Registers –
Master and Jump Controls – Data Handling – Analogs Input / Output – Selection of a
PLC.

UNIT V  DESIGN OF MECHATRONICS SYSTEM  9
Stages in designing Mechatronics Systems – Traditional and Mechatronic Design -
Possible Design Solutions. Case studies of Mechatronics systems- Pick and place
Robot- Autonomous mobile robot-Wireless surivieillance balloon- Engine Management
system- Automatic car park barrier.

TOTAL: 45 PERIODS

TEXT BOOKS:
2. Smaili, A and Mrad, F, "Mechatronics integrated technologies for intelligent

REFERENCES:
2. Michael B. Histand and David G. Alciatore, “Introduction to Mechatronics and

ME2402 COMPUTER INTEGRATED MANUFACTURING L T P C
3 0 0 3

OBJECTIVE:
- This course will enable the student
- To gain knowledge about the basic fundamental of CAD.
- To gain knowledge on how computers are integrated at various levels of planning and manufacturing understand computer aided planning and control and computer monitoring.

UNIT I COMPUTER AIDED DESIGN 9
Concept of CAD as drafting and designing facility, desirable features of CAD package, drawing features in CAD – Scaling, rotation, translation, editing, dimensioning, labeling, Zoom, pan, redraw and regenerate, typical CAD command structure, wire frame modeling, surface modeling and solid modeling (concepts only) in relation to popular CAD packages.

UNIT II COMPONENTS OF CIM 9
CIM as a concept and a technology, CASA/Sme model of CIM, CIM II, benefits of CIM, communication matrix in CIM, fundamentals of computer communication in CIM – CIM data transmission methods – seriel, parallel, asynchronous, synchronous, modulation, demodulation, simplex and duplex. Types of communication in CIM – point to point (PTP), star and multiplexing. Computer networking in CIM – the seven layer OSI model, LAN model, MAP model, network topologies – star, ring and bus, advantages of networks in CIM

UNIT III GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING 9

UNIT IV SHOP FLOOR CONTROL AND INTRODUCTION TO FMS 9
shop floor control – phases – factory data collection system – automatic identification methods – Bar code technology – automated data collection system.
UNIT V COMPUTER AIDED PLANNING AND CONTROL AND COMPUTER MONITORING


TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

ME2403 POWER PLANT ENGINEERING

OBJECTIVE:
• To understand the various components, operations and applications of different types of power plants

UNIT I INTRODUCTION TO POWER PLANTS AND BOILERS
Layout of Steam, Hydel, Diesel, MHD, Nuclear and Gas turbine Power Plants
Combined Power cycles – comparison and selection, Load duration Curves, Steam boilers and cycles – High pressure and Super Critical Boilers – Fluidised Bed Boilers

UNIT II STEAM POWER PLANT
Fuel and ash handling, Combustion Equipment for burning coal, Mechanical Stokers, Pulveriser, Electrostatic Precipitator, Draught- Different Types, Surface condenser types, cooling Towers

UNIT III NUCLEAR AND HYDEL POWER PLANTS
Nuclear Energy-Fission, Fusion Reaction, Types of Reactors, Pressurized water reactor, Boiling water reactor, Waste disposal and safety Hydel Power plant- Essential elements, Selection of turbines, governing of Turbines- Micro hydel developments
UNIT IV  DIESEL AND GAS TURBINE POWER PLANTS
Types of diesel plants, components, Selection of Engine type, applications-Gas turbine power plant- Fuels- Gas turbine material – open and closed cycles- reheating – Regeneration and intercooling – combines cycle

UNIT V  OTHER POWER PLANTS AND ECONOMICS OF POWER PLANTS
Geo thermal- OTEC- tidal- Pumped storage –Solar central receiver system Cost of electric Energy- Fixed and operating costs-Energy rates- Types tariffs- Economics of load sharing, comparison of various power plants.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

ME2404 COMPUTER AIDED SIMULATION AND ANALYSIS
LABORATORY

LIST OF EXPERIMENTS

A. SIMULATION
Simulation of Air conditioning system with condenser temperature and evaporator temperatures as input to get COP using C /MAT Lab.
Simulation of Hydraulic / Pneumatic cylinder using C / MAT Lab.
Simulation of cam and follower mechanism using C / MAT Lab.

