.

MECHANICAL ENGINEERING

SECOND YEAR

201 MATHEMATICS III

FIRST TERM:

1. **Ordinary Differential Equations and some Special Function:** Series solutions ordinary differential equations, Legendre and Bessel function and their properties.
   8 Lectures
2. **Partial Differential Equations:** Second order linear and quasi-linear partial differential equations, elliptic, parabolic and hyperbolic types, boundary and initial conditions solutions of Dirichlet and Neumann problems for Laplace equation and of heat conduction problems by Fourier method, DIA lembert solution of 1-D wave equation and solution of Cauchy problem.
   8 Lectures
3. **Functions of a Complex Variable:** Review of complex numbers, formulae of Euler and Demoivre, analytic functions, Cauchy Riemann conductions elementary complex functions and analytic function in term of a power series, Laur series, residue theorem, contour integration.
   8 Lectures

SECOND TERM:

Probability and Statistics: Axiomatic definition of probability, laws of probabilities classical occupancy problem with illustrations, conditional, probability

multiplication law, independence of events, Bayes rule, discrete and continuous random variables-cumulative distribution functions, probability mass function, probability density function, mathematical expectation, mean, variance, moment generating function and characteristic function, standard probability models-binomial, Poisson, exponential, Weibull, normal and long normal, sampling and sampling distribution –z, t, Chi-square and F, estimation of parameters, use of t, Chi-square and F in test significance. 24 Lectures

BOOKS RECOMMENDED:

TEXT BOOKS:

1. Advance Engineering Mathematics by E. Kreyszig, Wiley eastern Pvt. Ltd. (India)

REFERENCE BOOKS:

1. Advance Engineering Mathematics by C.R. Wysle
2. Mathematics of Physics and Modern Engineering by Sckolonikoff & Redhelfer
3. Advance Mathematics for Engineers and Physicists by L.A. Pipes

202 COMPUTATIONAL TECHNIQUES

FIRST TERM:

1. **Types of Computer:** Digital, analog and hybrid, organization of a digital computer system-CPU memory, I/O devices, representation of numbers-integer and floating point arithmetic, round off errors and their propagation.

2. **Introduction to computer languages:** Assembly language, higher languages compilers, problem solving using computers algorithm, flow chart, examples, FORTRAN programming, constant and variables, arithmetic expression I/O statements, specification statement, control statements, subscribed variables, logical expression, function and subroutines, examples of programming should include numerical as well as non-numeric matrix operations, searching, sorting etc.

3. **Iterative Techniques for solution of equation:** Simple iteration scheme, Newton-Raphson method, secant method, their rates of convergence, order of errors, etc. roots of polynomial equation, Gaussian elimination, Gauss-Siedel iteration, matrix inversion by Gaussian method, computation of determinant, polynomial approximation.

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SECOND TERM:

Lagrangian interpolation of polynomial, Aitkin's methods, method, Newton's forward difference formula, curve fitting (least square), Trapezoidal method,

Simpson's Rule, order of errors in integrations, solutions of initial value problems, Euler's methods, and 4th order Runge Kutta (algorithm only).

COMPUTATIONAL LABORATORY

FIRST TERM:
Familiarization with PC and DOS, preparing ASC II files using editors/word processors, system utilities, compiling and running, programme development in FORTRAN, number theoretic problems, series summation, matrix and vector operation, non-numeric data processing, searching and sorting.

SECOND TERM:
Numerical techniques finding roots of a function, quadrature, integration and solution of differential equations, interpolation and curve fitting solution of linear simultaneous equations and matrix inversions

TEXT BOOKS:
1. Computer Programming & Numerical Methods (For Engineers) by Swami Saran, P.K. Swami and K.K. Singh, Sarita Publishers, Meerut
2. Computer Oriented Numerical Methods by V. Rajaram, Prentice Hall of India

REFERENCE BOOKS:
1. Elementary Numerical Analysis by S.D. Conte
2. Introductory Methods of Numerical Analysis by S.S. Shastri
3. Numerical Methods in Engineering by M.G. Salve
4. Computing for Engineering by R. T. Fennes

203 BASIC ELECTRONICS

FIRST TERM:

P-n junction, Depletion layer, Barrier potential, forward and reverse bias, breakdown voltage, piv Characteristics of p-n junction diode knee voltage, load line and opt ideal p-n junction diode, junction capacitance, zener diode

Rectifiers and fitters-half wave, centre tap full wave and bridge rectifier, percentage of regulation, piv, ripple factor, C, RC, LC and PI filter, voltage double, clipping and clamping ckt voltage regulation
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BJT- Introduction, basic theory of operation of PNP and NPN transistor, V-I characteristics, CB, CE and CC configuration, junction FET-introduction, theory of operation,
JEFT parameters JEFT-amplifiers

MOSFET- Introduction, theory of operation MOSFET parameters application.
Graphical analysis of BJT and FET circuits, linear models of BJT and PET
Pulse and large signal models of BJT and FET

SECOND TERM:

Basic BJT and FET Amplifiers

Introductory idea of multistage and feedback amplifiers

Biasing, base bias, emitter feedback bias, collector feedback bias, voltage divider bias, load line and operating point

Integrated ckt-ideal op-amp, analysis of principle of integration simple op-amp, ckt- intro to digital integrated circuits light source –LED.

Photo detectors- Photo diode and photo transistors, thyristors-introduction to thyristors family, SCR characteristics and ratings

TRIAC- Theory of operation, characteristics and rating voltage control By SCR and TRIAC

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UJT- Introduction, basic theory of operation, characteristics and structure, complementary and programmable UJT relaxation oscillator.

206 MECHANICS OF SOLIDS-I

FIRST TERM:

1. **Introduction and fundamental concepts:** Introduction-purpose and scope of the subject, generalized procedure, basic assumption, types of forces (External and Internal forces), method of sections, constitutive laws, Elastic material, Principle of Super position, St. Venant's Principle Tensile test, generalized Hook's law for isotropic and linear elastic material.
   5 Lectures
2. **Simple stress and stain:** Uniaxial tension or compression of a bar (prismatic and non-prismatic), cases of simple shear, shear strain components in terms of shear stress, Bi-axial and tri-axial tension or compression, Thermal stress and strain, statically determinate system of bars in tension (or compression), thin walled pressure vessels, cylindrical and spherical shells.
   8 Lectures
3. **Shearing Force and Bending Moment:** Use of singularity functions in drawing B.M.D and S.F.D. 6 Lectures
4. **Stress due to bending:** Pure bending of beams, normal stress and shear stress distribution in a beam subjected to both B.M.D. and S.F.D. 6 Lectures

SECOND TERM:

1. **Deflection due to bending:** Double integration method, moment area method.
   4 Lectures
2. **Torsion:** Torsion of solid and hollow circular shaft, Torsion of a hollow thin walled shaft, closed coiled helical spring Flanged couple. 5 Lectures
3. **Two-dimensional stress analysis:** Plane stress components on a general plane at a point, Mohr's circle of stress. 6 Lectures
4. **Cases of combined loading:** Bending with tension (or compression) Eccentrically loaded member, core of section, torsion and shear, torsion and bending cases of transmission shafts subjected to bending tension or axial thrust.
   6 Lectures
5. **Elastic strain energy and its application:** Elastic strain energy of a rod under various kinds of loading-Elastic strain, energy for various states of stress, simple applications, Castiglians Theorem. 4 Lectures

LABORATORY WORK:

Minimum eight experiments bases on the theory covered under the subject.

