SCHEME –SECOND YEAR

S. No.	CODE	SUBJECT	L	T	P	CREDITS
**SEMESTER - III**
1	MES-211	ENGINEERING MATHEMATICS – III	3	1	0	3
2	MED-212	ELECTRICAL MACHINES & DRIVES	3	1	0	3
3	MED-213	MANUFACTURING PROCESSES – I	3	1	0	3
4	MED-214	MECHANICS OF MATERIALS	3	1	0	3
5	MED-215	FLUID MECHANICS	3	1	0	3
6	MED-216	ELECTRICAL MACHINES LAB	0	0	3	2
7	MED-217	MANUFACTURING PROCESSES – I LAB	0	0	3	1
8	MED-218	MECHANICS OF MATERIALS LAB	0	0	3	1
9	MED-219	FLUID MECHANICS LAB	0	0	3	1
	TOTAL		\multicolumn{3}{c}{**H = 32**}	**20**

S. No.	CODE	SUBJECT	L	T	P	CREDITS
**SEMESTER - IV**
1	MES-221	COMPUTER PROGRAMMING & NUMERICAL METHODS FOR MECHANICAL ENGINEERS	3	1	0	3
2	MED-222	KINEMATICS OF MACHINES	3	1	0	3
3	MED-223	MANUFACTURING PROCESSES – II	3	1	0	3
4	MED-224	INTERNAL COMBUSTION ENGINE	3	1	0	3
5	MED-225	ENGINEERING METALLURGY	3	1	0	3
6	MED-226	MACHINE DRAWING	1	0	3+3	4
7	MES-226	COMPUTER PROGRAMMING & NUMERICAL METHODS LAB	0	0	3	1
8	MED-227	MANUFACTURING PROCESSES LAB – II	0	0	3	2
9	MED-228	INTERNAL COMBUSTION ENGINE LAB	0	0	3	1
	TOTAL		\multicolumn{3}{c}{**H = 36**}	**23**

MES-211   ENGINEERING MATHEMATICS-III

	L	T	P/D	Cr
	3	1	0	3

1. PARTIAL DIFFERENTIAL EQUATIONS

Formation and solutions of partial differential equations, Lagrange's linear equation of the first order, Non-linear equations, Charpit's method, Homogeneous linear equations with constant co-efficients, Non-homogeneous linear equations, Nonlinear equations of the second order (Monge's method), Method of separation of variables, Solution of wave equations, Heat flow equations, Laplace's equations and transmission line equations and their applications to engineering problems.

2. SPECIAL FUNCTIONS

Series solutions about ordinary and singular point, Series solutions of Bessel's and Legendre's equations, Bessel's functions and Legendre's, polynomials, Modified Bessel's functions, Recurrence relations, generating functions and orthogonal properties, Equations reducible to Bessel's equation, Ber and Bei functions.

3. INTEGRAL TRANSFORMS

Definitions and Types of Integral Transforms, Application of Laplace transform to IVP and BVP, Periodic functions, Fourier transforms, Finite Fourier Sine and Cosine Transforms, Properties of Fourier Transforms, Applications of Integral Transforms to simple engineering problems. Hankel Transforms and its applications

4. FUNDAMENTAL CONCEPT OF PROBABILITY

Mutually Exclusive , Independent events, Conditional probability, Tree diagram, Algebra of events, Multiplication rule, Baye's rule , Series and Parallel system, product law of reliability and unreliability.

5. PROBABILITY DISTRIBUTIONS

Introduction to discrete and continuous Random variables, probability functions, probability density function, cumulative distribution function and their properties, two dimensional random variables, joint distribution of several random variables ,cumulative marginal and conditional distribution functions, Expected value. Bernoulli Trials, Binomial Distribution, Poisson and Normal Distribution, Expected value and variance of continuous and discrete random variables,

TEXT BOOKS
1. Advanced Engineering Mathematics: by Erwin Kreyszig, John Wiley and Sons
2. Partial Differential Equation for Engineers and Scientists: J.N. Sharma and Kehar Singh
3. Engineering Mathematics, Babu Ram, Pearson
4. Advanced Engineering Mathematics: by R. K. Jain & S. R. K Iyengar,
5.