B. ANALYSIS (SIMPLE TREATMENT ONLY)
1. Stress analysis of a plate with a circular hole.
2. Stress analysis of rectangular L bracket
3. Stress analysis of an axi-symmetric component
4. Stress analysis of beams (Cantilever, Simply supported, Fixed ends)
5. Mode frequency analysis of a 2 D component
6. Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends)
7. Harmonic analysis of a 2D component
8. Thermal stress analysis of a 2D component
9. Conductive heat transfer analysis of a 2D component
10. Convective heat transfer analysis of a 2D component

TOTAL: 45 PERIODS
LIST OF EQUIPMENTS
(For a batch of 30 students)

Computer System 30
17" VGA Color Monitor
Pentium IV Processor
40 GB HDD
512 MB RAM
Color Desk Jet Printer 01
Software
Suitable analysis software 30 licenses
C / MATLAB 5 licenses

ME2405 MECHATRONICS LABORATORY LTPC
0 0 3 2
(COMMON TO MECHANICAL AND PRODUCTION VI SEMESTER)

LIST OF EXPERIMENTS

1. Design and testing of fluid power circuits to control
   (i) velocity (ii) direction and (iii) force of single and double acting actuators
2. Design of circuits with logic sequence using Electro pneumatic trainer kits.
3. Simulation of basic Hydraulic, Pneumatic and Electric circuits using software
4. Circuits with multiple cylinder sequences in Electro pneumatic using PLC
5. Speed Control of AC & DC drives
6. Servo controller interfacing for DC motor
7. PID controller interfacing
8. Stepper motor interfacing with 8051 Micro controller
   (i) full step resolution (ii) half step resolution
9. Modeling and analysis of basic electrical, hydraulic and pneumatic systems
   using LAB VIEW
10. Computerized data logging system with control for process variables like
    pressure flow and temperature.

TOTAL: 45 PERIODS

LIST OF EQUIPMENT
(For a batch of 30 students)

1. Basic Pneumatic Trainer Kit with manual and electrical controls/ PLC Control each - 1 No.
2. Basic Hydraulic Trainer Kit - 1 No.
3. Hydraulics and Pneumatics Systems Simulation Software / Automation studio sets - 10 No
4. 8051 - Microcontroller kit with stepper motor and drive circuit sets - 2 No.
5. LAB VIEW software with Sensors to measure Pressure, Flow rate, direction, speed, velocity and force.seats - 2 No.
OBJECTIVES:
To learn about the basics of economics and cost analysis related to engineering so as to take economically sound decisions.

UNIT I INTRODUCTION TO ECONOMICS 8

UNIT II VALUE ENGINEERING 10
Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor-Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III CASH FLOW 9
Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS 9
Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

UNIT V DEPRECIATION 9

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES:

ME2452 COMPREHENSION L T P C 0 0 3 2

OBJECTIVE:
- The objective of comprehension is to provide opportunity for the student to apply the knowledge acquired during the earlier semesters to real life problems which he / she may have to face in future as an engineer.
- While learning as how to solve the real life problems, student will receive guidance from the faculty and also review various courses learnt earlier.
- Further this comprehension is to achieve an understanding of the fundamentals of contemporary manufacturing systems including materials, manufacturing process, product and process control, computer integrated manufacture and quality.
- The students work in groups and solve a variety of problems given to them.
- The problems given to the students should be of real like industrial problems selected by a group of faculty members of the concerned department.
- A minimum of three small problems have to be solved by each group of students. The evaluation is based on continuous assessment by a group of Faculty Members constituted by the professor in-charge of the course.

ME2453 PROJECT WORK L T P C 0 0 6 12

OBJECTIVE:
- The objective of the project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study.
- Every project work shall have a guide who is the member of the faculty of the institution.
- Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.
The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

The progress of the project is evaluated based on a minimum of three reviews.

The review committee may be constituted by the Head of the Department.

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion.

This final report shall be typewritten form as specified in the guidelines.

The continuous assessment shall be made as prescribed in the regulations (vide clause 10.3 of Regulations 2004 for B.E., B.Tech. programmes)

MG 2021 MARKETING MANAGEMENT L T P C 3 0 0 3

(COMMON TO MECHANICAL, PRODUCTION AND MECHATRONICS)

OBJECTIVE

To understand the various processes involved in Marketing and its Philosophy.

To learn the Psychology of consumers.