BOOK RECOMMENDED:

1. Mechanics of Solids – Kazmi
2. Mechanics of Solids – Singh and Jha
3. Mechanics of Solids – Ryder

REFERENCES:

1. Mechanics of Solids – Timoshinko and Gere
2. Introduction to Mechanics of Solids – Grandall and Dahl
3. Mechanics of Solids – Popov

207 FLUID MECHANICS

INTRODUCTION: Concept of continuum, difference between fluid mechanics and solid mechanics, brief history of classical hydraulics, hydrodynamics and fluid mechanics.
Characteristics properties of fluids- ideal and real fluids, Newtonian and non-Newtonian fluids viscosity, surface tension, capillarity compressibility, fluids statics and buoyancy

Fluid kinematics- Stream lines, path lines, streak lines, velocity potential and stream functions, laminar and turbulent flows, steady and unsteady flows, rotational, irrotational motion-circulation, vorticity, velocity and acceleration.

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FLUID DYNAMICS: Conservation of mass, principle of momentum and energy, moment of momentum, equation of motion, Euler's equation, Introduction to Navier's-Stokes equation, energy equation, hydraulic and energy gradients.

LAMINAR FLOW: Flow through pipes, frictional and other losses.

TURBULENT FLOW: Fully developed flows, boundary layer theory, rough and smooth pipe flows.

DIMENSIONAL ANALYSIS: Similitude of fluid flows, Hydraulics modeling, non-dimensional parameters (Reynolds, Fronde, Euler, Weber and Mach Numbers)

FLOW MEASUREMENT: Piezometer, manometers, pressure gauges, pilot tube, orifices, noticlers and weirs, orifice meter, venturimeter, forces on immersed bodies- drag and lift, asfoil section fluid mechanics, dynamic force exerted by fluid on fixed and moving vanes, racial flow over curved vanes, applications to hydraulic turbine blades, impulse and reaction turbines, reciprocating and centrifugal pumps, pressure due to deviated flow in pipes, jet propulsions.

208 MATERIAL SCIENCE & ENGINEERING MATERIALS

FIRST TERM:

1. **Atomic Bonding**: Infer atomic attraction repulsion, bond length, bond energy. Ionic, covalent, metallic and Vander Waal bonding, effect of type of bonding on properties of materials.
   4Lectures

2. **Crystal Structure and Geometry:** Space lattice, unit cell, crystal system, crystalline solids, structure of metallic, ionic and molecular crystals, atomic packing factor, density, co- ordination number, Miller notation of crystal directions and crystal planes, imperfection in crystal, edge and screw dislocations.
   6Lectures

3. **Electrical Properties of Materials:** Energy bond model for electrical conduction, intrinsic semiconductors, extrinsic semiconductors, superconductors.
   5 Lectures
4. **Magnetic Properties:** Magnetic properties. Permeability, effect of temperature on magnetization, B-H, curve magnetic remains Factors. 4Lectures
5. **Mechanical properties of Metals:** Plastic deformation of single crystals and polycrystalline metals, solid solution strengthening, Fractures of metals, Fatigue and creep of metals.
   6 Lectures

SECOND TERM:

1. **Alloy Constitution:** Principles of alloy formation, Eutectic, solid solution and intermetallic compounds, and thermal equilibrium diagrams of binary systems involving eutectic and peritectic reactions. 5 Lectures
2. **Iron and its alloys:** Iron-carbon equilibrium diagram, allotropy of Iron, plain carbon steels, effects of adding alloying elements in plain carbon steels, Ni-steels, Cr-steels, Ni-Cr steels, hear resisting and high speed steel, structures of gray and white cast iron.
   5 Lectures
3. **Non Ferrous Alloys:**
   Copper Base Alloys: Copper-Zinc, Copper-tin, Copper-aluminium and copper nickel alloys.
   2 Lectures
   Aluminium Base Alloys: Wrought and Cast Alloy, age hardenable alloys.
   2 Lectures
   Bearing Alloys: Requirement of bearing alloys, Fulfillment of above requirements, copper-base, tin-base and lead-base bearing alloys, super alloys
   3 Lectures
4. **Ceramics:** Classification of ceramics, structures of ceramics, structures and composition of glasses, mechanical properties of ceramic phases.
   3 Lectures
5. **Polymers:** Mechanism of polymerization, structure of polymers, classification of polymers, elastomers, natural and synthetic rubber. 3 Lectures

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6. **Composite Materials:** Introduction to composite materials, dispersion strengthened materials, fiber reinforced materials, cements. 2 Lectures

BOOKS RECOMMENDED:

1. Principle of Materials Science and Engineering by W.F. Smith (McGraw Hill)
2. The nature and properties of engineering materials by Z.D. Jastrozbski
3. Material Science By V. Raghvan

209 KINEMATICS OF MACHINERY

FIRST TERM:

1. **Basic Kinematic concepts:** Links Kinematic pairs, Kinematic chains, Mechanism and inversions, single and double slider crank chains, straight line motion mechanisms. 8 Lectures

2. **Velocity and Acceleration in Mechanism:** Relative velocity methods, instantaneous center of rotation, centroids, Kenomedy theorem of three centers, Acceleration diagram, acceleration center, Corriolis component. 8 Lectures
3. **Friction Devices:** Introduction to friction, belt, chain and rope drive, transmission of power through friction clutch, theory of shoe brakes band and block brakes. 8 Lectures

SECOND TERM:

1. **Fundamental Law of gearing:** Classification of gears and basic terminology, Geometric and kinematic characteristics of involutes and cycloidal tooth profiles, undercutting and interference. 6 Lectures

2. **Gear Trains:** Simple, compound and planetary, tooth load and torque. 6 Lectures
3. **Balancing:** Balancing of revolving masses in the same plane by a single revolving mass balancing of several revolving masses in different planes by two revolving masses in suitable planes. 6 Lectures
4. **Governors:** Watt, Porter, Procell and Hartnell governors, effect of friction, controlling force, Governor Effect and power sensitivity and isochronisms. 6 Lectures