REFERENCE BOOKS
1. Elements of Partial Differential Equations: by Ian N. Sneddon, McGraw-Hill
2. Differential Equations: by Shepley L. Ross, John Wiley & Sons, New York.
3. Advanced Engineering Mathematics by Chandrika Prasad.
4. Higher Engg. Mathematics, B. V. Ramana TMH

MED-212 ELECTRICAL MACHINES AND DRIVES

L	T	P	Cr
3	1	0	3

1. BASIC CONCEPTS OF ROTATING ELECTRICAL MACHINES
Introduction to Lap and wave windings, EMF generation, Harmonics in generated emf, MMF produced by distributed winding.

2. DC MACHINES
E.M.F. generated in armature, Torque in DC machines, armature reaction, MMF and flux density waveform of DC Machines, Commutation process, Basic performance equations of DC machine. Magnetization and operating characteristics of DC generators and DC motors, DC motor starting and speed control, losses and efficiency, applications of DC motors.

3. SINGLE AND POLY PHASE INDUCTION MOTORS
Principle of operation on the basis of double revolving field theory, Equivalent circuit, performance calculations and characteristics, Maximum starting torque conditions in single phase induction motors, Hysteresis motor, Reluctance motor and stepper motor. Theory of three phase induction motors, slip, phasor diagram, equivalent circuits, expression for torque, maximum torque, starting torque and output power, torque-slip and power-slip characteristics, Speed control of induction motor, Cogging & Crawling, applications of poly-phase induction motors.

4. SYNCHRONOUS MACHINE
Exciters for synchronous machines, phasor diagrams for cylindrical rotor synchronous machines, starting of synchronous motor, Synchronous condenser.

5. DYNAMICS OF ELECTRIC DRIVES
Introduction to an electric drive system, parts of electric drive system, choice criteria, Dynamic equations of an electric drive, torque equations, multiquadrant operation, type of loads, Control of electric drives, modes of operation, speed control, open & closed loop drives, current limit control, torque limit control

6. DC MOTOR DRIVES
DC motor drive – starting, braking, speed control, controlled rectifier converters for DC drives and chopper fed DC drives.

BOOKS/REFERENCES

1. Electrical Machinery   by P.S. Bhimbra, Khanna Publishers, Delhi,7th Edition,2004
2. Electric Machinery by A.E.Fitzerald, C.Kingsley and S.D.Umans, Tata McGraw Hill,6th   Edition, 2002
3. Theory of AC Machinery by A.S.Langsdorf, Tata McGraw Hill, 2nd Edition, 1955
4. Electrical Machines by Ashfaq Hussian, Dhanpat Rai & Company, 2nd Edition, 2002.
5. Fundamentals of Electrical Drives by G.K. Dubey, Alpha Science International Ltd.,2nd Edition,2001
6. Modern Power Electronics & Drives by B.K. Bose, Prentice Hall PJR,2002
7. Electric Drives-Concept and Applications by Vedam Subrahmanyam, TMH Ltd., 1994.
8. A First Course in Electrical Drives by S.K.Pillai, New Age International (P) Limited, 2nd Edition, 2004.
9. Generalized theory of Electrical Machines by P.S.Bhimbra, Khanna Publishers Delhi, 5th Edition, 2003.

MED-213   MANUFACTURING PROCESS-I

	L	T	P/D	Cr
	3	1	0	3

1. INTRODUCTION

Introduction to manufacturing, environmentally conscious design and manufacturing, general trends in Manufacturing, Responsibility of manufacturing engineer. Classification of materials and selection of materials for mechanical design; Mechanical, Physical and Thermal properties materials and Mechanical testing of materials.

2. METAL CASTING PROCESS

Introduction, Solidification of metals, cast structures, concept Fluid flow and heat transfer in casting process, Furnaces, Casting alloys. Pattern, Pattern materials and Pattern allowances, molds, gating and riser types and design principles, various casting techniques, casting defects and their remedy; Casting design principles and Economics of casting.