To formulate strategies for advertising, pricing and selling

UNIT I MARKETING PROCESS 9
Definition, Marketing process, dynamics, needs, wants and demands, marketing concepts, environment, mix, types. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy

UNIT II BUYING BEHAVIOUR AND MARKET SEGMENTATION 9
Cultural, demographic factors, motives, types, buying decisions, segmentation factors - demographic -Psycho graphic and geographic segmentation, process, patterns.

UNIT III PRODUCT PRICING AND MARKETING RESEARCH 9
Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION 9
Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.

UNIT V ADVERTISING, SALES PROMOTION AND DISTRIBUTION 9
Characteristics, impact, goals, types, and sales promotions- point of purchase- unique selling proposition. Characteristics, wholesaling, retailing, channel design, logistics, and modern trends in retailing.

TOTAL: 45 PERIODS
TEXT BOOKS:

REFERENCES:

ME2021       QUALITY CONTROL AND RELIABILITY ENGINEERING L T P C
                                      3 0 0 3
(COMMON TO MECHANICAL, AUTOMOBILE AND PRODUCTION)

OBJECTIVE:
- To introduce the concept of SQC
- To understand process control and acceptance sampling procedure and their application.
- To learn the concept of reliability.

UNIT I   INTRODUCTION AND PROCESS CONTROL FOR VARIABLES
Introduction, definition of quality, basic concept of quality, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality control: Quality cost - Variation in process- causes of variation – Theory of control chart - uses of control chart – Control chart for variables – X chart, R chart and σ chart - process capability – process capability studies and simple problems. Six sigma concepts.

UNIT II   PROCESS CONTROL FOR ATTRIBUTES
Control chart for attributes – control chart for non conformities – p chart and np chart – control chart for nonconformities – C and U charts, State of control and process out of control identification in charts, pattern study.

UNIT III   ACCEPTANCE SAMPLING
UNIT IV  LIFE TESTING - RELIABILITY

UNIT V  QUALITY AND RELIABILITY

TOTAL: 45 PERIODS

Note: Use of approved statistical table permitted in the examination.

TEXT BOOKS

REFERENCES

ME 2022  REFRIGERATION AND AIR CONDITIONING  L T P C
3 0 0 3

AIM:
• To reach the underlying principles of operation in different Refrigeration & Air conditioning systems and components.

OBJECTIVES:
• To provide knowledge on various refrigeration cycles, system components and refrigerants. To provide knowledge on design aspects of Refrigeration & Air conditioning Systems.

UNIT I  REFRIGERATION CYCLE
UNIT II REFRIGERANTS AND SYSTEM COMPONENTS

UNIT III PSYCHROMETRY
Psychrometric processes use of psychrometric charts – Grand and Room Sensible Heat Factors – bypass factor – air washers, requirements of comfort air conditioning, summer and Winter Air conditioning.

UNIT IV AIR CONDITIONING SYSTEMS

UNIT V UNCONVENTIONAL REFRIGERATION CYCLES
Vapor Absorption system – Ejector jet, Steam jet refrigeration, thermo electric refrigeration. APPLICATIONS – ice plant – food storage plants – milk – chilling plants.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

ME 2023 RENEWABLE SOURCES OF ENERGY L T P C
3 0 0 3

AIM:
• To instruct the importance of renewable energy and its utilization for the thermal and electrical energy needs and also the environmental aspects of theses resources.

OBJECTIVE:
At the end of the course, the student expected to do Understand and analyze the pattern of renewable energy resources Suggest methodologies / technologies for its utilization Economics of the utilization and environmental merits

UNIT I SOLAR ENERGY
UNIT II WIND ENERGY 9

UNIT III BIO - ENERGY 9

UNIT IV OTEC, TODAL, GEOTHERMAL AND HYDEL ENERGY 9

UNIT V NEW ENERGY SOURCES 9
Hydrogen, generation, storage, transport and utilization, Applications : power generation, transport – Fuel cells – technologies, types – economics and the power generation

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

ME2024 INDUSTRIAL TRIBOLOGY L T P C
3 0 0 3

UNIT I SURFACES AND FRICTION 9

UNIT II WEAR 9
UNIT III  LUBRICANTS AND LUBRICATION TYPES  9
Types and properties of Lubricants - Testing methods - Hydrodynamic Lubrication –
Elasto-hydrodynamic lubrication - Boundary Lubrication - Solid Lubrication- Hydrostatic
Lubrication.