BOOKS RECOMMENDED:

1. Theory of Machines by J. Lall
2. Theory of Machines by Bevan, Tata McGraw Hill
3. Theory of Machines by Shigley, McGraw Hill

214 THERMODYNAMICS I

FIRST TERM:

1. **Sources of Energy:** Solar, fossil, nuclear, geothermal, wind, tidal and bio-mass energy, basic principles of energy conversion, direct and indirect energy conversion methods. 4 Lectures
2. **Basic Concepts:** Dimensions and units, thermodynamic systems and their properties, Zeroth law and temperature equilibrium concept. 3 Lectures
3. **First Law of Thermodynamics:** Concept of work and heat, first law applied to open and closed systems, internal energy and enthalpy- flow work examples, gases vapours, Laws of perfect gas, specific heat at constant pressure and constant volume, PVT relations.
4. **PVT Surface for Steam:** Properties of steam, use of steam tables, simple thermodynamic process involving gases and vapours. 7 Lectures
5. **Helhotz and Gibb's functions, Maxwell's relations** 3 Lectures
6. **Second Law of Thermodynamics:** Introduction, Kelvin-plank and classisus statements and their equivalence, reversible cycle-Carnot cycle, Corollaries of second law, classisus inequality entropy as a property, principle of increase of entropy, entropy, and calculation of entropy change

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in ideal gas processes. 7
Lectures

SECOND TERM:

1. **Ideal Cycles:** Otto, Diesel, Dual and Joule cycles, comparison of cycle efficiencies.
   5 Lectures
2. **Vapour Cycle:** Carnot and Ranking cycle (use of Moller chart)
   2 Lectures

3. **Non-reacting Mixtures:** Mixture of ideal gases, Dalton's law, mixture of ideal gases and vapour Psychometry, Adiabatic saturation temperature, dbt and wbt, Humidity degrees of saturations, use of Psychometric chart, processes including air-vapour mixtures, evaporative cooling.
   7 Lectures
4. **Combustions:** Combustion processes, Strichiometric reaction equation, mass balance, complete and incomplete combustion analysis, enthalpy and internal energy of reaction, enthalpy of formations, flue gas analysis, Orsat apparatus, higher and lower heating values of fuels.
   7 Lectures
5. **Fuel cells, solar cells and solar collectors M.H.D. conversion**
   3 Lectures

BOOKS RECOMMENDED:
TEXT BOOKS

1. Engineering Thermodynamics by Balzihiser and M.R. Samuels

REFERENCE BOOKS:

1. Thermodynamics by F.W. Seers
2. Thermodynamics by R. Prasad and B.K. Singh
3. Heat and Thermodynamics by Zemsusky
4. Thermodynamics by Reynolds

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MECHANICAL ENGINEERING

THIRD YEAR

ME 301 MANUFACTURING PROCESS – I

FIRST TEM:

1. **Casting Processes:**

A. Types of pattern, pattern allowances, and types of moulds, sand preparation and sand test, preparation of moulds.
B. Furnaces: Electric Furnaces, cupola
C. Cores: Uses of cores chills, chaplets
D. Gating Design: Aspiration effect and effect of friction and velocity distribution. Design of risers and gates, dry sand mould casting, shell mould casting, investment casting, gravity die casting metal mould casting, slush casting, centrifugal casting, CO2 process
E. Casting effects, causes and remedy
F. Finishing of casting and inspection 12 Lectures

2. **Mechanical Working of Metal:**
Hot working and cold working, its advantages, disadvantages and applications, Rolling, Forging, Wire drawing, Extrusion, Punching and blanking, piercing, spinning coining, Embossing, thread rolling, tube drawing. 8 Lectures
3. **Powder Metallurgy:**
Principle, methods of producing powder, pressing sintering and finishing operations applications 4 Lectures

SECOND TERM:

1. **Welding, Brazing and Soldering:**
Principles, process, parameters and applications of gas welding, Arc welding, TIG, MIG, welding, thermit welding, Electron beam welding, laser beam welding, submerged arc welding, electro slag welding. Flux- for gas welding and for arc welding, electrode classification and selection, atomic hydrogen welding, selection of welding technique, filter metal welding for the following metals cast iron, aluminium and copper and their alloys, resistance welding, defects in welding, inspection-Destructive test and non-destructive test, equipment, fluxes and applications of soldering and brazing. 16 Lectures

2. **Heat treatment of metals:**
Allotropic and non-allotropic alloys, heat treatment processes, heat treatment of carbon steel with reference to iron carbon diagram and TTT curve, time transformation and temperature curve, defects in heat treatment and their remedies, Aus tempering and Mar tempering, surface hardening of steels, heat treatment of high speed steels.
8 Lectures

BOOKS RECOMMENDED:
TEXT BOOKS:

1. Manufacturing Processes and Materials of Engineers, by Doyle, Keysar, Leach, Schrader and Singer (Prentice Hall)

REFERENCE BOOKS:

1. Foundry Technology by K.P. Sinha & D.B. Goel
2. Theory of Metal Forming and Metal Cutting by K.P. Sinha & S.C. Prasad
3. Welding Engineering by Rossi

ME 302 MACHINE DESIGN & DRAWING

FIRST TERM:

1. Introduction to the methodology of Engineering design 2 Lectures
2. **Principles of Machine Design:** Form and functional design, product simplification and standardization. 3 Lectures
3. **Working Stress:** Selection of suitable factor of safety and design stress taking into account, the influence of shape, size, type of loading, conditions of service, quality of material and manufacturing process. 3 Lectures
4. **Fatigue, creep, wear:** Impact and vibration consideration in design for the selection of material ad design stress. 3 Lectures

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5. **Design of fastening devices:** Screw fastening, key, pin and cotter, cotter and knuckle joints, riveted joints with special reference to pressure vessels, power transmission elements, rope, belt, shaft, axle and couplings. 13 Lectures

SECOND TERM:

1. Power screw, screw jack, spur and Helical gears, lever, bearings-journal, ball and roller 8 Lectures
2. Design of helical and leaf springs 8 Lectures
3. Design of clutches and brakes 8 Lectures

SESSIONAL WORK:

3 hours per week: 100 marks
Minimum six design problems pertaining to the theory paper

BOOKS RECOMMENDED:
TEXT BOOKS:

1. Machine Design by Maleer and Haritman
2. Machine Design by Dr. S.C. Bhattacharya
3. Design of Machine Elements by Black
4. Machine Design Data Book by Abdullah Shariff
5. Machine Design by Shigley
6. Machine Design by Vallance and Doughli
7. Machine Design by Pandya and Shah
8. Machine Design by Sharma and Agarwal
9. Machine Design Data Book by Mahadevan
10. Machine Design Data Book by P.G. Institute of Tech. Coimbatore

ME 303 MECHANICS OF SOLID – II

FIRST TERM:

1. **Strain Energy:** Strain energy due to direct bending and shear, Castiglione's theorem, application to deflection and rotation of the beam, deflection of simply supported beam and cantilever beam due to shear. 6 Lectures
2. **Thick Cylinders and Spheres:** Thick cylinders, radial and hoop stresses, application of compound stress theories, compound cylinders, thick spherical shells-radial and circumferential stress. 8 Lectures
3. **Rotation of Rings and Discs:** Thin disc of uniform thickness, radial and hoop stresses, disc with central holes and disc of uniform strength. 4 Lectures
4. **Theories of Yielding:** Different theories of failure, comparison of theories of failure, yield loci 6 Lectures

SECOND TERM:

1. **Unsymmetrical Bending:** Flexural stresses due to unsymmetrical bending of beams.
2. **Shear Centre:** Shear centre for thin walled open across section shear flow. 4 Lectures
3. **Beams with large original curvature:** Stresses in crane hooks, rings and links 6 Lectures
4. **Analysis of strain:** Principal strain, Mohr's circle of strains. 2 Lectures
5. **Fatigue:** The fatigue of metals, Bauschinger's experiment, and strain method of obtaining fatigue ranges formulae connecting stress range, maximum stress and ultimate strength, S-N curve, Gerber's formula, Goodman's Law. 2 Lectures
6. **Creep:** Creep of metals, mechanism of creep, equicohesive temperature, creep curve, creep rate, prediction of long time properties from short duration test. 2 Lectures

BOOKS RECOMMENDED:
TEXT BOOKS:

1. Strength of Materials by G.H. Ryder
2. Mechanics of Solids by Kazmi
3. Mechanics of Materials by Arthur Morlay
4. Mechanics of Solids by L.S. Srinath

ME 304 APPLIED THERMODYNAMIC - II

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FIRST TERM:

1. **Boilers:** Classification, Boiler mountings and accessories, draft system, calculation of chimney height, induced and forced draft fans, equivalent evaporation, boiler efficiency and heat balance, high pressure boilers. 8 Lectures
2. **Steam Engine:** Construction and working of simple steam engines, ideal and actual indicator diagrams, diagram factor, mechanical efficiency and estimation of cylinder dimensions, missing quantities, governing and performance. 5 Lectures
3. **Steam Nozzles:** Flow through nozzles, shape and flow area, effect of friction, wet and supersaturated flow, estimation of flow area. 4 Lectures
4. **Steam Condensers:** Type, cooling water requirement, air leakage and air pump capacity, vacuum and condenser efficiency, steam ejectors, stray ponds and cooling towers. 7 Lectures

SECOND TERM:

1. **Steam Turbines:** Construction and working of steam turbines, impulse and reaction turbines, inlet and outlet velocity diagrams-work output and efficiency, pressure and velocity compounding, regenerative and reheat cycles, back pressure pass out turbine's. 12 Lectures
2. **Refrigeration:** Refrigeration machine, heat pump, COP, units of refrigeration, ideal refrigeration cycles, Bell-Coleman air refrigeration system. 4 Lectures
3. **Vapour Refrigeration Systems:** Simple vapour compression refrigeration cycles, wet and dry compression, sub cooling and super heating, actual vapour compressions cycle, flash chamber and accumulators, vapour absorption refrigeration cycles, Electrolux refrigerator. 8 Lectures

BOOKS RECOMMENDED:
TEXT BOOKS:

1. Thermal Engineering	by C.P. Gupta
2. Heat Engines	by R. Yadav
3. Refrigeration and Air Conditioning	by S. Dompundwar

REFERENCE BOOKS:

1. Heat Engines	by D.A. Low
2. Refrigeration and Air Conditioning	by Manohar Prasad
3. Heat Engines	by P.L. Ballany

ME 305 ENGINEERING ECONOMICS AND MANAGEMENT

FIRST TERM:

1. **Engineering Economy:** (a) Simple and compound interest, Annuities, (b) Depreciation, causes and methods, (c) Comparison of alternative and replacement studies: (i) Equivalent annual cost method, (ii) present worth method, (iii) Rate of return method. 5 Lectures
2. **Accounting:** (a) Double entry book keeping, (b) journal, (c) Ledgers, (d) Manufacturing account: profit and loss accounts, (e) Balance Sheet. 7 Lectures
3. **Costing:** (a) Cost and cost accounting, elements of costs, (b) Break even analysis, determining selling price and profitability, (c) Overhead cost allocation 7 Lectures
4. **Entrepreneurship development:** (a) Introduction to entrepreneurship, (b) motivation, (c) Psychological factors, risk taking behaviour, (d) Rural entrepreneurship, (e) Self employment 5 Lectures

SECOND TERM:

1. **Management and Organisation:** (a) Principle of management (b) elements of management, planning, organizing, direction and control, (c) Organisation structure and charts, line staffs functional and committee organisation. 4 Lectures
2. **Industrial Management:** (a) Industrial ownership: Proprietorship, Partnership, Joint Stock Company and Cooperative Societies, (b) Site selection, (c) Plant layout: process oriented, product oriented layouts, line balancing. 4 Lectures

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3. **Production Materials Management:** (a) Production types: job order, batch and mass production, (b) Inspection and quality control, (c) Inventory control, economic order quantity. 4 Lectures
4. **Optimization Techniques:** (a) Linear programming: graphical method, analytical method of solution (two variables) (b) CPM and PERT. 4 Lectures
5. **Personal Management:** (a) Functions: Manpower planning: Recruitment, selection, training promotion, discipline, welfare (b) Job evaluation, (c) Merit rating, (d) Wages and incentives. 4 Lectures
6. **Marketing Management:** (a) market research and sales forecasting (b) sales management, (c) Advertisement and sales promotion 4 Lectures

BOOKS RECOMMENDED:

1. Engineering economy by De Carmo, Sallion and Canada (Mac Millan) Publ. Co. New York and Collier Mac Millan publishers, London.
2. Industrial Organisation and Management by Bethal, Atwater, Smith and Stackman (Mc Graw Hill Book and Co)
3. Industrial Organisation and Engg. Economics by Banga and Sharma (Khanna Publishers, Delhi)
4. Industrial Engg. And Management by O.P. Khanna, Dhanpat Rai and Sons, Delhi
5. Management Accounting by Anthony Robert N
6. Development Entrepreneurship by Udai Pareek and T. Vankateshwara Rao (Sanjiv Printry, Ahmedabad)
7. Industrial Management by Kurtz O'Donnell