3. METAL AND SHEET METAL FORMING PROCESSES

Introduction, Elastic and Plastic deformation, yield criterion, hot working and cold working. Bulk deformation processes with analysis: Forging, Rolling, Extrusion, Rod, Wire and Tube drawing, Swaging, Die manufacturing method and Die failures. **Sheet Metal forming**: Processes and classification with analysis, Formability of sheet metals, Equipment for sheet metal forming, Design considerations, Economics of sheet metal.

4. JOINING AND FASTENING PROCESSES

Introduction, Classification of welding processes: Arc-welding processes, High energy beam welding, Fusion welding joints, Cold welding, Ultrasonic welding, Friction welding, Resistance welding, Explosion welding, Diffusion bonding, Brazing and Soldering, Mechanical Fastening, Joining Plastics, Ceramics and Glasses, Design consideration in Joining, Economic considerations in welding; Introduction to fabrication of microelectronic and mechanical devices.

5. PROCESSING OF METAL POWDER, CERAMICS, GLASSES, COMPOSITES and SUPER CONDUCTORS

Introduction, Production of Metal Powders, Compaction of metal powders, Sintering, Secondary and Finishing Operations, Design consideration of Powder Metallurgy, Economics of Powder metallurgy. Ceramics: structure, properties and applications, Shaping ceramics, Glasses: structures properties and applications, Shaping and forming glasses, Design consideration ceramics and glasses, Processing of metal matrix and ceramic matrix composites, Processing of Super conductors.

6. PROCESSING OF POLYMERS AND REINFORCED PLASTIC COMPOSITES

Introduction, Structure, Behavior, Properties, General characteristics and applications of Thermo-Plastics and Thermosets. High temperature Polymers, electrically conducting polymers and biodegradable Plastics. Elastomers, Reinforced Plastics, Processing of Plastics, Processing of Polymer-Matrix-reinforced Plastics, Design considerations and Economics of Processing of Plastics.

TEXT BOOKS

1. Manufacturing Process for Engineering Material by Kalpakjian; Person Pub.(Text Book)
2. Manufacturing Engineering and Technology by Kalpakjian; Person Pub.
3. Manufacturing Engineering and Technology by Groover; TMH Pub.
4. ASM Hand Books on Casting, Welding and Forming
5. Manufacturing Technology P.N.Rao

MED- 214　　　　　　MECHANICS OF MATERIALS

L	T	P	Cr
3	1	0	3

1. ANALYSIS OF STRESS & STRAIN

State of stress, stress on arbitrary plane, Equality of cross shear, stress invariants, Principal planes, Mohr's Circle for 3-D state of stress, Octahedral stresses, state of pure shear, Cauchy's stress quadric, Introduction to strain and rectangular strain components, state of strain at point, cubical dilatation, compatibility conditions.

2. SLOPE AND DEFLECTION OF BEAMS

Review of bending theory, relationship between slope, deflection and radius of curvature, Slope and deflection of various types of beams with various loadings by Macaulay's method, double integration method and Moment area method, Fixed & continuous beams.

3. CURVED BEAMS

Bending of beams with initial curvature, Division of curved beams on the basis of radius of curvature, Beams with large radius of curvature, Values of link radius (h^2)for –Rectangular, Trapezoidal, Circular, T, I, and Triangular section Position of neutral axis, Stresses in a crane hook, chain link and ring ,variation of stresses across the section.

4. COLUMNS AND STRUTS

Types of columns Failure of column, Euler's column theory, Slenderness ratio, End conditions for long columns, Equivalent length of columns, Limitation of Euler's formula, Factor of safety, Empirical relations-Rankine's Straight line and Johnson's parabolic formula

5. UNSYMMETRICAL BENDING AND SHEAR CENTER

Definitions, product of inertia, parallel axis theorem of product of inertia, Unsymmetrical bending ,stresses due to unsymmetrical bending –combined and axial loads, shear center –for symmetrical section, Equal leg angle section and channel section.

6. THICK PRESSURE VESSELS

Thick cylindrical shell. Stresses in thick shells, Derivation for radial and circumferential stress for a thick shell subjected to internal fluid pressure Longitudinal and shear stresses, Distribution of stresses across the shell thickness, Cylindrical shell subject to both internal and external fluid pressure compound cylinders distribution of stresses across the thickness of compound cylinder, thick spherical shells under internal fluid pressure, wire wound cylinders.