UNIT IV  FILM LUBRICATION THEORY  9
Fluid film in simple shear - Viscous flow between very close parallel plates - Shear stress
variation Reynolds Equation for film Lubrication - High speed unloaded journal bearings -
Loaded journal bearings – Reaction torque on the bearings - Virtual Co-efficient of
friction - The Sommerfield diagram.

UNIT V  SURFACE ENGINEERING AND MATERIALS FOR BEARINGS  9
Surface modifications - Transformation Hardening, surface fusion - Thermo chemical
processes – Surface coatings - Plating and anodizing - Fusion Processes - Vapour
Phase processes - Materials for rolling Element bearings - Materials for fluid film
bearings - Materials for marginally lubricated and dry bearings.

TEXT BOOK:

REFERENCES:
2. E.P.Bowden and D.Tabor., "Friction and Lubrication ", Heinemann Educational
1995.

ME2025  VIBRATION AND NOISE CONTROL  L T P C  3 0 0 3
(COMMON TO MECHANICAL AND AUTOMOBILE)

OBJECTIVES:
• The student will be able to understand the sources of vibration and noise in
automobiles and make design modifications to reduce the vibration and noise and
improve the life of the components

UNIT I  BASICS OF VIBRATION  9
Introduction, classification of vibration: free and forced vibration, undamped and damped
vibration, linear and non linear vibration, response of damped and undamped systems
under harmonic force, analysis of single degree and two degree of freedom systems,
torsional vibration, determination of natural frequencies.

UNIT II  BASICS OF NOISE  9
Introduction, amplitude, frequency, wavelength and sound pressure level, addition,
subtraction and averaging decibel levels, noise dose level, legislation, measurement and
analysis of noise, measurement environment, equipment, frequency analysis, tracking
analysis, sound quality analysis.
UNIT III AUTOMOTIVE NOISE SOURCES 9

UNIT IV CONTROL TECHNIQUES 9
Vibration isolation, tuned absorbers, untuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

UNIT V SOURCE OF NOISE AND CONTROL 9
Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

ME2026 UNCONVENTIONAL MACHINING PROCESSES L T P C 3 0 0 3
(COMMON TO MECHANICAL AND PRODUCTION)

OBJECTIVE:
- To learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications

UNIT I INTRODUCTION 5

UNIT II MECHANICAL ENERGY BASED PROCESSES 10
UNIT III  ELECTRICAL ENERGY BASED PROCESSES  8

UNIT IV  CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES  12

UNIT V  THERMAL ENERGY BASED PROCESSES  10
Laser Beam machining and drilling (LBM), plasma arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment –Types - Beam control techniques – Applications.

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

ME2027         PROCESS PLANNING AND COST ESTIMATION                 L T P C
(COMMON TO MECHANICAL AND PRODUCTION - CORE)  3 0 0 3

OBJECTIVE:
• To introduce the process planning concepts to make cost estimation for various products after process planning

UNIT I   WORK STUDY AND ERGONOMICS  10

UNIT II   PROCESS PLANNING  10
UNIT III    INTRODUCTION TO COST ESTIMATION  

UNIT IV     COST ESTIMATION  
Types of estimates – methods of estimates – data requirements and sources- collection of cost- allowances in estimation.

UNIT V  PRODUCTION COST ESTIMATION  
Estimation of material cost, labour cost and over heads, allocation of overheads – Estimation for different types of jobs.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

ME2028                                   ROBOTICS                                                    L T P C  
3 0 0  3  
(COMMON TO MECHANICAL, AUTOMOBILE AND PRODUCTION - CORE)

OBJECTIVES:
- To understand the basic concepts associated with the design and functioning and applications of Robots
- To study about the drives and sensors used in Robots
- To learn about analyzing robot kinematics and robot programming

UNIT I    FUNDAMENTALS OF ROBOT  

UNIT II     ROBOT DRIVE SYSTEMS AND END EFFECTORS  

UNIT III SENSORS AND MACHINE VISION  
Requirements of a sensor, Principles and Applications of the following types of sensors – Position of sensors (Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders,

UNIT IV  ROBOT KINEMATICS AND ROBOT PROGRAMMING  10
Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional), Four Degrees of Freedom (In 3 Dimensional) – Deviations and Problems. Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End effector commands, and Simple programs

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS  8
RGV, AGV; Implementation of Robots in Industries – Various Steps; Safety Considerations for Robot Operations; Economic Analysis of Robots – Pay back Method, EUAC Method, Rate of Return Method.