ME 306 DYNAMICS OF MACHINERY

FIRST TERM:

1. **Force Analysis of Mechanisms:** Dynamics of plane motion rigid body, equivalent mass systems, forces in mechanisms and machines, friction in link mechanism.
2. **Dynamics of direct acting engine mechanism:** Displacement velocity and acceleration of the piston, turning moment diagrams, fluctuation of crank shaft speed and energy flywheels. 8 Lectures
3. **Cams:** Classification of cams and followers, radial cam, nomenclature, type of follower motions uniforms, simple harmonic, parallel cycloidal, generation of cam profile by graphical method, analytical cam design, pressure angle cams with specified contours. 10 Lectures

SECOND TERM:

1. **Cyroscopic motion:** Principles of Cyroscope, Cyroscopic acceleration, Cyroscopic couple and reaction. 6 Lectures
2. **Balancing of inertia forces and moments in machines:** Balancing of reciprocating masses, primary and secondary forces and couples, concept of direct and reverse cranks, balancing of multicylinder engines. 8 Lectures
3. **Vibrations:** Basic concepts- simple harmonic motion, degree of freedom, types of damping, equivalent systems, free and forced vibrations, linear and angular, single degree freedom systems with and without damping, whirling of shaft vibration, isolation and absorbers, elementary treatment of system with two degree of freedom. 10 Lectures

BOOKS RECOMMENDED:

1. Theory of Machines by Sigley and J.I.
2. Theory of Machine by Bevan
3. Theory of Machine by Shah and Jadhuvansi

ME 307 HEAT AND MASS TRANSFER

FIRST TERM:

1. **Introduction:** Modes of heat transfer-conduction: convection and radiation 1 Lecture
2. **Conduction:** Fourier law, thermal conductivity of solids, liquids and gases, factors influencing thermal conductivity, general three dimensional heat conduction equations in Cartesian and cylindrical coordinates. 4 Lectures
3. **One Dimensional steady:** State conduction through plane walls, cylinder and spheres, flow through plane walls, cylinder and spheres, flow through composite walls cylinders and spheres,

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critical thickness of insulation, heat conduction with internal heat source through plane wall and cylinders, different types of fins, heat transfer from fins of uniform cross section.
6 Lectures

4. **Two Dimensional Steady:** State conduction through plane wall, one dimensional unsteady state heat conduction, heat capacity systems, heat flow in a semi-infinite solid with sudden change of surface temperature, periodic changes of surface temperature.
9 Lectures

5. **Heat Exchangers:** Basic types of heat exchangers, fouling factors overall heat transfer coefficient, LMTD, Effectiveness, NTU-methods of design of single and multi pass heat exchange. 5 Lectures

SECOND TERM:

1. **Convection:** Free and forced convection- Basic concept of hydrodynamic and thermal boundary layers- Laminar and turbulent boundary layer over a flat plate-equation of motion and energy, heat transfer through tubes constant wall temperature and constant heat flux (Empirical relations) similarity conditions of heat transfer- Reynolds Analogy, application of dimensional analysis-empirical relations of convective heat transfer (Free and Forced). 10 Lectures
2. **Fundamentals of boiling heat transfer:** Pool, nucleate and film boiling, heat transfer in condensations drop wise and flow wise (empirical equations)
4 Lectures
3. **Radiation:** Thermal radiation-monochromatic and total emissive power, absorptivity, reflectivity, transmissivity, black and grey bodies, Plank's Law, Wien's law, Stefan-Boltzmann's law, Kirchhoff's law, heat transfer by radiation between black and grey surfaces, electric network methods of solving radiation problems, radiation shields, shape factor.
7 Lectures
4. **Mass Transfer:** Introduction-Flick's law of diffusion-diffusion coefficient, Analogy between heat and mass transfer elementary problems. 4 Lectures

BOOKS RECOMMENDED:
TEXT BOOKS:

1. Heat and Mass Transfer by E.R.G. Eckert and R.M. Drake
2. Principles of Heat Transfer by Frank Krieth

REFERENCE BOOKS:

1. Engineering Heat Transfer by C.P. Gupta and R. Prakash
2. Heat and Mass Transfer by S. Domkundwar
3. Heat and Mass Transfer by B. Gupta and J. Srinivasan

ME 308 FLUID MACHINERY

FIRST TERM:

1. **Introduction:** Application of the momentum and moment of momentum equations to flow through hydraulic machinery, Euler's fundamental equation, classification of machine.
5 Lectures
2. **Water Turbines:** Classification of turbines, impulse turbine, construction details, velocity triangles, power and efficiency calculations, governing of Pelton Wheels, reaction turbines: Francis and Kaplan turbines, constructional details, velocity triangles, power and efficiency calculations, degree of reaction, draft tube, cavitations', Thoma's Cavitations factor.
12 Lectures
3. **Principle of Similarity:** Unit and specific quantities, performance characteristics, testing of models and selection of water turbines. 3 Lectures
4. **Reciprocating Air Compressor:** P.V. diagram calculation of isothermal and adiabatic work, free air delivery, slippage, volumetric efficiency, effect of clearance, multi stage compression, inter-cooling. 4 Lectures

SECOND TERM:

1. **Rotary Compressor:** Introduction, rotary positive displacement compressors, static and total head values, centrifugal compressors and their performances, axial flow compressors-polytrophic efficiency, surging, choking and stalling, fans and blowers.
8 Lectures

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2. **Rotodynamic Pumps:** Classification, Centrifugal Pump, Vector Diagram, Specific speed, Head, Power and Efficiency calculation, Performance characteristics Special Types of Pumps.
   7 Lectures
3. **Positive Displacement Pumps:** Reciprocating pump, Theory, Indicator Diagram, Slip, Effect of Friction and Acceleration, Theory of air vessels, Gear, Vans and screw pumps.
   5 Lectures
4. **Other Machines:** Hydraulic Accumulator Intensifier Ram pump and press.
   2 Lectures
5. **Hydraulic Power Transmission:** Theory of Hydraulic couplings and Torque converters, Operating characteristics and common uses.