7. THEORIES OF ELASTIC FAILURE

Introduction to theories of failure, Graphical representation of theories of Elastic Failure and significance, Application of theories of elastic failure. Utility of factor of safety in design.

TEXT BOOKS

1. Mechanics of Materials Vol. & II　　　　: E.J.Hearn
2. Strength of Materials　　　　　　　　: Timoshenko
3. Mechanics of Solids　　　　　　　　　: Kazmi
4. Mechanics of Materials　　　　　　　: Beer, Johnston & DeWolf
5. Advanced Mechanics of Materials　　　: Boresi and Schmidt
6. Advanced mechanics of material　　　　: Solecki & Conant
7. Engineering mechanics of solids　　　　: Egor P. Popov

MED-215　　　　　　　ENGINEERING METALLURGY

	L	T	P/D	Cr
	3	1	0	3

1. FUNDAMENTALS OF MECHANICAL BEHAVIOR
Engineering materials, Material properties: Tension, compression, torsion, hardness, Fatigue, creep etc.

2. STRUCTURE OF METALS AND ALLOYS
Elementary consideration of structures of metals, space lattices, crystal systems allotropy, grain boundaries.

3. PHASE DIAGRAMS
Solidification of metals, cooling curves, phase rule, solid solution, Eutectic and peritectic systems, Inter-metallic compounds. Interpretation of Equilibrium diagrams.

4. FERROUS ALLOYS
Iron carbon equilibrium diagram, Plain carbon steels, alloys steels, tool steels and heat resistant steels-classification composition and uses. Impurities in steel, hot shortness, and cold shortness, Manufacture, properties and uses of cast irons – Grey, malleable and nodular, ISI specifications.

5. NON-FERROUS METALS AND ALLOYS
Copper, aluminum, magnesium, nickel, zinc, and lead – base alloys, Equilibrium diagrams of some important alloys like bronze, brass, bearing materials, Age hardening of non-ferrous metals.

6. HEAT TREATMENT OF STEEL
Critical temperatures on heating and cooling, equilibrium structures – annealing normalizing, Martensitic transformation and tempering isothermal transformation diagrams, Quenching and hardening, Harden ability and harden ability tests, Interrupted quenching, surface hardening processes.

7. MECHANICAL WORKING OF METALS
Hot and cold working, Recovery, Recrystallization, Soldering and brazing alloys.

8. CORROSION AND OXIDATION
Types of corrosion, oxidation Design against corrosion, protective coatings and environment control.

TEXT BOOKS

1. Engineering Metallurgy　　　　　　　　: A.G.Guy
2. Engineering Metallurgy　　　　　　　　: S.P.Nayak
3. Fundamentals of Engineering Metallurgy　: F.W.J.Bailey
4. Physical Metallurgy　　　　　　　　　: Avener
5. Metallurgy for Engineers　　　　　　　: E.C. Rollason
6. Physical Metallurgy　　　　　　　　　: V. Raghavan

MED-216   **FLUID MECHANICS**

	L	T	P/D	Cr
	3	1	0	3

1. **FLUID STATICS**
   Brief History of Fluid Mechanics, Fluid & Their properties, Viscosity, Pressure measurement, Basic equation of fluid statics, absolute and gauge pressures, Pressure measuring devices, manometers, forces on submerged surfaces, stability of floating and submerged bodies.

2. **FLUID KIMEMATICS**
   Flow Kinematics, Concepts of streamline, streamline etc., Velocity, Acceleration, Euler's equation, circulation, vorticity and rotation, Irrotational flow, velocity potential stream function, Continuity Equation.