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

ME 2029 DESIGN OF JIGS, FIXTURES & PRESS TOOLS  L T P C
3 0 0 3

OBJECTIVES:
• To understand the functions and design principles of Jigs, fixtures and press tools
• To gain proficiency in the development of required views of the final design.

UNIT I LOCATING AND CLAMPING PRINCIPLES:  8
UNIT II   JIGS AND FIXTURES  10
Design and development of jigs and fixtures for given component- Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs – General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.

UNIT III   PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES  10

UNIT IV  BENDING FORMING AND DRAWING DIES  10

UNIT V MISCELLANEOUS TOPICS  7
Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine Blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Single minute exchange of dies – Poka Yoke - Course should be supplemented with visits to industries.
(Use of Approved design Data Book permitted).

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
5. ASTME Fundamentals of Tool Design Prentice Hall of India.
OBJECTIVES:
- To understand the fundamentals of composite material strength and its mechanical behavior. Understanding the analysis of fiber reinforced Laminate design for different combinations of plies with different orientations of the fiber.
- Thermo-mechanical behavior and study of residual stresses in Laminates during processing. Implementation of Classical Laminate Theory (CLT) to study and analysis for residual stresses in an isotropic layered structure such as electronic chips.

UNIT I  INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS & MANUFACTURING  

UNIT II  FLAT PLATE LAMINATE CONSTITUTE EQUATIONS  

UNIT III  LAMINA STRENGTH ANALYSIS  

UNIT IV  THERMAL ANALYSIS  

UNIT V  ANALYSIS OF LAMINATED FLAT PLATES  

TOTAL: 45 PERIODS
TEXT BOOK:

REFERENCES:

ME 2031 THERMAL TURBOMACHINES

AIM:
To instruct the importance of the principles of various turbomachines

OBJECTIVE:
To understand the various systems, principles, operations and applications of different types of turbo machinery components.

UNIT I PRINCIPLES
Energy transfer between fluid and rotor-classification of fluid machinery,-dimensionless parameters-specific speed-applications-stage velocity triangles-work and efficiency.

UNIT II CENTRIFUGAL FANS AND BLOWERS
Types- stage and design parameters-flow analysis in impeller blades-volute and diffusers, losses, characteristic curves and selection, fan drives and fan noise.

UNIT III CENTRIFUGAL COMPRESSOR
Construction details, impeller flow losses, slip factor, diffuser analysis, losses and performance curves.

UNIT IV AXIAL FLOW COMPRESSOR
Stage velocity diagrams, enthalpy-entropy diagrams, stage losses and efficiency, work done simple stage design problems and performance characteristics.

UNIT V AXIAL AND RADIAL FLOW TURBINES
Stage velocity diagrams, reaction stages, losses and coefficients, blade design principles, testing and performance characteristics.

TOTAL: 45 PERIODS
TEXT BOOK:

REFERENCES:

ME 2032 COMPUTATIONAL FLUID DYNAMICS L T P C 3 0 0 3

AIM:
- To impart the knowledge of numerical techniques to the solution of fluid dynamics and heat transfer problems.

OBJECTIVE:
To introduce Governing Equations of viscous fluid flows
- To introduce numerical modeling and its role in the field of fluid flow and heat transfer
- To enable the students to understand the various discretization methods, solution procedures and turbulence modeling.
- To create confidence to solve complex problems in the field of fluid flow and heat transfer by using high speed computers.

PREREQUISITE:
Fundamental Knowledge of partial differential equations, Heat Transfer and Fluid Mechanics

UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS 8

UNIT II FINITE DIFFERENCE METHOD 9
UNIT III    FINITE VOLUME METHOD (FVM) FOR DIFFUSION   9
Finite volume formulation for steady state One, Two and Three-dimensional diffusion problems. One dimensional unsteady heat conduction through Explicit, Crank – Nicolson and fully implicit schemes.

UNIT IV    FINITE VOLUME METHOD FOR CONVECTION DIFFUSION   10
Steady one-dimensional convection and diffusion – Central, upwind differencing schemes-properties of discretization schemes – Conservativeness, Boundedness, Transportiveness, Hybrid, Power-law, QUICK Schemes.