BOOK RECOMMENDED:

TEXT BOOKS:

1. Hydraulic Machines by J. Lal
2. Turbo Machinery by Kadambi and Prasad
3. Hydraulic Machines by VP. Vasandani

MECHANICAL ENGINEERING
Fourth Year

ME 401 ENGINE AND GAS TURBINE

FIRST TERM:

1. **Introduction:** Engine classification, two stroke, four stroke (S.I. and C.I.) Engines, engine parts, engine's working principles in general and valve timing diagrams.
   4 Lectures

2. **Review of thermodynamics cycles:** Their comparison, fuel air cycles, real cycles.
   3 Lectures

3. **Engine performance test:** Purpose and types, measurements of power (IHP, BHP, and FHP), air-fuel ratio, and plot of different performance curves (Engine speed vs. BHP, IHP, thermal efficiency, torque, air fuel ratio). 4 Lectures

4. **Theory of combustion:** Principles of combustion, chemical equilibrium and dissociation, adiabatic flame temperature, thermodynamic charts-Unburned and burned mixture charts, transition from unburned to burned mixture charts, combustion process in SI and CI engines, effect of engine variables on combustion process, knock in SI and CI engines, combustion chambers for SI and CI engines.
   9 Lectures

5. **Fuels:** Petroleum base fuels, gasoline and its properties, alcohol (Fuel for SI engine) blending, diesel fuel and properties knock ratings of SI and CI fuel.

SECOND TERM:

1. **(a)** **Carburetion** : Working principles, chemically correct Air-fuel ratio and load variation, Governing and compensating devices (accelerating pumps, idling jets, economizer chokes etc.) venture and jet diameter calculation. 5 Lectures

   (b) **Injection system:** Types, elements of atomizer and pumps, types of nozzle and Governing system. 3 Lectures

2. **(a)** **Supercharging:** Principle of supercharging, superchargers, Turbo Supercharger
   2 Lectures

   (b) **Engine Lubrication and cooling:** Purpose, Principles of Lubrication and cooling, Types of lubricants. 3 Lectures

3. **GAS TURBINE:**

   Principle:

   Principles of gas turbine, simple open gas turbine cycle, Effect of operating variables on thermal efficiency, Regenerative and reheat cycles, Multistage efficiency, Multistage gas turbine cycle, closed cycle gas turbine, gas turbine application.
   6 Lectures

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4. **Jet propulsion:** Working Principle, Thrust, thrust power, propulsive force and propulsive efficiency. 2 Lectures
5. **Rocket engines:** Basic theory of operation, solid propellant rockets, Application of rocket engines. 2 Lectures

BOOKS RECOMMENDED:
TEXT BOOKS:

1. I.C. Engines By E. Obert
2. Fundamental of IC engines By P.W. Gills and Smiller
3. IC Engines By S.P. Sen

REFERENCE BOOKS:

1. I.C. Engines by Taylor and Taylor
2. I.C. Engines by Timothy
3. I.C. Engines by Mathur
4. I.C. Engines by A.C. Rao

ME 402 MANUFACTURING PROCESS-II

FIRST TERM:

1. **Machine Tools** : Principles of copying, forming and generating, speeds and feeds for machine tools, Classification, specification and operation of machine, Machine like Lathe, Shaper, drilling machine, Milling m/c, their accessories and tools, Estimation of machining time, Boring machine, Broaching m/c Capstan and Turret Lathes, single and multispindle Automatic Lathes, Abrasive machining Types, selection of grinding wheels, Grinding machine-type and operation Special purpose m/c tools and operation; Special purpose m/s tools, transfer type machine tools, Numerically controlled machine tools. 18 Lectures
2. **Newer Machining Technique:** Abrasive Jet Machining, Ultrasonic machining, Electro discharge machining, Electro-Chemical machining and Grinding, Chemical milling, Plasma-arc machining, deep Drawing. 6 Lectures

SECOND TERM:

1. **Metal cutting:** Mechanics of metals cutting, Merchant's analysis, tool life, Taylor’s Equation, Tool angles and shapes, Tool materials-composition, properties, and applications, Effects of work and machine variables on cutting force, Power consumption. 12 Lectures
2. **Jigs and fixtures:** Locating elements, clamping devices, Principles of Jigs and Fixtures design. 4 Lectures
3. **Metrology:** Tolerance and allowance, Limit system, limit gauge, Measurement of surface roughness. Inspection of gears and screw threads. 8 Lectures

BOOKS RECOMMENDED:
TEXT BOOKS:

1. Manufacturing process and materials for Engineers- by Doyle, Keyser, Leach Schrader and Singer(Prentice Hall)
2. Production Technology - by Gupta & Jain (Khanna Publishers)
3. Elements of Workshop Technology Vol.II- by Hazare, Choudhary and Bose

REFERENCE BOOKS:

1. Principle of Machine Tools (Vol I and II) by Sen & Bhattacharya(New Central Book Agency)
2. Production Tooling Equipment by S.A.J. Persons
3. Modern Machining Processes by Panday(Tata Mc Graw Hill)
4. Dimensional Metrology by Khare and Vajpayee

ME 403 INDUSTRIAL ENGINEERING AND MANAGEMENT

FIRST TERM:

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1. **Material management Inventory managements:** Inventory function Models (deterministic) inventory analysis and control 2 Lectures

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2. **Work Study:** (a) Motion study - Flow process charts, motion economy, therbligs (b) Time study, Work measurement techniques, equipments, performance rating, standard time, (c) Work sampling: Principles, procedure and application, Ergonomics, fatigue.

3. **Production planning and control:** (a) Production batch size, Buffer stock, production range, minimum cost Batch size, (b) Machine loading, machine interference, Man Machine charts, (c) Production control, Progressing Feed Back, control charts. 6 Lectures

4. **Quality Management** : (a) Statistical methods : Probability and probability, distribution functions confidence limits, estimation, analysis of variance (b) Statistical quality control; Sampling inspection, Acceptance sampling plans, control charts for variables, (c) Operating characteristic (O.C.) Curve; Average outgoing Quality (A. O. Q.) Curve and limits (AOQL), producers Risk, consumer Risk (LTPD), acceptable quality level (AQL). (d) Qualify circles: Quality organisation, quality education, problem solving techniques, brain storming, (e) Quality standards, Bureau of Indian Standards, ISI, ISO, 900. 10 Lectures

SECOND TERM:

1. **Elementary Operation research:** (a) Transportation problems (b) Assignment problems (c) Linear programming problems, simplex methods, Quality, (d) Queuing *theory* (Signal channel) 8 Lectures
2. **Project Management**: (a) Net-work technique PERT and CPM, Crashing the Network, application, cantt chart, (b) Small scale industry ; Feasibility study, Financing the project, Govt, incentives, industrial policy, preparation of project report. 7 Lectures
3. **Industrial Safety** : (a) Industrial accidents, Causes and costs (b) Process risks, Mechanical, Chemical and Electrical (c) Accident prevention; Safety education, preventive measures, protective equipments, machine safe guarding, (d) First aid. 5 Lectures
4. **Pollution control** : (a) Industrial Hygiene : Fatigue causes, fatigue reduction, (b) Clean environment, (c) Land pollution, scrap and waste control, (d) Water pollution, water treatment and sewage disposal, (e) Air pollution : Control of fumes, smoke; toxic material, noise, temperature. 6 Lectures