3. **FLUID DYNAMICS**
   Reynolds transport theorem, Integral form of continuity, momentum and energy equation, Bernoulli's equation and its application, venturimeter, orifice, mouth pieces, weirs and notches, linear momentum equation and its applications, forces on pipe junction, bends, stationary flat and curved vanes, moment of momentum equation, Dimensional homogeneity, dimensionless ratios, dimensions and units, dimensionless parameters, similitude and model studies

4. **VISCOUS FLOW**
   Equation of motion for laminar flow through pipes-Hagen Poiseuille formula, Flow between parallel flat plates, Couette flow, Plane Poiseuille flow, Flow through pipes, minor and major losses, Transition from laminar to turbulent, Reynolds experiment, Eddy viscosity, Mixing length concept and velocity distribution in turbulent flow, unsteady motion of flat plates.

5. **BOUNDARY LAYER CONCEPTS**
   Boundary layer equations, estimation of laminar boundary layer thickness for flat plate and drag by momentum integral method, boundary layer separation

6. **COMPRESSIBLE FLOW**
   Compressibility, Mach number, Area velocity relation, isentropic relations, 1-D compressible flow, Normal Shock.

   TEXT BOOKS
   1. Fluid Mechanics and Its Applications   : V.K.Gupta et.al.
   2. Fluid Mechanics   : F.M.White
   3. Fluid Mechanics   : Yunus Cengel

MES- 221 COMPUTER PROGRAMMING & NUMERICAL METHODS
FOR MECHANICAL ENGINEERS

L	T	P/D	Cr
3	1	0	3

1. **PROGRAMMING FUNDAMENTALS & TECHNIQUES**
   Steps in program development, algorithm, flowchart, pseudocode, evolution and classification of programming languages, Basics of mathematical programming languages such as FORTRAN, MATLAB, C, C++ etc.

2. **NUMERICAL COMPUTATIONS AND ERRORS ANALYSIS**
   Introduction, Numbers and their accuracy, Floating point arithmetic, errors in numbers, Computational methods for error estimation, General error formulae-approximation of a function, series approximations and error propagation in computation.

3. **ALGEBRAIC AND TRANSCENDENTAL EQUATIONS**
   Revision of some basic concepts on polynomial equations, Bisection method, iterative method, Regula-falsi method, Newton-Raphson method, Secant method, Generalized Newton's method for multiple roots, solution of non- linear simultaneous equations and finding complex roots by Newton-Raphson method.

4. **SYSTEM OF SIMULTANEOUS ALGEBRAIC EQUATIONS**
   Solution of system of algebraic linear equations-Gauss elimination method, Jacobi's method and Gauss-Seidal method, Eigen values and Eigen vectors-Power method, Jacobi's method and Householder method.

5. **INTERPOLATION AND FUNCTION APPROXIMATIONS**
   Least square curve fit and trigonometric approximations, Approximations by trigonometric polynomials and quality of approximations, Finite differences and difference operators, Newton's interpolation formulae, Gauss forward and backward formulae, Sterling, Bessel's and Evertte's formulae, Interpolation with unevenly spaced data points-Lagrange's interpolation.

6. **NUMERICAL DIFFERENTIATION AND INTEGRATION**
   Numerical differentiation, errors in numerical differentiation, Maximum and minimum values of a tabulated function, Numerical integration- Trapezoidal, Simpson's 1/3 and 3/8 rules, Boole's and Weddle's rules, Romberg integration- recursive formulae, Evaluation of double integrals by Trapezoidal and Simpson's rules.

7. **ORDINARY DIFFERENTIAL EQUATIONS**
   Taylor's series method, Picard's method, Euler's method, Modified Euler's method, Runge- Kutta methods of 2nd and 4th order, Adams- Moltan and Miline methods, Solution of simultaneous and higher order equations. Finite Difference Method to solve ordinary differential equation.

8. Application of Programming and Numerical methods to solve various problems related to mechanical engineering.

   Text Books:
   1. Numerical Methods for Engineers and Scientists   : J.N. Sharma
   2. Numerical Analysis   : F. B. Hildbrand
   3. Numerical Method for Engineers and Scientists   : Jain, Iyengar and R. K. Jain
   4. Introductory Methods of Numerical Analysis   : S.S. Sastry
   5. Programming with C   : Byron GottFried
   6. An Introduction to Programming and Numerical Methods in MATLAB   : Otto & Denier

MED-222   KINEMATICS OF MACHINES

	L	T	P/D	Cr
	3	1	0	3

1. **INTRODUCTION**
   Plain motion, kinematic concepts of links; basic terminology and definitions; inversion of kinematic chain.