UNIT V    CALCULATION FLOW FIELD BY FVM   9
Representation of the pressure gradient term and continuity equation – Staggered grid – Momentum equations – Pressure and Velocity corrections – Pressure Correction equation, SIMPLE algorithm and its variants. Turbulence models, mixing length model, Two equation (k-€) models – High and low Reynolds number models

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
5. Introduction to Computational Fluid Dynamics Anil W. Date Cambridge University Press, 2005.

ME2034    NUCLEAR ENGINEERING   L T P C
3 0 0 3

OBJECTIVE
To gain some fundamental knowledge about nuclear physics, nuclear reactor, nuclear fuels, reactors and safe disposal of nuclear wastes.

UNIT I    NUCLEAR PHYSICS   9
Nuclear model of an atom-Equivalence of mass and energy-binding- radio activity-half life-neutron interactions-cross sections.
UNIT II  NUCLEAR REACTIONS AND REACTION MATERIALS  9
Mechanism of nuclear fission and fusion- radio activity- chain reactions-critical mass and composition-nuclear fuel cycles and its characteristics-uranium production and purification-Zirconium, thorium, beryllium.

UNIT III  REPROCESSING  9
Reprocessing: nuclear fuel cycles-spent fuel characteristics-role of solvent extraction in reprocessing-solvent extraction equipment.

UNIT IV  NUCLEAR REACTOR  9
Nuclear reactors: types of fast breeding reactors-design and construction of fast breeding reactors-heat transfer techniques in nuclear reactors- reactor shielding. Fusion reactors.

UNIT V  SAFETY AND DISPOSAL  9

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
UNIT IV NUCLEAR REACTOR
Nuclear reactors: types of fast breeding reactors-design and construction of fast breeding reactors-heat transfer techniques in nuclear reactors- reactor shielding. Fusion reactors.

UNIT V SAFETY AND DISPOSAL

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

GE2021 PROFESSIONAL ETHICS IN ENGINEERING

UNIT I ENGINEERING ETHICS

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III ENGINEER’S RESPONSIBILITY FOR SAFETY

UNIT IV RESPONSIBILITIES AND RIGHTS

UNIT V GLOBAL ISSUES
TEXT BOOKS:

REFERENCES:

GE2023 FUNDAMENTALS OF NANOSCIENCE L T P C 3 0 0 3

UNIT I INTRODUCTION 9
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II PREPARATION METHODS 10
Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES 7
Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV PREPARATION ENVIRONMENTS 9
Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

UNIT V CHARACTERISATION TECHNIQUES 10
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation
ME2035 ENTREPRENEURSHIP DEVELOPMENT 3 0 0 3
(COMMON TO ALL BRANCHES)

OBJECTIVE:
- Study of this subject provides an understanding of the scope of an entrepreneur, key
  areas of development, financial assistance by the institutions, methods of taxation
  and tax benefits, etc.

UNIT I  ENTREPRENEURSHIP 9
Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and
Intrapreneur – Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial
Growth.

UNIT II  MOTIVATION 9
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self
Rating, Business Game, Thematic Apperception Test – Stress management, 
Entrepreneurship Development Programs – Need, Objectives.

UNIT III  BUSINESS 9
Small Enterprises – Definition, Classification – Characteristics, Ownership Structures –
Project Formulation – Steps involved in setting up a Business – identifying, selecting a
Good Business opportunity, Market Survey and Research, Techno Economic Feasibility
Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources
of Information – Classification of Needs and Agencies.

UNIT IV  FINANCING AND ACCOUNTING 9
Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution,
management of working Capital, Costing, Break Even Analysis, Network Analysis

UNIT V  SUPPORT TO ENTREPRENEURS 9
Sickness in small Business – Concept, Magnitude, causes and consequences, 
Corrective Measures – Government Policy for Small Scale Enterprises – Growth
Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub
Contracting.

TOTAL: 45 PERIODS

TEXT BOOKS:
   Weinheim Cambridge, Wiley-VCH, 2000

REFERENCES:
   Structure”, Theory, Modeling and Simulations”, Prentice-Hall of India (P) Ltd, New
   Delhi, 2007.