BOOK RECOMMENDED:

1. Hand book of industrial engineering and management by W. Grant Ireason and E.L. Grant (Prentice Hall of India, New Delhi).
2. Elements of Production planning and control by Samuel Eilon.
3. Industrial Engineering and management By O.P. Khanna (Dhanpat Rai and Sons.)
4. Industrial Organisation and Engg. Economics By Banga and Sharma (Khanna Publishers, New Delhi)
5. Industrial Engineering - By P.K. Khurana

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6. Quality control and Application by Hansen and Ghare (Prentice Hall India, New Delhi)
7. Purchasing and Materials Management by Lee and Doublers (Tate Mc Graw Hill Publishing Co. Ltd. New Delhi)
8. Statistical Quality control - By E.L. Grant (Wiley Eastern)

ME 404 MECHANICAL SYSTEMS AND DESIGN

FIRST TERM:

1. Design of sub assembles and machine elements (i) Design of brackets and pipe joints, (ii) Design of gear boxes, (iii) Design of welded joints (iv) design of chain drive. 18 Lectures
2. Design of flywheel and hydraulic press. 6 Lectures

SECOND TERM:

1. Design of I.C. Engine parts: Cylinders, Trunk pistons, Connecting Rods, Crank and crank shaft and valve gear. 16 Lectures
2. Design of Centrifugal pump. 8Lectures

BOOKS RECOMMENDED:

1. Machine design	by Maleev and Hartman.
2. I.C. Engine	by Maleev
3. Machine Design	by Wrigley and Taylor
4. Machine Design	by Panday and Shah
5. Machine Design	by Sharma and Agarwal
6. Machine Elements	by V. Dobrovolsky and others.

HAND BOOKS:

1. Design Data Book	by P.S.G. Institute of Tech., Coimbatore.
2. Design Data Book	by Mahadevan
3. Design Data Book	by Abdullah Shariff
4. A. Pocket Book for Mech. Engineers	by D.A. Low

MACHINE DESIGN (SESSIONAL WORK)

1. One major problem - Design and Drawing of an I.C. engine.
2. One minor problem - Any one of the following.

a. Design and drawing of a gear box
b. Design and drawing of a centrifugal pump.

ME 405 CONTROL SYSTEMS AND MEASUREMENT

FIRST TERM:

1. **Introduction:** Concept of automatic controls - open loop and closed-loop systems servomechanism-block diagrams-transfer functions.
2. **Representation of control components and systems:** Translational and rotational mechanical components-electrical components, series and parallel combinations-comparators for rotational and linear motions integrating devices-hydraulic servomotor temperature control systems. Speed control systems.
3. **System response:** First and second order systems responses to step-poise ramp and sinusoidal inputs-systems with distance velocity lag.

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4. **Controller Mechanisms:** Pneumatic hydraulic and electric controller's general principles and circuits for generating various control actions.
5. **Control System Analysis**: Transient response of simple control systems-stability of control systems-routh's Criterion.

SECOND TERM:

1. Control of block diagram.
2. **Pressure:** Use of monometers, Bourdon gauge, bellows type gauge, Measurement of vacuum and pressure, Transducers, static and dynamic; response of pressure measuring instruments.
3. **Flow:** Use of obstruction type meters. Variable area meters, Probes, Positive displacement type meters, hot wire Anemometry.
4. Temperature; Use of thermocouples, resistance thermometer, Pyrometer, thyristors static and dynamic response of temperature measuring instruments, Thermocouple errors and compensation, Heat flux measurements and meters.
5. **Strain:** Use of strain gauges, Static and dynamic response. Displacement, Velocity Acceleration, Jerk linear and angular. Piezoelectric pick/ups, Inductive type pickup, Force, Torque, Time Frequency and phase angel: Use of CRO: Electronic counters Density and viscosity of gases and liquids. Calorific value of solid liquid and gaseous fuels, Noise, Humidity Flow visualization, demonstration of shadow and Schleren, techniques, Introduction to Metrology

BOOKS RECOMMENDED:
TEXT BOOKS:

1. Automatic Control Engineering by Raven (Mc. Graw Hill Book co.)
2. Mechanical Measurement by Back with & Buck

REFERENCE BOOKS:

1. Automatic control system by Kuo (Prentice Hall of India Ltd.)
2. Control system engineering by Nagrath (Wiley Eastern Publication)

ME 406 GAD/CAM AND ROBOTICS

Introduction: Concept of CAD/DAM

Computer System, Computer aided Design system, Hardware, Computer Aided design system, Software transformation systems Geometric modeling draughting Applications of CAD/CAM techniques to finite element data preparation. Computer Aided Manufacture the APT System CNC DNC system, the use of Micro-computers in CAD/CAM system. Industrial Robotics
Automated guided vehicles, Process planning Materials management planning Implications of CAD/DAM for industry.

BOOKS:

1. Computer Aided Design and Manufacture By C.B. Besant & C.W. K LW
2. Principle of Computer aided Design By Joe Rooney & Philip Steamman
3. Computer Aided Design and Manufacture CAD/CAM - Groover & Jinner

ME 407 OPERATION RESEARCH

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Origin and Development of O, R Areas of Applications Allocation problems Transportation problem and Assignment problem, Linear Programming; Graphical and simplex Technique, Degeneracy Duality, Stepping stone method. MODI Method, Veggies Approximation Method, Introduction to simulation and mente-carls technique, Queuing theory, Introduction non-linear programming, Project Management by PERT and CPM Crashing of Network, Decompression of activity-Updating Dynamic programming

ME 408 MECHANICAL VIBRATIONS

FIRST TERM:

1. **Single Degree of Freedom:** Equations of motion, Undammed free vibration, Torsion Vibration, Free dumped Vibration, Forced damped vibration, Rotating and reciprocating unbalance, Vibration Isolation, Transmissibility, Logarithmic decrement, Equivalent viscous Damping, Coulomb Damping, Critical speed of shaft.
2. **Vibration Isolation:** Vibration Isolation and Transmissibility Materials used for Isolators and their properties.
3. **Two Degree of Freedom:** Principal modes, Dynamic absorb, Lagrange equation, Influence coefficients.

SECOND TERM:

1. **Natural Frequency of Lumped Mass Systems**: Rayleigh's method, Dunkerley's method, Matrix method, Matrix iteration method, Holzer's method.
2. **Vibration of continuous systems:** Vibration of strings, longitudinal vibration of bars, Torsion and Transverse vibration of beams.