2. **MOTION, AND FORCE ANALYSIS**
   Absolute and relative motion, kinematic and dynamic qual1tities and their relationship, vector diagram, instantaneous centers, velocity and acceleration polygons, special graphical methods for slider crank mechanism.

3. **KINEMATIC SYNTHESIS OF MECHANISMS**
   Introduction, Movability of four bar linkage, Frendenstein's Equation, Function Generation, Errors in synthesis problems, Chebyshev spacing of Precision points.

4. **POWER TRANSMISSION**
   Flat belts and the kinematic design of pulleys, V-belts, length of belts, transmission of power by belts, condition for maximum power transmissions, initial tension.

5. **GEARS**
   Fundamental law of gearing, classification and basic terminology, involute tooth profile and its kinematic considerations, type of gears, standards in tooth forms, gear trains, simple, compound, reverted and epicyclic gear train.

6. **FRICTION DEVICES**
   Coulomb friction, pivots and collars, power screws, plate and cone clutches.

7. **BRAKES AND DYNAMOMETERS**
   Types of brakes, band, block, band and block, internal expanding shoe brake, determination of pressure and torque on internal expanding shoe brakes, Dynamometers, types: absorption and transmission dynamometers, prony brake dynamometer, rope brake dynamometer, belt transmission dynamometer, torsion dynamometer.

8. **LUBRICATION**
   Theory of lubrication, hydrodynamic & hydrostatic lubrication.

   TEXT BOOKS:
1. Theory of Machines   : J Lal
2. Theory of Machines   : P.L.Ballaney
3. Theory of Machines   : V.P.Singh
4. Theory of Machines   : S. S. Rattan Mechanism & Machine Theory Rao & Dukkipati
5. Theory of Machines   : Mallib
6. Theory of Machines   : Abdulta Sharif
7. Theory of Machines   : R.K.Bansal

MED- 223   MANUFACTURING PROCESS-II

	L	T	P	Cr
	3	1	0	3

1. **MACHINING PROCESSES AND MACHINE TOOLS**
   Introduction, Types of motions in Machining, Types of machines, Machining operations and Machining Parameters related quantities for: Turning, Milling, Boring, Shaping, Planing, Slotting, Drilling, Reaming, Broaching, Grinding, Fine finishing operations, Gear cutting and gear finishing machines; Cutting speeds, Feeds and depth of cut used generally in Machining.

2. **DESIGN PRINCIPLES OF CUTTING TOOLS, JIGS AND FIXTURES**
   Design of Single point turning, parting and boring tools. Design of form tools: broach design, milling cutter, drill bit for milling, twist drill. Design of thread cutting tools, reamers, Jigs and Fixtures, Clamps

3. **DESIGN FEATURES OF MACHINE TOOLS**
   Introduction, A single Machine tool Manufacturing system, Performance criterion of machine tools, essential steps in design of machine tools, Design of machine tool drives, Design of machine tool spindle, Design of spindle bearings, design of sideways and guide ways, Design of controls and displays, Devices for automatic lubrication, safety devices, Machine tools testing

4. **NON CONVENTIONAL MACHINING**
   Introduction, Ultra sonic machining, Abrasive jet machining, Electrical Discharge machining, Electrical Discharge wire cut machining, Laser beam machining, Electron beam machining, Chemical machining, Electrochemical grinding; Thermal and non-thermal analysis and applications

5. **NON- DESTRUCTIVE TESTING**
   Introduction, Selection of Nondestructive (N-D) method, Visual inspection, Dye penetration testing, Magnetic particle inspection, Eddy current testing, Ultrasonic inspection and Radiography inspection

6. **METROLOGY**
   Introduction, Interchangeability, Comparators, Gauges, Sine Bars, Surface finish measurements, Limit Gauges, Autocaulimeters, Angle measurement, Laser metrology, Tool Maker's microscope, Profile projector.

   TEXT BOOKS:
1. Fundamental of Metal cutting and Machine tools   : B.L.Juneja
2. Manufacturing Process for Engineering Material   : Kalpakjian; Person Pub.
3. Manufacturing Engineering and Technology   : Kalpakjian; Person Pub.
4. Manufacturing Engineering and Technology   : Groover; TMH Pub.
5. ASM Hand Books on Machining and Testing of materials
6. The testing instruction of engineering material   : Davis H.E. Troxel, Mc grawHill
7. Metal cutting theory and practice   : Bhattacharya New central book agency Pub.

MED-224   **INTERNAL COMBUSTION ENGINES**

	L	T	P	Cr
	3	1	0	3

1. **INTRODUCTION**
   Otto, Diesel, dual and Stirling cycle, Comparison of cycles, Actual cycles and their analysis, Classification of IC Engine, two stroke and four stroke cycle engines, Difference between C.I. and S.I. engines, Engine Design and operating parameters

2. **COMBUSTION OF S.I. ENGINES**
   Combustion in S.I. Engines, Flame front propagation, Flame speed, Ignition delay, abnormal combustion, Combustion chambers for S.I. engines

3. **COMBUSTION OF C.I. ENGINES**
   Combustion in C.I. Engines, Ignition delay, Combustion knock, combustion chamber for C.I. engines, fuel injection testing

4. **TESTING AND PERFORMANCE**
   Parameters, Engine power, Engine efficiencies, Type of tests and characteristic curves, Variables affecting performance characteristics, Methods of improving engine performance

5. **CARBURETION, LUBRICATION, COOLING AND IGNITION SYSTEM**
   Simple and complete carburetors, Gasoline Injection, combustion design for S.I. Engines, Friction and lubrication, Types of lubrication systems, Engine cooling Ignition systems, Magneto and Battery ignition systems, Ignition timing

6. **EMISSION**
   Engine economy, Air pollution due to IC engines, Engine emissions, Particulates, Emission control methods, EGR (Exhaust gas recirculation)

7. **FUELS**
   Fuels and their properties, Stoichiometric and actual air requirements, Flue gas analysis

8. **MODERN DEVELOPMENTS IN IC ENGINES**
   Electronic fuel injection, MPFI, CRDi, iVTEC, HCCI, etc.

   TEXT BOOKS:
   1. I.C. Engines Fundamentals   : J. B. Heywood
   2. Internal combustion Engine   : Sharma & Mathur
   3. Internal combustion Engine   : V.Ganeshan
   4. I.C.Engine Analysis and Practice   : E.F.Obert

MED-225   MACHINE DRAWING

	L	T	P	Cr
	1	0	3+3	4

1. **SHAFT COUPLINGS**
   Drawing of muff coupling, flanged coupling, pin type f1exible coupling

2. **KEYS, COTTER JOINTS & PIN JOINTS**
   Sketch of taper- keys, sunk taper- keys, saddle keys, Round or pin key, Gib head, parallel, or- feather keys, spline shafts, woodruff key, Drawing of cotter and outer joint, knuckle joint.

3. **FASTENERS**
   Form and proportions of screws, nuts, locking arrangements, foundation bolts, washers, bolts, proportions of rivets, riveted joints, welding symbols and welded joints

4. **PIPE JOINTS**
   Drawing of flanged joint for C.I. pipes, sketch of spigot and socket joint.

5. **ASSEMBLY OF FOLLOWING MACHINE PARTS TO BE DRAWN**
(a) Plummber block, foot step bearing
(b) Steam engine stuffing box, stop valve, cross head.
(c) I.C.Engine connecting rod
(d) Lathe tail stock.
   Surface finish, fits and tolerances to be indicated on working drawings as per-BIS conventions.
   Practical assignments on modeling of machine components using software.

   TEXT BOOKS:
   1. Machine Drawing   : N.D.Bhat
   2. Machine Drawing   : Narayana, Kannaiah, Reddy
   3. Machine Drawing   : P.S.Gill
   4. Machine Drawing   : R.K.Dhawan
   5. Machine Drawing   : G.R.Nagpal
   6. Geometrical & Machine Drawing   : Parkinson