TOTAL: 45 PERIODS

REFERENCES:

ME2036 PRODUCTION PLANNING AND CONTROL L T P C
3 0 0 3

OBJECTIVE:
- To understand the various components and functions of production planning and control such as work study, product planning, process planning, production scheduling, Inventory Control.
- To know the recent trends like manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).

UNIT I INTRODUCTION 9
Objectives and benefits of planning and control-Functions of production control-Types of production-job- batch and continuous-Product development and design-Marketing aspect - Functional aspects-Operational aspect-Durability and dependability aspect-aesthetic aspect. Profit consideration-Standardization, Simplification & specialization-Break even analysis-Economics of a new design.

UNIT II WORK STUDY 9
Method study, basic procedure-Selection-Recording of process - Critical analysis, Development - Implementation - Micro motion and memo motion study - work measurement - Techniques of work measurement - Time study - Production study - Work sampling - Synthesis from standard data - Predetermined motion time standards.

UNIT III PRODUCT PLANNING AND PROCESS PLANNING 9
Product planning-Extending the original product information-Value analysis-Problems in lack of product planning-Process planning and routing-Pre requisite information needed for process planning-Steps in process planning-Quantity determination in batch production-Machine capacity, balancing-Analysis of process capabilities in a multi product system.

UNIT IV PRODUCTION SCHEDULING 9
Production Control Systems-Loading and scheduling-Master Scheduling-Scheduling rules-Gantt charts-Perpetual loading-Basic scheduling problems - Line of balance - Flow production scheduling-Batch production scheduling-Product sequencing - Production Control systems-Periodic batch control-Material requirement planning kanban –
Dispatching-Progress reporting and expediting-Manufacturing lead time-Techniques for aligning completion times and due dates.

UNIT V INVENTORY CONTROL AND RECENT TRENDS IN PPC
Inventory control-Purpose of holding stock-Effect of demand on inventories-Ordering procedures. Two bin system -Ordering cycle system-Determination of Economic order quantity and economic lot size-ABC analysis-Recorder procedure-Introduction to computer integrated production planning systems-elements of JUST IN TIME SYSTEMS-Fundamentals of MRP II and ERP.

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

ME2037 MAINTENANCE ENGINEERING L T P C
3 0 0 3
(COMMON TO MECHANICAL AND PRODUCTION)

OBJECTIVES:
- To enable the student to understand the principles, functions and practices adapted in industry for the successful management of maintenance activities.
- To explain the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements.
- To illustrate some of the simple instruments used for condition monitoring in industry.
UNIT I  PRINCIPLES AND PRACTICES OF MAINTENANCE PLANNING  10
Basic Principles of maintenance planning – Objectives and principles of planned
maintenance activity – Importance and benefits of sound Maintenance systems –
Reliability and machine availability – MTBF, MTTR and MWT – Factors of availability –
Maintenance organization – Maintenance economics.

UNIT II  MAINTENANCE POLICIES – PREVENTIVE MAINTENANCE  9
Maintenance categories – Comparative merits of each category – Preventive
maintenance, maintenance schedules, repair cycle - Principles and methods of
lubrication – TPM.

UNIT III  CONDITION MONITORING  9
Condition Monitoring – Cost comparison with and without CM – On-load testing and off-
load testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol
thermometers – wear-debris analysis

UNIT IV  REPAIR METHODS FOR BASIC MACHINE ELEMENTS  10
Repair methods for beds, slideways, spindles, gears, lead screws and bearings – Failure
analysis – Failures and their development – Logical fault location methods – Sequential
fault location.

UNIT V  REPAIR METHODS FOR MATERIAL HANDLING EQUIPMENT  8
Repair methods for Material handling equipment - Equipment records –Job order
systems -Use of computers in maintenance.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To create awareness about optimisation in utilization of resources.
- To understand and apply operations research techniques to industrial operations.

UNIT I  LINEAR MODEL  10

UNIT II  NETWORK MODELS  8

UNIT II  INVENTORY MODEL  9
Types of Inventory- EOQ –ERL- Deterministic inventory problems – Price breaks - Stochastic inventory problems- selective inventory control techniques.

UNIT II  REPLACEMENT MODELS  9
Replacement of items that deteriorate with time – value of money changing with time – not charging with time – optimum replacement policy – individual and group replacement. Sequencing problem: models with n jobs with 2 machines – problem with n jobs with m machines.