TEXT BOOKS:

1. Vibrations for Engineers by K.K. Pujara (Dhanpat Rai and Sons)
2. Mechanical Vibration Analysis by Dr. O.S. Sharma (Khanna Publisher)

REFERENCES:

1. Mechanical vibration by Thomson.

ME 409 AUTOMOBILE ENGINEERING

FIRST TERM:

1. **Power Units:** Arrangement of cylinders, fuel supply system, and air cleaner. Silencer, engine lubrication, cooling system. 4 Lectures
2. **Transmission:** Transmission requirement, mechanical transmission, tractive resistance performance of vehicles, gear ratio, gear box, fluid transmission, hydromatic transmission, propeller shaft, universal joint, differential, rear axle, wheels and tyres. 16 Lectures
3. **Steering:** Front axle centre point steering, caster action, steering mechanism, power steering, wheel alignment.

SECOND TERM:

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1. **Braking System:** General braking requirement, elementary theory of shoe brake, weight transfer, mean lining pressure and heal generation during braking, mechanical and hydraulic brakes, weight distribution, stability of a vehicle on a slope, braking of a vehicle.
   12 Lectures
2. **Chassis and Suspension:** Chassis springs, engine mounting, suspension system, shock absorbers.
   4 Lectures
3. **Electrical System:** Ignition starting, lightening and generating system, cut out, voltage regulator, spark plug, electrical petrol gauge, trafficator, horn, wind screen wiper.
   6 Lectures
4. **Maintenance:** Trouble shooting, service station and its equipments.

TEXT BOOKS:

1. Automotive Mechanics by Heitner.
2. Problems on Automobile Engineering by Giri and Sinha.

REFERENCE BOOKS:

1. Motor Vehicles by Newton and Steed.
2. Automobile Engineering by Narang.
3. Automobile Engineering by A.W. Judge.
4. Automobile Engineering by Station Abbey.

Automobile Engineering Laboratory Sessional
At least six experiments based on Automotive Engines, transmission, brake, ignition, cooling system and steering system.

ME 410 METROLOGY

FIRST TERM:

1. **Definitions:** Precession and accuracy, linearity repeatability sensitivity, readability
   2 Lectures
   Types and sources of errors
   Linear measurement: Virnier height gauge, tests for their accuracy.
2. **Micrometer:** Instruments for internal measurement, telescopic internal gauge, hemi spherical gauge for small bores, pin gauge for bores, ball type plug gauge, Kelipart gauge for deep bores, and four ball methods slips gauge. 5 Lectures
3. **Comparator:** Characteristics, uses and special requirements, sigma mechanical comparator, reed types mechanical comparator, Eden Rolt comparator, mechanical optical comparator, Zeiss ultra optimeter, pneumatic comparator, velocity type and back pressure type, solex pneumatic gauge differential comparator, electrical comparator, relative merit and demerit of comparator.
   6 Lectures
4. **Angular Measurement:** Sine centre, straightness test by spirit level and auto collimator.
5. **Measurement by light wave interference:** Flatness testing, fringe patterns, NPL, flatness-interferometer, the pitter-NPL gauge, interferometer, Michelson Interferometer, parallelism testing.
6. Checking angle off a piece tapered on one side, to check angle of a tapered hole, to determine the included angle of an internal dove fall, to measure the angle of a V-groove, to determine the width of a V-groove, to measure internal taper angle gauges.
   5 Lectures

   SECOND TERM:

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7. **Fits and Gauges:** Definitions of terminology, composed tolerance, tolerance accumulation, fundamental deviation, calculation of limits, clearance, tolerance, etc.

8. Types of fits, Taylor's principle of limit gauging, type of limits gauges, materials of limit gauge, inter changeability and selective assembly.

9. **Gauge tolerance:** Design of ring and plug gauges. 7 Lectures

10. **Measurement and testing of spur gear:** Terminology of gear tooth, in volute curve, rolling gear test, measurement of tooth thickness by constant chord methods, gear tooth Virnier caliper, base tangent method, base pitch measurement, Runour measurement, tools profile checking. 5 Lectures

11. **Measurement of surface finish:** Terminologies centre line average, root mean square, maximum peak to valley height, surface inspection by comparison methods, roughness measurement by instruments.

12. **The Tomlinson surface meter:** Tracer type profilogram, Taylor-H
6 Lectures
13. Hobson Taysufr: Symbols for roughness grades and their approximate value, manufacturing process and values.

14. **Measurement of screw thread:** Screw terminology, error in screw threads, measurement of major diameter, minor diameter and effective diameter, two wire methods and three wire methods, best size of wire, checking thread form.

BOOKS:
Engineering Metrology by R.K. Jain

ME 411 REFRIGERATION AND AIR CONDITIONING

FIRST TERM:

1. **Air Refrigeration System:** Refrigeration Machine, heat pump, coefficient of performance, ideal refrigeration cycle, Bell Coleman refrigeration cycle, actual Bell Coleman, Refrigeration cycle, open and closed systems, applications of air refrigeration in air-crafts.
2. **Vapour Compression System:** Simple vapour compression refrigeration cycle, merits and demerits of this system, air refrigeration system, factors affecting the performance of a vapour compression, multistage vapour compression system, intercooler, flash chamber, accumulator and heat exchanger.
3. **Vapour Absorption System:** Simple and modified vapour absorption refrigeration system, Electrolux refrigerator, COP of heat operated refrigeration systems.
4. **Special Refrigeration System:** Absorption, cascade mixed, Vortex Thermoelectric and steam jet refrigeration system.

SECOND TERM:

1. **Refrigeration:** Classification and nomenclature of refrigerants, primary and secondary refrigerants, properties of some common refrigerants, physical, chemical and thermodynamics properties, selection of refrigerants, leakage of refrigerants and methods of detection.

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2. **Equipment:** Elementary discussion of refrigerating equipment, ice plant and cold storage.
3. **Psychometry:** Properties of air vapour mixtures, wet bulb, dew point and dry bulb temperatures, humidity, total heat, psychometric relation, psychometric chart and its uses, psychometric processes evaporative cooling.
4. **Air Conditioning:** General principles and requirement for comfort air conditioning, thermodynamics of human body, estimation of heating and cooling loads, capacity of cooling coils, humidification and dehumidification, unit air conditioner, central air conditioner, year around conditioner, humidity and temperature control, industrial applications of air conditioning systems.

TEXT BOOKS:

1. Refrigeration & Air Conditioning by Jordon & Priester
2. Refrigeration & Air Conditioning by Manohar Prasad
3. Refrigeration & Air Conditioning by C.P. Arora