UNIT III  QUEUING THEORY  9

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:
AIM:
- To give exposure to various types of process equipments and their design.

OBJECTIVES:
- To understand the different types of stresses and their effects in pressure vessel.
- To understand the piping layout and the stresses acting on it.

UNIT I  CYLINDRICAL SHELL AND VARIOUS CLOSURES  9
Membrane theory for thin shells, stresses in cylindrical, spherical and conical shells, dilation of above shells, general theory of membrane stresses in vessel under internal pressure and its application to ellipsoidal and torispherical end closures. Bending of circular plates and determination of stresses in simply supported and clamped circular plate. Introduction to ASME code and formulae

UNIT II  JUNCTION STRESSES, OPENING AND REINFORCEMENTS  9
Discontinuity stresses. Stress concentration in plate having circular hole due to bi-axial loading. Theory of reinforced opening and reinforcement limits.

UNIT III  SUPPORT DESIGN  9
Supports for vertical & horizontal vessels. Design of base plate and support lugs. Types of anchor bolt, its material and allowable stresses. Design of saddle supports.

UNIT IV  BUCKLING IN VESSELS  9
Buckling of vessels under external pressure. Elastic buckling of long cylinders, buckling modes, Collapse under external pressure. Design for stiffening rings. Buckling under combined external pressure and axial loading.

UNIT V  PIPING STRESS ANALYSIS  9

TOTAL : 45 PERIODS

TEXT BOOKS:
1. Harvey J F, ‘Pressure vessel design’ CBS publication
2. Brownell. L. E & Young, E. D, ‘Process equipment design’, Wiley Eastern Ltd., India

REFERENCES:
1. ASME Pressure Vessel and Boiler code, Section VIII Div 1 & 2, 2003
2. American standard code for pressure piping , B 31.1
3. Henry H Bednar, Pressure vessel Design Hand book,CBS publishers and distributors
4. Stanley M Wales, Chemical Process equipment, selection and design, Butterworths, series in Chemical Engineering,1988
UNIT I  SPARK IGNITION ENGINES

UNIT II  COMPRESSION IGNITION ENGINES
Stages of combustion-normal and abnormal combustion – Factors affecting knock, Direct and Indirect injection systems, Combustion chambers, Turbo charging , Introduction to Thermodynamic Analysis of CI Engine Combustion process.

UNIT III  ENGINE EXHAUST EMISSION CONTROL
Formation of NO\textsubscript{x} , HC/CO mechanism , Smoke and Particulate emissions, Green House Effect , Methods of controlling emissions , Three way catalytic converter and Particulate Trap, Emission (HC,CO, NO and NO\textsubscript{x}) measuring equipments, Smoke and Particulate measurement, Indian Driving Cycles and emission norms

UNIT IV  ALTERNATE FUELS

UNIT V  RECENT TRENDS

TOTAL =45 PERIODS

TEXT BOOK:

REFERENCES:
2. Patterson D.J. and Henein N.A,”Emissions from combustion engines and their control,” Ann Arbor Science publishers Inc, USA, 1978
AIM:
To build up necessary background for the design of various types of heat exchangers.

OBJECTIVES:
• To learn the sizing of heat exchangers, thermal and mechanical stress analysis for various heat exchange applications.

UNIT I DIFFERENT CLASSIFICATION OF HEAT EXCHANGERS 9
Parallel flow, counter flow and cross flow; shell and tube and plate type; single pass and multipass; once through steam generators etc;

UNIT II PROCESS DESIGN OF HEAT EXCHANGERS 9
Heat transfer correlations, Overall heat transfer coefficient, LMTD, sizing of finned tube heat exchangers, U tube heat exchangers, fouling factors, pressure drop calculations.

UNIT III MECHANICAL DESIGN OF SHELL AND TUBE TYPE 9
Thickness calculation, Tubesheet design using TEMA formula, concept of equivalent plate for analysing perforated analysis, flow induced vibration risks including acoustic issues and remedies, tube to tubesheet joint design, buckling of tubes, thermal stresses

UNIT IV COMPACT AND PLATE HEAT EXCHANGER 9
Types – Merits and Demerits – Design of compact heat exchangers, plate heat exchangers, performance influencing parameters, limitations

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

TOTAL : 45 PERIODS

TEXT BOOKS / REFERENCES: