SCHEME OF COURSES FOR B.TECH IST YEAR
COMMON TO ALL BRANCHES

B.Tech I year,I Semester
(Common to all branches)

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total
1.	PH-101T	Engineering Physics-I	4	310	4
2.	CY-101T	Engineering Chemistry	4	310	4
3.	MA-101T	Engineering Mathematics-I	4	310	4
4.	HU-101T	Communicative English	3	310	4
5.	CS-101T	Computer Programming and Fundamentals	3	210	3
6.	ME-101T	Manufacturing Techniques	2	200	2
7.	ME-103T	Engineering Graphics	3	120	3
		Total	**23**		**24**
Laboratory Courses					
8.	PH-101P	Engineering Chemistry Lab	2	003	3
9.	CS-101P	Computer Programming Lab	2	003	3
10.	ME-101P	Workshop Practice Lab	2	003	3
Total			**6**		**9**
G. Total			**29**		**32**

B.Tech I year II Semester
(Common to all branches)

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total
1.	EI-102T	Basic Electronics Engineering	4	310	4
2.	MA-102T	Engineering Mathematics-II	4	310	4
3.	EE-102T	Basic Electrical Engineering	4	310	3
4.	PH-102T	Engineering Physics-II	4	310	4
5.	CY-102T	Environmental Studies: Scientific &Engineering Aspects.	3	300	3
6.	HU-102T	Fundamental of Economics	3	300	3
7	ME-104T	Basic Mechanical Engineering	4	310	4
Total			**26**		**27**
Laboratory Courses					
8.	CY-102P	Basic Electronics Lab	2	003	3
9.	EC-102P	Engineering Physics lab	2	003	3
10.	CS-102P	Basis Electrical Engineering Lab	2	003	3
Total			**6**		**9**
G. Total			**32**		**36**

B.Tech II year III Semester Mechanical Engineering

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. L T P	Total
1.	ME-201T	Kinematics of Machines	4	3 1 0	4
2.	ME-203T	Production Processes-I	4	3 1 0	4
3.	ME-205T	Fluid Mechanics	4	3 1 0	4
4.	MA-201T	Engineering Mathematics - III	4	3 1 0	4
5.	ME-207T	Material Science	4	3 1 0	4
6.	ME-221T	Human Values and Professional Ethics-I	2	200	2
		Total	**22**		**22**
Laboratory Courses					
7.	ME-201P	Kinematics of Machines Lab	2	0 0 3	3
8.	ME-203P	Production lab	2	0 0 3	3
9.	ME-205P	Fluid Mechanics Lab	2	0 0 3	3
		Total	**6**		**9**
		G. Total	**28**		**31**

B.Tech II year IV Semester Mechanical Engineering

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total
1.	ME-202T	Dynamics of Machines	4	3 1 0	4
2.	ME-204T	Mechanics of Solids-I	4	3 1 0	4
3.	ME-206T	Internal Combustion Engines	4	3 1 0	4
4.	ME-208T	Production Processes-II	4	3 1 0	4
5.	ME-222T	Human Values and Professional Ethics-II	2	200	2
6.	EE-202T	Elements of Electrical Machines	3	2 1 0	3
		Total	**21**		**21**
Laboratory Courses					
7.	ME-202P	Dynamics of Machines Lab	2	0 0 3	3
8.	ME-204P	I.C. Engines lab	2	0 0 3	3
9.	ME-206P	Machine Drawing Lab	2	0 0 3	3
10.	ME-220P	Mini Project-I	2	0 0 3	3
11.	EE-202P	Electrical Machines Lab	2	0 0 3	3
		Total	**10**		**15**
		G. Total	**31**		**36**

B.Tech III year V Semester Mechanical Engineering

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total
1.	ME-301T	Mechanics of Solids-II	4	3 1 0	4
2.	ME-303T	Mechanical Engineering Design-I	4	3 1 0	4
3.	ME-305T	Energy Conversion	4	3 1 0	4
4.	ME-307T	Heat Transfer	4	3 1 0	4
5.	ME-309T	Mechanical Measurement and Metrology	4	3 1 0	4
6.	ME-311T	Operations Management	4	3 1 0	4
		Total	**24**		**24**
Laboratory Courses					
7.	ME-301P	Mechanics of Solid Lab	2	0 0 3	3
8.	ME-303P	Heat & Mass Transfer lab	2	0 0 3	3
9.	ME-305P	Mechanical Measurement Lab	2	0 0 3	3
		Total	**6**		**9**
		G. Total	**30**		**33**

B.Tech III year VI Semester Mechanical Engineering

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total
1.	ME-302T	Computer Aided Design	4	3 1 0	4
2.	ME-304T	Mechanical Engineering Design-II	4	3 1 0	4
3.	ME-306T	Production Planning & Control	4	3 1 0	4
4.	ME-308T	Turbo & Fluid Machinery	4	3 1 0	4
5.	ME-310T	Operation Research	4	3 0 0	4
6.	ME-***	Elective-I	3	3 1 0	4
		Total	**23**		**24**
Laboratory Courses					
7.	ME-302P	CAD Lab	2	0 0 3	3
8.	ME-306P	Turbo & Fluid Machinery Lab	2	0 0 3	3
9.	ME-320P	Mini Project-II	2	0 0 3	3
		Total	**6**		**9**
		G. Total	**29**		**33**

Student has to undergo a summer training of 45 days at the end of VI Sem.

B.Tech IV year VII Semester Mechanical Engineering

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total
1.	**	Open Elective (Offered by Science and Humanities Department.)	3	3 0 0	3
2.	***	Pool Elective (Offered by Engineering departments.)	4	3 1 0	4
3.	ME-403T	Computer Aided Manufacturing	4	3 0 0	4
4.	ME-415T	Value Engineering/Mooc,s	4	3 1 0	4
5.	ME-405T	Seminar	2	0 0 3	3
6.	ME-***	Elective-II	4	3 1 0	4
7.	ME-401	Industrial Training (viva)	3	-----	-----
		Total	**24**		**22**
Laboratory Courses					
8.	ME-401P	Industrial Engg. Lab	2	0 0 3	3
9.	ME-403P	CAM Lab	2	0 0 3	3
10.	ME-405P	Minor Project-I	2	0 0 3	3
		Total	**6**		**9**
		G. Total	**30**		**31**

B.Tech IV year VIII Semester Mechanical Engineering

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total
1.	ME-***	Elective III	4	3 1 0	4
2.	ME-***	Elective-IV	4	3 1 0	4
3.	ME-406T	Refrigeration & Air Conditioning	4	3 1 0	4
4.	ME-***	Elective –V	4	3 1 0	4
		Total	**16**		**16**
Laboratory Courses					
5.	ME-406P	Refrigeration & Air Conditioning lab	2	0 0 3	3
6.	ME-404P	Major Project-II	10	0 1 5	06
		Total	**12**		**09**
		G. Total	**28**		**25**

LIST OF POOL ELECTIVES

SI. No.	Course No.	Subject
1.	ME-473T	Work Study
2.	EC-475T	Audio Engineering
3.	EC-477T	Integrated Circuit Technology
4.	CS-479T	Artificial Intelligence
5.	CS-481T	Image Processing
6.	ME-475T	Non Conventional Energy sources

The above list is subject to expansion/modification.

LIST OF OPEN ELECTIVES

SI. No.	Course No.	Subject
1.	HU-491T	Principal of Management
2.	MA-491T	Operations Research
3.	CY-491T	Charge Transfer in Plasma
4.	HU-493T	Introduction to Psychology
5.	CY-401T	Polymeric Materials and their Applications
6	PH-419T	Futuristic Materials
7.	PH- 429T	Material Imperfection and Applications
8.	HU-402T	Engineering Economics
9.	HU-409T	Quantitative Methods in Economics
10.	HU-407T	Foreign Trade

The above list is subject to expansion/modification.

LIST OF DEPARTMENTAL ELECTIVES

Elective-I		
SI. No.	**Course No.**	**Subject**
1.	ME-312T	Advance Welding Technology
2.	ME-314T	Powder Metallurgy
3.	ME-316T	Automotive Mechanics
4.	ME-318T	Statistical Quality Control
5.	ME-320T	Advance Fluid Mechanics

Elective-II		
SI. No.	**Course No.**	**Subject**
1.	ME-407T	Power Plant Engineering
2.	ME-409T	Composite Materials
3.	ME-411T	Fracture Mechanics
4.	ME-413T	Tribology
5.	ME-417T	Advanced Manufacturing Systems

Elective-III		
SI. No.	**Course No.**	**Subject**
1.	ME-402T	Cryogenic Engineering
2.	ME-404T	Industrial hydraulics
3.	ME-408T	Advance Precision Machining Processes
4.	ME-410T	Metal Forming
5.	ME-430T	Non Destructive Testing

Elective-IV		
SI. No.	**Course No.**	**Subject**
1.	ME-412T	Mechanical Vibration
2.	ME-416T	Gas Dynamics
3.	ME-418T	Maintenance Management
4.	ME-420T	Failure Analysis
5.	ME-422T	Principles of Robotics

Elective-V		
SI. No.	**Course No.**	**Subject**
1.	ME-414T	Industrial Management
2.	ME-424T	Heat Exchanger Design
3.	ME-426T	Computational Fluid Dynamics (CFD)
4.	ME-428T	Finite Element Method

ME.201T	**KINEMATICS OF MACHINES (III Sem)**				
Credits:04		**L**	**T**	**P**	**Total**
Max. Marks:		**3**	**1**	**0**	**04**

1. Basic Concepts**:** Kinematic Quantities (Displacement, velocity, Acceleration), structure, machine, degree of freedom, mechanisms, Kinematic link, Kinematics Pairs, Kinematics chain, joints, Types of joints, inversion of Mechanism, four bar mechanism, Inversion of four bar mechanism, slider crank mechanism, Inversion of slider-crank mechanism, Inversion of double slider crank Mechanism, Grublers Equation, Kutzbach Criterion (Numerical problems).
2. Kinematic Synthesis of linkages: Type, Number and Dimensional Synthesis, Synthesis of dwell mechanisms Intermittent Rotory Motion problems Movability of four bar mechanism (Grashoffs Criterion), function generation, path generation, approximate & exact synthesis of function & path generation, chebyshev's spacing of accuracy points, function generation of four bar linkages (Freudenstein's Equation), function-generation of Slider-Crank mechanism using three accuracy points only, Three position synthesis, Bloch's Method of synthesis.
3. Velocity in Mechanism: Instantaneous Center Method-Analysis of reciprocating engine mechanism, Analysis of four bar mechanism, Number and types of instantaneous centres in mechanism, Method for locating an instantaneous Center, Kennedy Theorem, Procedure for locating instantaneous Centres, (Numerical problems).

   Relative velocity method- Velocities in four bar chain, velocities in slider-crank mechanism, rubbing velocity, Mechanical advantage. (Numerical problems)
   Acceleration in Mechanism: Acceleration of a body moving along a circular path, Acceleration diagram for a link, Acceleration diagram for slider-Crank mechanism, Acceleration of intermediate and affect points. Coriolis acceleration Component. (Numerical problems)

4 Analysis & Synthesis of cam follower mechanism, cam profile, pressure angle, cam size, Motions of followers, cycloidal motion, Cam profile construction with different followers.

5 Gear: Introduction, Classification of gears, Basic terminology, Law of gearing, velocity of sliding Cycloidal profile teeth, In volute profile teeth, length of path of contact, length of arc Contact, interference, minimum no of teeth to required to avoid interference wheel and pinion helical gears, Spiral gears. (Numerical problems).
Gear Train: Introduction, Types of gear trains-Simple, Compound, reverted, Epicyclic, velocity ratio of simple gear train, compound gear train, Epicyclic gear train, Sun and planet gear train, Compound epicyclic gear train. (Numerical problems)

Text Book:

(i) Theory of Machines by Jagdish Lal (ii) Theory of Machines by P.L.Baliney
(iii)Theory of Machines by S.S. Rattan

ME.202T	**DYNAMICS OF MACHINES (IV Sem)**			
Credit:04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 Static Force Analysis- Applied and Constraint forces, Free Body diagrams, Conditions for equilibrium, Friction-force models, Static force analysis with friction, gear force analysis.

Dynamic force Analysis- Inertia forces and D' Alembert's principle, Euler's Equations of motion, the principle of Superposition.

Unit:2 Dynamical System- Force on reciprocating parts of an engine. Considering friction and inertia of moving parts, Turning moment on Crank-shaft, Turning moment diagrams for different types of engines, Fluctuation of energy, Fluctuation of speed of Crank-shaft, Fly wheels, calculation of fly wheel size operation of a fly wheel in a punching press (Numerical problems).

Unit:3 Governors-Functions, type and analysis of following types of governors: Watt, Porter, Prowel, Hartnell, Willson Harnell, Pickering. Hunting, Isochronisms, Stability, Efforts and Power of governors. Sensitiveness, controlling forces (Numerical problems).

Gyroscope-Principle and application of gyroscope. Gyroscopic Couple, Effect of Gyroscopic couple on the stability of automotive vehicles, Gyroscopic Power on the ships and aero-planes. (Numerical problem).

Unit:4 Definitions, Types of friction, friction in screw jack, Limiting friction, friction in pivot and collar bearing, Disc and collars. Friction clutches-Disc clutch, Multi plate clutch, Centrifugal Clutch, Cone clutch.

Brakes- Types of brakes, shoe brake, Band brake, Band and block brake, Internal expanding shoe brake. (Numerical problems).

Dynamometer- Absoption dynamometer, Transmission dynamometer, Torsiondynamometer. (Numerical problems).

Power transmission in belt drives and gear trains, Condition of maximum power. Open flat belt drive, Cross belt drive, length of belt, ratio of belt tensions, Power transmitted by belt, V-belt drive, Rope drive, Chain drive, Centrifugal tension. (Numerical problems).

Unit:5(a) Balancing of rotating masses-in one plane, in different planes, Balancing of Reciprocating masses. Balancing of radial, In-line, V-engines. (Numerical problem)

5(b) Vibrations- Free and Forced vibrations, Types of vibrations, whirling speeds, Damped vibrations, Forced- Damped vibrations, Logarithmic decrement, Torsional vibrations. (Numerical problems)

Reference Books:

1. Theory of Machines and Mechanisms by Joseph Shigley,
2. Theory of Machine by P.L. Balianey
3. Theory of Machine and Mechanisms by J. Lal
4. Theory of Machine by Dr. R.K. Bansal

ME-203T	**PRODUCTION PROCESSES-I (III Sem)**			
Credits-04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 **Casting processes:-**

Introduction, pattern and mould, melting pouring cooling and solidification mechanism of solidification, continuous casting process, Riser design and placement, generation of residual stresses, defects in castings, miscellaneous casting processes, inspection and testing of castings, Micro-welding.

Unit:2 **Joining Processes:-**

Introduction principles of solid phase welding, principles of fusion welding (Heat source, modes of metal transfer in are welding, heat flow characteristics, gas metal reaction, cooling of fusion weld, principles of solid/liquid state joining, various joining processes, weld defects and inspection).

Unit:3(a)**Mechanics of forming processes:-**

Forming processes: Introduction, plastic deformation and field criteria , relationship b/w ten site and shear field stresses.

3(b)**Power Metallurgy:-**

Definition, Principle &uses, Methods of Powder production, Mechanical pulverization, Electrolysis. Nano fabrication, nano materials, nano powders.

Unit:4**Non Destructive Testing:-**

Principles, Types &Applications, Liquid penetrant test, Magnetic particle test, Radiographic &Ultrasonic testing.

Unit:5**Numerical controlled machine tools:-** IntroductionDefinition, procedure for manufacturing through N-C machine tool sys. Classification of NC sys. Advantages and disadvantages of using NC machines, types of numerical controls.

Rapid prototyping operations:- Introduction, subtractive process, additive process, virtual prototyping, applications.

Reference Book:

1.Production Engineering by R.K.Jain
2.Manufacturing Engineering &Technology by S.Kalpakajian, S.R. Schmid
3.Manufacturing Engg. & Technology by Degarmo
4. Manufacturing Science by Amitabha Ghosh, A.K. Mallik

ME-204T	**MECHANICS OF SOLIDS-I (IV Sem)**			
Credits:04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 **Simple Stress & Strains:-**

Stress-Strain &types-Elastic limit, Hooke's Law, Young Modulus of Elasticity (E), Poisson's ratio (1/m)-Bars of Varying *Cis,* with derivation, compound bars (Composite section). Relationship between volumetric stress and linear strains along any 3 mutually perpendicular directions. Temperature stresses in compound bars. Yield stress, working stress, Factor of safety, Ductile &brittle materials, Stress-Strain Curve for a ductile material, Saint Vanant's principle and numerical problems.

Bending Moment and Shear force diagram:

Introduction's and B.M. diagrams. Sign conventions for *SF* and B.M. Determinate structures & indeterminate structures. *SF* and 8.M. diagrams for simply supported beams with a point load at mid point, Eccentric point, Beam carrying UDL, Beam carrying UVI, Overhanging beams, Beams carrying inclined loads, Beams subjected to couple-problems relations between loads-shear force and bending moment.

Unit(2a)**Principle Stresses and Strains:-**

Simple stress &compound stress, General two dimensional or biaxial stress system expression for Normal & tangential stress for a general 2D stress system-Principle stress & principle planes- expressions for principle stress & directions of principle plains. To show that shear stress on principle plans is zero. To show that sum of the normal stresses on any two mutually plane is a constant in a general 2D stress system. Derivation of the expression for max. shear stress & directions of planes carrying max. shear Stress Graphical method-Mohr' circle

2(b) **Thin cylinders:-**

Hoop or Circumferential stresses. Longitudinal stresses. Max shear stress. Design of thin cylindrical shells, spherical shells.

Unit:3**Column & Struts:-**

Types of column. Slenderness ratio. Effective length (I) (Derivation). Long and Short columns. Formulae, assumption mode in deriving Euler's formula, limitation for Eulers formula. Rankines formula, tutorials. Problem.

Unit:4**Deflections:-**

Slope, deflection &Elastic Curve. Derivation of the differential equation for slope deflection. Maculays method. Tutorials for various types of beam carrying various types of loads

Unit:5**Bending Theory:-**

Homogenous & isotropic materials. Pure bending. Neutral axis. Derivation of the Bending Equation M/I=F/Y=E/R Variation of bending stress across given section. Moment of resistance. Section modulus. Moment of inertia for various sections with

tutorials.

Torsion of Shafts:-

Derivation of the torque equation T = τ= Gθ -Assumptions in theory of JRL Pure torsion. Derivation of the expression for power transmitted by a shaft with tutorials. Derivation of the expression for principal stress & max shear stress developed in a shaft subjected to BM and torque tutorials.

Text Books:

(I) Strength of Materials by Sadhu Singh (ii) Strength of Materials by S. Ramamuthum

Reference Books:

(i) Strength of Materials R.K. Raiput

(ii) Strength of Materials Tumoshinko & Gere

ME.205T	**FLUID MECHANICS (II year, ME. & CH.)**			
Credits: 04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1

1. Fluid and Their Properties: Phases of matter-Definition of fluid, continuum. Density mass density-weight density-specific volume. Specific gravity, vapour pressure, compressibility. Relationship between bulk modules (k) and pressure (p) for a Gas; for isothermal condition (constant temperature), for adiabatic condition, importance of compressibility. Viscosity, Kinematic viscosity-Newton's law of Viscosity. Cohesion &Adhesion. Surface tension; Effect of surface tension on forming a droplet of liquid; pressure inside a liquid droplet (Raindrop); pressure inside a soap bubble; pressure inside a liquid jet. Capillarity. Types of fluid-Ideal and real fluid, Newtonian and non Newtonian fluids. Numerical problems on properties of fluid.
2. Fluid Pressure & it's Measurement: Fluid pressure at a point. Pascal's law. Hydrostatic law (Pressure variation in a fluid at rest). Effect of shape and size of the container on the intensity of pressure-Numerical Problems. Absolute, gauge, atmospheric and vacuum pressure-Problems. Measurement of pressure; Barometer; Manometers; simple manometer, single piezometer, u-tube simple manometer, sensitive inclined tube simple manometer; Differential manometer, two piezometer, inverted U-tube differential manometer, U-tube differential manometer-Problems; Micro manometer; Mechanical Gauges, Bourdon tube pressure gauge, diaphragm pressure gauge, deadweight-pressure gauge.

Unit:2

1. Fluid Static's: Total pressure force on a horizontal lamina; Total pressure force on a vertical lamina; Centre of pressure-to locate the position of center of pressure; Total pressure on an inclined lamina; To locate the center of pressure for inclined lamina; Force on curved surface, Pressure Diagram.
   Numerical problems on total pressure for horizontal lamina, total pressure force and center of pressure for vertical Lamina and inclined lamina, force on curved surface, pressure diagram. Buoyancy, Buoyant forces &center of buoyancy, meta centre and metacenteric height, determination of met centric heights, equilibrium bodies - Numerical Problems.
2. Fluid Kinematics (fundamental of fluid flow): Description of fluid motion-langrangian method & EuleriIan methods of study of fluid flow (theory). Basic scientific laws used in the analysis of fluid flow (basic principles of fluid flow)- Law of conservation of mass. Newton's law of motion, law of conservation of energy, thermodynamic laws (theory). Types of fluid flow; Steady and unsteady flow, uniform flow and non-uniform flow, one dimensional flow, two dimensional flow and three dimensional flow, rotational flow and Irrotational flow, laminar and turbulent flow, Description of the flow pattern-stream line stream tube-path line, streak line. Continuity Equation; Equation of continuity for one dimensional steady flow, equation of continuity for three, dimensional unsteady compressible flow. Velocity Potential and Stream function; relation between stream function and velocity potential (Cauchy Riemann Equation). Flow nets; method of drawing flow

nets, uses and limitation. Circulation and Vorticity. Vortex flow; Forced vortex flow, free vortex flow, numerical problems finding rate of flow. Examine whether the given velocity fluid represents possible incompressible fluid flow and the possible cases whether irrotational or not, steady or unsteady.

Unit:3

1. Fluid Dynamics: Eulers equation of motion along a stream line (Derivation). Bernoulli's equation (derivation from Euler's equation), assumptions in deriving Bernoulli's equation; Modified form of Bernoulli's equation (real fluid); Bernoulli's Equation from energy principles (Derivation); Limitations of Bernoulli's equation; Total Energy line.

   Hydraulic gradient line; Practical applications of Bernoulli equation; Venturi meter, inclined venturi meter, orifice meter, pitot tube, pitot static tube (Prandtl pitot tube), flow nozzle. Numerical problem on Bernoulli equation and its application.

2. Flow Measurement: Orifice and mouth piece; Venturi meter, orifice meter, flow nozzle meter, pitot tube, notches &weirs, Flumes-Problems.

Unit:4

Flow Through Pipes: Reynolds experiment to demonstrate type of flow; Equation for head loss in pipe due to friction. Darey-Weisback Equation (derivation); Other formulae for head loss due to friction in pipe, Chezy's formula, Manning formula, Hazen Williams formula. Other energy losses in pipes; major losses; minor losses; head loss due to sudden enlargement of pipe (Carnot or Borda's equation), head loss due to sudden contractions, head loss at entry, head loss due to pipe fittings. Energy line & Gradient line. Pipe in series, equivalent pipes, pipes in parallel, objects of laying pipes in parallel, elements of pipe networks. Siphon. Moody's diagram. Power transmission through pipes; Condition for maximum transmission of power, maximum efficiency of transmission of power, problems. Water hammer in pipes (only theory).

Unit:5 Boundary Layer Theory

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control, Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect.

Text books:

1. Hydraulics & Fluid mechanics-By P.N. Modi & S.N.Seth (Standard Book house, Delhi.)
2. Fluid mechanics & Hydraulic machines-by RK. Rajput (S.Chand & Company Ltd. New Delhi.)
3. Fluid mechanics & Hydraulic Machines-By RK. Bansal (Laxmi Publications (P) Ltd, New Delhi.)

References:

1. Fluid mechanics-By VL Streeter (Mc Graw Hill-SI Edition)
2. Fluid Mechanics-by Douglas (ELBS Edition)

3. Fluid Mechanics through problems-by Garde (New Age Publication)
4. Theory &Application of fluid mechanics-K. Subramanya (TMH outer Series)
5. Fluid Mechanics-Schaum series.

B.Tech. Third Semester
Paper: Mathematics-III Credit -4 Paper Code: MA-201T

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UNIT:1 **Ordinary Differential Equations:** First order equations (linear and non-linear). Linear equations of second and higher orders with constant and variable coefficients. Solution of second order equations by removing first derivative, changing of dependent and independent variables and method of variation of parameters.

UNIT:2 **Special Functions & Partial Diff. Eqns:** Power Series solutions of second order equations by frobenious method. Legendre polynomials and Berel's functions of first kind and their properties method of separation of variable for heat, wave and Laplace equations: Their solutions and related application.

UNIT:3 **Integral Transforms:** Laplace transform, existence theorem, Laplace transform of derivatives and integrals, Laplace transform of special functions. Inverse Laplace transform, convolution theorem. Applications of Laplace transform and its inverse to solve ordinary and partial differential equation.

Introduction to Fourier transforms. Fourier series, half range sine and cosine series, related applications.

References

1. J.N.Sharma: Differential Equations, Krishna Prakashan Media (P) Ltd., Meerut.
2. B.V.Raman: higher Engineering Mathematics, Tata McGraw Hill Co., Ltd., 2008.
3. R.K.Jain & S.R.K. Iyenger: Advance Engineering Mathematics, Narosa Publishing House, 2002.
4. A.R.Vashistha: Integral Transforms Krishan Prakashan Media (P) Ltd., Meerut.
5. G.G.Simmons: Differential Equations, Tata McGraw Hill Co. Ltd., 1981.

ME-206T **INTERNAL COMBUSTION ENGINE (IV Sem)**

Credits-04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 Introduction to I. C. Engine, Classification of I.C. Engine, Difference between two stroke and four stroke engines, difference between SI &CI engines.

I. C. Engine: cycles-Otto, diesel and dual; calculation of air standard efficiency, work ratio, mean effective pressure, volumetric efficiency IHP, BHP etc.

Testing & Performance-Introduction, Rating and testing methods; Measurement of fuel and air consumption, brake horse power, frictional horse power, Mechanical and thermal efficiency, engine losses and heat balance.

Unit:2(a) Combustion in SI Engines-Introduction; ignition limits, stages of combustion; ignition lag, factors affecting detonation, effects of detonation, control of detonation, knock, rating of volatile fuels, octane number, firing order; salient feature of different combustion chamber.

2(b) Combustion in CI engine-Introduction, combustion process and stages, air fuel ratio in CI Engines; Delay period or ignition lag, factors affecting ignition lag or delay period; Diesel knock, factors affecting diesel knock; Salient features of different combustion chambers. Firing order.

Unit:3 Carburetion-Introduction, different mixture requirement in SI engine, Elementary carburetor, complete carburetor, additional systems required, carburetor types; calculation of air fuel ratio for simple carburetor; petrol injection- Introduction, continuous and timed injection system. Fuel injection- Introduction, requirements of a fuel injection system; Types of injection system-Air and solid injection system; type of fuel injectors.**Engine emission and control.**

Ignition system-Introduction, Magneto and Battery ignition systems. Advantages and disadvantages of both the systems.

Unit:4 Supercharging-Introduction, object of supercharging of SI and CI engines, Turbo charging its effect on engine.

Unit:5 Cooling-Introduction, Necessity of cooling, disadvantages of overcooling, cooling systems- Air and water or liquid cooling, types of liquid cooling; Advantages and disadvantage of air and water cooling; Radiator. Lubrication- Introduction, function of a lubricating system, Different lubrication systems, mist and wet sump lubrication systems. Properties of lubricants

Books:

(I) I. C. Engine by Sharma &Mathur
(ii) I. C. Engine by V. Ganeshan
(iii) I. C. Engine by V. Domkundvar

ME-207 T	**MATERIALS SCIENCE (III Sem)**				
Credit:04		**L**	**T**	**P**	**Total**
Max. Marks:		**3**	**1**	**0**	**04**

Unit:1 Introduction to materials science, Introduction & types of advanced materials, some mechanical properties. Atomic structure and' bonding, types of atomic and molecular bonds, primary and secondary bonds, ionic bonding mechanism and examples, inter atomic forces for ion pair, covalent bonding, mechanism and examples, covalent bonding in carbon, energy and separation distance relationships, metallic bonding, secondary bonding mechanism and example.

Unit:2(a) Crystal structures and crystal geometry, space lattice and unit cells, crystal systems and Bravais lattices, classification of space lattices by crystal system, principal metallic crystal structures, BCC, FCC and SC crystal systems, relationship between lattice constant 'a' and atomic radius in SC, BCC & FCC system, atomic packing factor, miller indices for crystallographic planes in cubic unit cells, determination of miller Indices in cubic system. An introduction to crystal system, determination by X-ray diffraction method.

2(b) Crystalline imperfections, types of imperfections, zero dimension, one dimension and two dimension defects, point defects, line defections, edge &screw dislocations, their formation and Burger vectors, grain boundaries, rate process in solids, Numerical determination of number of vacancies.

Unit:3 Atomic diffusion in solids, diffusion in solids in general, Diffusion mechanisms, vacancy mechanism, substitutional mechanism, types of diffusion, steady state diffusion and non-steady state diffusion, Fick's Laws of diffusion, factors affecting diffusivity, Numerical problem on Non-steady diffusion (Industrial applications).

Unit:4 Phase diagrams, definition, explanation of phases, phase diagram of pure substances (water and Iron), Gibbs phase rule, Binary isomorphous alloy systems, Lever rule, numerical examples on lever rule for binary alloys, binary eutectic alloy systems, Invariant reactions, their representations and examples, Iron-Iron carbide phase diagram, phases of Fe-Fe_3C phase diagram, invariant reactions, slow cooling of plain carbon steels, numerical problems using lever rule, rapid cooling of plain-carbon steels, isothermal transformation of Austenite in eutectoid plain carbon steel, continuous cooling of eutectoid plain carbon steel T.T.T. diagram.

Unit:5 Heat Treatment, purpose, application, types of heat treatment processes, Annealing, Normalizing, tempering, surface hardening, case hardening techniques.

Text Book:

1. Materials Science by F.W.Smith

Reference Book:

1. Material Science by Van Vlack
2. Material Science by V. Raghwan

ME-208 T	**Production Process II (IV Sem)**			
Credit:04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 **Introduction to machine processes :-**Mechanics of basic machining operation. Orthogonal &Oblique cutting, principle angles of a single point cutting tool, Tool reference system. Machine reference System, orthogonal reference system, and normal reference system. Fool geometry and signature in MRS, ORS &. NRS systems, there interrelationship, numerical examples, chip formation mechanism, chip thickness ratio, dynamic shearing strain, velocity relationship, force relationship in orthogonal cutting merchant's circle diagram.

Unit:2(a)Turning and boring:-Lathe machines, Its principle of working, types, parts of lathe, operational on lathe in brief. Work holding devices &accessories, turning parameters, design consideration for turning operations, high-speed machine on lathe, ultra precision machine on lathe.

2(b) **Drilling &Reaming:-** Introduction, tools for drilling, classification of drills, twist drills, its parts, angles and terminology, type of drilling machines, Design consideration for drilling, reaming and tapping.

2(c) Shaping and planning:-Introduction to shapers and planes, Working principle of shaper, principle parts, size, specification and classification of shaper, quick return crank &slotted are, hydraulic mechanism, working principle of a planner, main parts types of planers, difference between planner &shaper.

2(d) Milling:- Working principle, types of milling machines, column & knee type milling machines, horizontal, vertical &universal milling machines milling methods, milling cutters, milling operations, milling parameters.

Unit:3 **Gear Manufacturing :-** Types materials, methods of gear manufacturing brief introduction to gear cutting and gear shaping, design consideration for gear machining, Gear finishing methods.

Unit:4 **Abrasive machining and finishing operations:-** Grinding, finishing operations, surface finish in machining, surface finish in grinding.

Unit:5 **Economics of machining operations:-** Introduction, optimizing cutting parameters. (a) For minimum cost. (b) For minimum production. (c) Optimum cutting speed for maximum efficiency.

Books: -

1. Manufacturing Engineering &Technology by S. Kalpakajian, S.R. Schmid
2. Production Process by P.C. Sharma
3. Manufacturing Engineering & Technology by S. Kalpakjian & Steven R. Schmid

B-TECH. SEMESTER-IV

ELEMENTS OF ELECTRICAL ENGINEERING

EE-202T

L	T	P	TOTAL
3	1	0	4

UNIT-I:

TRANSFORMER:

Principle & construction of single phase transformer, EMF equation, phasor diagram, equivalent circuit diagram ,SC test, OC test, efficiency.

UNIT-II:

DC MACHINES:

Principle & construction of DC generator, types of windings, types of DC generator, OCC, load characteristics, principle & construction of DC motor, back EMF, torque equation, load characteristics.

UNIT-III:

INDUCTION MOTORS:

Principle and construction of 3-phase induction motor, concept of slip, phasor diagram. Equivalent circuit diagram, T-S characteristics.

UNIT-IV:

SYNCHRONOUS MACHINES:

Principle and construction of synchronous machines, EMF equation, OCC & SCC, synchronous impedence, principle of synchronous motor, V-curve, synchronous condenser.

Text Books:

Electrical Technology by B.L.Theraja

P.S.Bimbhra, "Electrical Machinery", Khanna Publisher

Subject: **Human Values and Professional Ethics – I**
Code: ME-221T ***Credits: 2***
SEM: III Semester ***L P T: 2 0 0***

1.Sensitization of student towards issues in all dimensions of life.
There are a whole range of issues which one faces in life towards which the young students are generally unfamiliar and therefore insensitive. Almost all the concerns - environmental, societal, familial or personal, are result of human action. Sensitization towards them therefore is an important step.

2.Inculcation of Self Reflection.
Human action is governed by various internal factors primarily the beliefs one holds, and therefore looking-in' becomes essential, to see what beliefs one is holding, whether they are really true or not, if they are not true, then what could be the process to get the "right" belief and then further validate it. Most of the young people are somehow trained to look only ―outside‖. The motivation and the skill to look inside are missing. Inculcation of self reflection in students will result in them becoming more responsible, honest and trustworthy. Lack of such qualities in individuals is major concern of organizations, institutions and society in general.

3.Understanding (Clarity) of Human Relationships and Family.
It will try to show that relationships and material prosperity are the basic desire for a human being. Two global problems which we face today are war (including terrorism) and imbalance in nature (global warming). If we look at reasons for war, the fundamental cause is: Human Being is in opposition to other Human Being. Therefore one is willing (or gets compelled) to exploit others. This is due to lack of understanding of relationships.

4.Exposure to Issues in Society and nature (larger manmade systems and Nature)
To show that fundamental reasons for imbalance in nature are pollution and resource depletion. Both these aspects are result of consumerist model of development.
To show how harmony can be ensured at following levels individual, human-human relationships, larger society, Various social systems like education system, economic system, political system and others, and rest of the nature.

5.Development of Commitment and Courage to Act.
If the understanding is right, then the actions become right. Commitment and courage to act are considered consequences of right understanding in an individual. In the course, an attempt will be made to build right understanding in the individual, and then further plan of actions will also be discussed in order to implement the understanding in various life situations in the right manner.

Text Book:

1. Human Values and Professional Ethics by JAYSHREE SURESH
2. Human Values and Professional Ethics by RR Gaur, R Sangal and GP Bagaria

Subject: Human Values and Professional Ethics – II

Code: ME-222T **Credits: 2**

SEM: IV Semester

L P T: 2 0 0

Unit 1: Understanding Education:
Dialogues on education, to reflect over meaning and significance of education. History and philosophy of education, Search for truth and understanding of cosmos and society. - Pre industrialization and post industrialization. Modern education, a process of alienation from self and society. - Critique of education from the Western and Indian perspectives

Unit 2: Indian Perspectives of Education:
Notions of Vidya, Shiksha, Talim and Education. Upanishads and Raj-Yoga for understanding and educating the Self. - Spirit of enquiry of the Upanishads and the path of Ashtanga Yoga. Role of education in transforming social consciousness. Alternatives in education in 19th-20th century India.

Unit 3: Harmony in nature:
Four orders of nature- material order, plant order, animal order and human order. Salient features of each. Human being as cause of imbalance in nature. (Film "Home" can be used.). Human being as cause of imbalance in nature. Depletion of resources- water, food, mineral resources. Pollution, Role of technology, Mutual enrichment not just recycling. Prosperity arising out of material goods and understanding of self. Seperation of needs of the self and needs of the body. Right utilization of resources. Understanding the purpose they try to fulfil.

Unit 4: Recapitulation on society:
Five major dimensions of human society. Fulfilment of the individual as major goal. Justice in society. Equality in human relationships as naturally acceptable. Establishment of society with abhaya (absence of fear).

Unit 5: Ethics:
Ethical Human Conduct, Value, Character and Netikataa. Professional ethics, conduct as an engineer or scientist. Holistic human being through holistic education in just order.

Text Book:

1. Human Values and Professional Ethics by JAYSHREE SURESH
2. Human Values and Professional Ethics by RR Gaur, R Sangal and GP Bagaria

ME-301 T	**MECHANICS OF SOLIDS-II (V Sem)**			
Credits:04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 **Analysis of stress:-** Introduction, Body force surface force and stress vector, state of stress at a point normal and shear stress components, rectangular stress component, stress component in an arbitrary plane (Numerical on above), Equality of cross shears. Principal stress, Stress invariants. (Numerical). Octahedral stresses, state of pure shear, decomposition into hydrostatic and pure shear stress. Equations of equilibrium in cylindrical coordinates. St. venant's principle. Arrays stress function, compatibility condition.

Unit:2 **Analysis of Strain:-** Introduction, deformation, deformation in the neighborhood of a point change in the length of a linear element. The state of strain at a point, Interpretation of Vxy, Vyz, Vx:z. as shear strain components, Cubical dilation.

Unit:3(a)**Curved beams:-** Winkler back theory, Bending stresses in curved beam with circular, rectangular. Trapezoidal, I and T sections, stresses in a ring. Stresses in a chain links (Numerical on curved beams)

3(b)**Unsymmetrical Bending:-** Introduction, product of Inertia, Deflection of beam due to unsymmetrical bending, shear centre. (Numerical on above)

Unit:4**Thick Cylinder and Rotating Disc:-** Stresses in thick cylinders, Compounding of cylinders, stresses in rotating disc. (Numerical)

Unit:5**Fatigue and Creep:-** Fatigue of material, endurance limit, Soderberg triangle, notch sensitivity and sensitivity factor. Factor influencing the endurance limit introduction to creep.

Text Book:

1. Mechanics of Solids by LS. Srinath
2. Mechanics of Solids by Abdul Mubeen
3. Mechanics of Solids by Ryder

Reference Book:

1. Timosherko &Gere
2. E.J. Hearn Vol I &II

ME-302T COMPUTER AIDED DESIGN (VI Sem)

CREDIT:04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

1. Introduction to CAD, definition of CAD and its role in product cycle, -significance and importance of CAD.

   CAD Hardware, types of systems, CAD systems evaluation criteria, input devices, output devices, hardware integration & networking, hardware trends, IBM PC compatible CAD hardware.

   CAD software:- Introduction, graphic standard, basic definitions, date structure, database, database management system (DBMS), user interface, software modules, operating system graphic, applications, programming, communication, modeling & viewing, software documentation & development.
2. Microcomputer based CAD system, general features, hardware components and configuration, **IBM** PC compatible CAD system, microcomputer based CAD software, operating system, mechanical application 2D drafting, symbol libraries, report generation, parametric design, 3D functions, finite element analysis, kinematics & functions analysis.
3. Geometric Modeling: types of curves: Introduction, wire frame models, wire frame entities, curve representation, analytic &synthetic curves, hermit cubic spline, bezier curves, B-spline curves, Types of surfaces:- introduction, surface models, surface entities, surfaces like plane surface, ruled surfaces, surface of revolution, tabulated cylinder, hermit bicubic surface, B-spline surface, coons surface, blending surface, offset surface, triangular patches, sculptured surfaces, rotational parametric surface, design &engineering application. (Only theory no numerical)
4. Types of solids:- Introduction, solid models, solid entities, solid representation, fundamentals of solid modeling, boundary representation (B-rep, constructive solid geometry (CSG), sweep representation, other representations, organization of solid modeler's, solid modeling based applications, design engineering applications. (Only theory no numerical)
5. Two &three dimensional graphic concept, geometric transformation, introduction, transformation-translation, scaling, reflection, rotation, mapping of geometric models, projection of geometric models, orthographic projections, perspective projection.

   Virtual Realism: - Introduction, model clean up hidden line removal, hidden surface removal, z-butter algorithm, hidden solid removal, ray tracing algorithm, shading, shading models, coloring, coloring models.

   Graphic Aids: - Intro, geometric modifiers, names layers, colors, grids groups, dragging &rubber banding, clipping, Graphic manipulation editing:- intro, entity selection methods, manipulation operations, editing operators, design &engineering application.

References: 1.CAD *I* CAM by Ibrahim Zied2. CAD *I* CAM byZimmer &Groover

ME-303T	**MECHANICAL ENGINEERING DESIGN-1 (IV Sem)**			
Credit:04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 (a) Introduction to Mech. Engg, Design, Design synthesis, Design procedure for a machine part. Design considerations based on strength, rigidity, fatigue, corrosion, wear and thermal consideration, Allowable stresses, stress concentration, factor of safety.

(b) Design under static load, modes of failures, stress strain relationship, shear stresses and shear strain, stresses due to Bending moment, stresses due to torsional moment, principal stresses. Theories of failures, maximum normal stress theory, maximum shear stress theory, distortion energy theory, maximum strain theory, maximum strain energy theory.

Unit:2 (a) Design under variable loading, stress concentration, stress concentration factors, reduction of stress concentration effects, fluctuating stresses, fatigue failures, Endurance limit and its approx. estimation.

(b) Design of shaft under different kinds of loading such as twisting moment only and combination of twisting, bending moment. Design of keys. Design of different types of couplings such as muff, compression, flexible coupling. Types of coupling, flexible and rigid coupling.

Unit:3 Riveting: strength of riveted joint, efficiency, design of riveted joint, riveted joint of uniform, strength, Design of riveted joint for Boilers etc. Welded joint, strength of transverse and parallel fillet welded joints, axial loaded unsymmetrical, welded sections, Eccentrically loaded welded sections

Unit:4 Power transmission, types of pulleys for flat belts, design of C! pulleys, design of belts.

Unit:5 Bearing, bearing loads. Design of Journal bearing (selection parameters) types of lubrication, hydrostatic bearings.

Text Book:

(I) Machine Design by P.C Sharma &D.K. Agarwal

Reference Reference Books:

(I) Machine Design by Shigley

(i) Machine Design by Muben Ahmed

ME-304 T	**MECHANICAL ENGINEERING DESIGN-II (VI Sem)**				
Credits:04		**L**	**T**	**P**	**Total**
Max. Marks:		**3**	**1**	**0**	**04**

Unit:1 Design consideration of Gear, Lewis formula, dynamic effect, Design for spur, helical and bevel gears.

Unit:2 Design procedure of I.C. Engine Cylinder, Cylinder head.

Unit:3 Design procedure of I.C. Engine piston.

Unit:4 Design procedure of I.C. Engine connecting rod, Crank Shaft.

Unit:5 Design procedure of I.C. Engine valves.

Text Book:

1. Machine Design by Sharma & Agarwal
2. Machine Design by Pandy &Shah.

ME-305T	ENERGY CONVERSION (V Sem)			
Credits:04	L	T	P	Total
Max. Marks:	3	1	0	04

Unit:1 Steam Nozzles: Introduction, Definition, principle uses, types of nozzles, flow of steam through nozzle, condition for maximum discharge. Expansion of steam considering friction, nozzle efficiency, velocity coefficient, Relation between nozzle efficiency and velocity coefficient. Supersaturated or Metastable flow through nozzle. General relationship between area, velocity &pressure in nozzle flow, aspect ratio (numerical.)

Unit:2 Steam Turbine: Introduction, definition, working principles, uses, types of steam turbine, advantages of steam turbine over Reciprocating steam engine, Working of Impulse &Reaction turbine. Compounding of steam Turbine, velocity diagram, balding efficiency, stage efficiency or gross efficiency, nozzle efficiency, influence of blade tip speed ratio or blade efficiency Difference between impulse and reaction turbine, degree of reaction, carry over factor, (numerical), reheat factor and its numerical problems. Methods of governing (throttle, nozzle control; by pass governing etc.)

Unit:3 A. Gas Turbine Introduction, application, advantage of gas turbine, classification of gas Turbine, Bray ton or Joule cycle &its related formulae derivation. Thermal efficiency of Bray ton cycle, work ratio, advantages &disadvantages of closed cycle over open cycle units. Ideal &practical gas turbine cycle. Methods for improvement of thermal efficiency of simple open cycle constant pressure gas turbine. Advantage of gas turbine over I-C engine &steam engines, numerical problems.

B. Jet Propulsion Basic, definition, types of jet propulsion, screw propeller, turbo jet, turbo prop, ram jet, specific thrust, thermal efficiency, propulsive efficiency, ram efficiency, overall efficiency. Introduction to rocketing egg. Comparison between turbo machine &positive displacement machines.

Unit:4 Condensers and Steam Generators

A. Introduction, definition, uses, types of steam condensers, Air leakage, It's effect on the performance of condenser & methods of It's removal from condensers.

B. Steam Generators: Definition, uses, classification of boiler, brief description of the boiler (lancashire, Cornish,. Cochran) Typical high pressure boiler-Benson, La-Mont, Loeffler, Velox) brief description. Boiler mounting & accessories- only names & their function. Performance of boilers, evaporation, boiler thermal efficiency, heat losses in a boiler plant.

Unit:5 Reciprocating, Rotary Compressors.

Text Book:

1. Thermal Engineering by P.C. Ballaney

Reference Book:

1. Thermal Engineering by R.K. Rajput

ME-306T PRODUCTION PLANNING AND CONTROL (VI Sem)

Credit:04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 Introduction: Objective and functions of PPC, scope of PPC, role of PPC in the organization manufacturing systems- intermittent and continuous; plant location Difference between production planning and production control

Unit:2a Production Planning: Objectives and functions, its importance in the organization; technical scheduling- sequencing assignment model, route chart, operation ratio loading-load chart.

Unit:2b Production Control: Objective, functions and importance; Dispatching-job order and issue systemdispatching of cards, reports etc; expediting progress reports, corrective actions; Evaluations and Analysis value analysis and Assembly line balancing.

Unit:3 Material Planning Material requirement planning (MRP) and material resource planning(mrp2) scope and objectives of material planning; Material handling

Unit:4 Purchasing Store Keeping and Replacement Analysis: Objectives and functions; purchasing procedure, purchase cycle method ofpurchasing tender buying, hand to mouth buying contract purchasing ,make or buy decisions, market purchasing etc; terms and conditions of standard purchase order

Unit:5 Significance of stores Management: Replacement need and objectives; replacement of items that denote with timeValue of money remains same during the time, (ii) value of money change with time Probabilistic model of replacement; control of waste & scrap, waste management andwaste recycling.

Books:

1. Industrial Engineering Handbook — H.B. Maynard (McGraw Hill)
2. Modern production Management — E.S. Buffa (Wiley Eastern)
3. Theory &Problems in Production and Operation — S.N. Chary (THH)
4. Purchasing and inventory control — K.S. Meno

ME-307 T HEAT TRANSFER (V Sem)

Credit:04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 (A) Introduction to Basic modes of heat transfer:

Conduction, Convection, Radiation, Overall heat transfer co-efficient.

(B) Steady state one dimension heat conduction, General heat conduction equation, in Rectangular, cylindrical, and spherical co-ordinates. Steady state one dimension-heat conduction without internal heat generation (with uniform thermal conductivity and non-uniform thermal conductivity)- for flat plate, hollow cylinder, spherical shell. Electrical Analogy, log mean area. One dimension heat conduction with heat generation or system with internal heat source. - for plane wall, for hollow cylinder, for sphere. Insulation, purpose of insulation, critical radius of insulation for cylinders and spheres.

Unit:2 Heat transfer through extended surface- fins, Types of fins, heat transfer through Rectangular fin, pin type fin (Spine), fin effectiveness and efficiency. **Unsteady state heat conduction;** Introduction to unsteady state heat conduction. System with negligible internal resistance (Lumped heat analysis).

Unit:3 Heat transfer by convection; Introduction, convective heat transfer co-efficient, basic equations- Continuity equations, momentum equations, Energy equations. Boundary layer- concept-Velocity boundary layer, thermal boundary layer. Dimensional analysis, Buckingham's theorem, dimensional analysis applied to force convection. Dimensionless numbers and their physical significance.

Forced Convection:

Thermal boundary layer. Energy equation of thermal boundary layer over a flat plate. Integral Energy equation (Approximate solution of energy equation). Laminar tube flow. Development of boundary layer, velocity distribution, temperature distribution Turbulent flow over a flat plate, turbulent boundary layer, Reynolds Analogy, Colburn Analogy. Heat transfer parameters for combination of laminar and turbulent flow.

Free Convection

Characteristic parameters in free convection. Momentum and energy equations for laminar free convection. Heat transfer on a vertical flat plate, integral equations for momentum and energy on a flat plate, velocity and temperature profiles on a vertical flat plate, and solution of the integral equation for a vertical flat plate. Transition and turbulence in free convection. Empirical Correlations for free convection.

Unit:4 Heat Exchanges

Type of heat exchangers, heat exchanger analysis. Logarithmic mean temperature difference, overall heat transfer co-efficient, fouling factor, heat exchanger effectiveness and Number of Transfer Unit (NTU).

Unit:5 Radiation

Surface emission properties, absorptivity, reflectivity, transmitivity. Concept of

black body, Stefan Boltzman law, Kirchoffs law, Plank's Law, Wein's displacement law, Intensity of radiation and Lamberts Cosine Law. Radiation exchange between black bodies separated by a non-absorbing medium, shape factor Algebra and salient features of the shape factor, shape factor calculation for simple configuration such as: a black body inside a black enclosure, A tube with a cross section of a equilateral triangle, hemispherical surface and a plane surface. Heat Exchange between two non black parallel surfaces. Heat Exchange between infinite long concentric cylinders. Electrical network analogy for thermal radiation system. Radiation Exchange between three grey surfaces. Radiation shield.

Text books:

1. Heat &Mass Transfer by Dr. D.S. Kumar
2. Introduction to Heat &Mass Transfer by J.P. Holeman
3. Heat & Mass Transfer by Domkundwan

ME-308 T **TURBO AND FLUID MACHINARY (VI Sem)**

CREDIT:04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Part (A) Turbo Machines:-

Unit:1 Introduction, turbo machines, turbines, pumps, compressors fans, blower, type of incompressible and compressible flow machines, application of turbo machines.

Basic definitions and law of thermodynamics, general steady flow energy equation, poly tropic (small stage efficiency) for turbines and compressors, energy and momentum equation, Euler's work for turbo machines.

Flow through turbo machines cascade, one dimensional, two dimensional and three dimensional, axial turbine and compressor cascade, radial cascade, cascade tunnel, different type of tunnels (straight cascade tunnel, annular cascade tunnel), different cascade variables.

Unit:2 Axial turbine stage: introduction, stage velocity triangle, work done, enthalpy, entropy diagram, single stage impulse, multistage velocity compounded impulse, multi stage pressure compounded impulse, reaction stages, degree of reaction, losses and efficiency.

Part (B) Hydraulic Machine:-

Unit:3 Turbines:- Classification of hydraulic turbines, impulse and reaction turbines, pelton wheel, work done and efficiency of pelton wheel, velocity diagram, Francis turbine, work done and efficiency of Francis turbine, axial flow reaction turbine Kaplan turbine. (theory and numerical), performance, characteristics curve, draft tube, unit quantities, specific speed .

Unit:4Pumps:-

A. Centrifugal pump: - Introduction, main parts of centrifugal pump, work done by centrifugal pump on water, different heads and efficiency, minimum speed for starting the centrifugal pump, multi stage centrifugal pump (both for high heads, and for high discharge), specific speed of centrifugal pump, priming of centrifugal pump, cavitations phenomenon, NPSH.

B. Reciprocating pump:- Introduction, main parts, working of reciprocating pump, classification of Reciprocating. Pump, single acting and double acting reciprocating pump, slip of reciprocating pump, percentage slip, air vessel, effect of acceleration on piston.

Unit-5 Hydraulic Actuators and control: Hydraulic accumulator, Hydraulic press, Hydraulic Crane, Hydraulic Lift, Hydraulic Ram, Hydraulic Coupling, Hydraulic torque converter, Air lift Pump, Jet Pump.

Books:

1. Fluid mechanics and hydraulic machinery- R. K. Bansal
2. Fluid mechanics and hydraulic machinery- Modi and Seth
3. Hydraulic machines- Jagdish'Lal
4. Turbines, compressors and fans- S.M. Yahya
5. Gas Turbines and propulsive systems- P.R. Khajuria, SP Dubey

Note:- For Turbo Machinery Book of S.M. Yahya is followed and for hydraulic machinery<u>R.K. Bansal and Jagdish Lal</u>

ME-309 T **MECHANICAL MEASUREMENT (V Sem)**

Credit:03	**L**	**T**	**P**	**Total**
Max. Marks:	**2**	**1**	**0**	**03**

Unit:1 Principle of Measurement: Classification of measurement, precision, accuracy &sensitivity, standards of measurements-primary, secondary, tertiary &working standards; length standards-line standards, wave length standards; characteristics of various standards of measurement. Linear Measurement: Linear Measuring instruments, Vernier height gauge, Vernier depth gauge, inside micrometer, depth micrometer, etc; surface plate; spirit level; surface gauge; radius & feeler gauges; pitch screen gauges; slip gauges-requirement of slips; wringing of slips; use of slip gauges, measurement with slip gauges. Classification of instruments, null and deflection type, contacting and non contacting type, analog and digital type.

Unit:2(a) Motion Measurement: Linear motion measurement, angular motion measurement, measurement of displacement, velocity and acceleration, seismic.

2(b)Force, Torque and Power Measurement: Analytical balance, Elastic force measuring devices; spring axially loaded member, cantilever type, proving ring; load cell; pneumatic load cell, hydraulic load cell. Dynamometers; types of dynamometers; pony brake, fluid friction type, Electrical dynamometer, D.C. dynamometer, eddy current dynamometer. Numerical Problem base on prony brake.

2(c) Temperature Measurement: Classification, Expansion type thermometer; bimetallic type; liquid in glass thermometer. Electrical thermometer; resistance thermometer, thermostat, thermo couple, thermopiles, laws of thermocouple, Pyrometers; Radiation pyrometer, optical pyrometer.

Unit:3(a) Stress Strain Measurement: Mechanical devices, optomechanical devices, inductive device, capacitive devices, resistive devices- resistance strain gauge construction of strain gauge, wheat stone bridge, mounting of gauges, method of measurement, Numerical Problems based on measurement of strain with the help of resistance strain gauge, Introduction to nano measurements.

3(b) Surface Roughness measurement: elements of surface roughness, types of lays & their representation; evaluation of surface value, Ra value, CLA value RZ value, surface finish measuring instruments-profilometer, profile graph light cross section method, visual inspection methods.

Unit:4(a) Limits, Fits and Tolerances: Terminology of limits &fits, types of fits clearance, interference transition, hole basis &shaft based system of fits. Interchangeability &selective assembly; limits of tolerance allowance; designation of hole & shaft; ISO system of limits & fits; Design of limits, Tolerances & deviation on the shaft and hole system.

4(b) Gauge &Gauge design: Type of gauges, plain &limit gauge; plug &ring gauge; 'Go' and 'No Go' Gauges; Design of 'Go' & 'NoGo' gauges for holes & shafts. Manufacturing tolerance, wear allowance, Taylor's principle, advantages & its limitations.

Unit:5 Screw Thread and Gear Measurement: Terminology of screw threads &gears tooth, effect of pitch errors on threads, thread micrometer, effective diameter

measurements two wire & three wire methods; best wire size; use of tool maker's microscope in measuring various elements of thread; sources of errors in gear manufacturing, measurement of individual elements of gear, gear tooth caliper base tangential gear tooth caliper, Parkinson gear tester ,tooth thickness measurement constent chord method, base method, test plug method for pitch diameter measurement, two wire method for helical gears,run out,lead& backlash

Book: 1. Engineering Metrology (Khanna) by Jain, R.K.
2. Hand book of Industrial metrology (prentice Hall)-ASTME
3. Engineering metrology (Macdonald) Hume. K.J.
4. Engineering Inspection (Pitman)-Parkinsan, A.C.
5. Fundamentals of Mechanical Inspection, (Graw Hill) Jenkins, R.

References: -

1. Mechanical Measurement by Sirohi and Radha Krishan (Unit 1, 6, 7, 8, 10)
2. Mechanical Measurement by Thomas G. Beckwith and N. Lewis Buck (Unit 3, 5)
3. Electrical and Electronics Measurement and Instrumentation (Unit 4) by AK Sawhney

ME-310 T **OPERATION RESEARCH (VI Sem)**

	L	T	P	Total
Credit-04				
Max. Marks:	**3**	**0**	**0**	**04**

Unit:1 Introduction: The Historical development, the nature and Meaning of 'OR', Management application of 'OR' scope of 'OR', Development of 'OR' in India.

(A) Assignment Models- Introduction, mathematical formulation of Assignment prob.
Fundamental theorems, Hungarian Method for assignment problem, Traveling salesman problem by Branch & Bound techniques.

(B) Transportation Model- Initial Basic Feasible Solution by North-West corner rule, Least cost Method or VAM, optimization by MODI Method, Test of optimality, Degeneracy in transportation problems.

Unit:2 Linear Programming Problem: Introduction, General formulation of LPP, slack & surplus variables, Simplex Method, Degeneracy prob.

Unit:3 Replacement Model:-
Introduction, replacement Model for deteriorative items, Replacement Model for Nondetoratives Items, cash flow diagram, Group replacement Model.

Unit:4 Simulation-Introduction, Types of Simulation, why to use simulation, limitation of simulation technique, Generation of random Numbers, Monte-Carlo

simulation, Scope of simulation techniques.

Unit:5 Queuing Theory-Or waiting line Models. Introduction, Queuing system. Arrival rate, service rate, Queue discipline, Derivation of Average waiting time, Mean queue length, minimum cost service rate.

Text Books:

1. Operation Research by Taha
2. Operation Research by D.S. Hira

ME-311T	**OPERATION MANAGEMENT (V Sem)**			
Credits:04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Chapter 1 The Operation Function: Operations management operation decisions frame work, operation as a process. Operations strategy model, operations, Objectives.

Chapter 2a Product Design: Strategies fro new product, New product development process, cross functional product Design, Value analysis.

Chapter 2b Process & Service Design: (a) Product flow characteristics, process selection decisions, fowsed operations.
(b) Service definition, service matrix, customer contact Technology in service.

Chapter 3 Fore Casting: A fore casting frame work qualitative fore casting methods, times services fore casting , moving average, fro cast errors selection of fore casting method.

Chapter 4 Facilities & Aggregate Planning: facilities decisions, facility strategy
Aggregate Planning,
Planning options
Aggregate Planning costs.
Examples of costing.

Chapter 5 Project Planning & Scheduling
Objectives and Trade off, scheduling methods PERT methods CPM method.

Chapter 6 Inventory
Purpose of Inventories, Inventory cost structures, Economic order quantity, continuous review systems periodic review systems, ABC inventory management.

Reference Books:

1. Operation Management: Contemporary Concepts and Cases by Roger G. Schroeder
2. Production and Industrial management By James Telsang
3. Operations Management: Theory& Practice ByD. Mahadevan

ME-316T	**AUTOMOBILE ENGINEERING (Elective-I) (VI Sem)**				
Credit: 04		**L**	**T**	**P**	**Total**
Max. Marks:		**3**	**1**	**0**	**04**

Unit:1 **Power Unit:**

Engine Classification, engine performance and characteristics; Description of power unit.

Transmission:

Transmission requirements; standard transmission system; fluid transmission system; Automatic transmission, performance requirements and gear ratios.

Unit:2 **Tires:**

Pneumatic tries, tube; tubeless tries; importance of maintaining tire pressure. Tyre manufacturing, Tyre rethreading.

Steering:

Steering geometry, function of steering system, steering gear; types, power steering, steering gear ratio, overall steering ratio, turning ratio, types of steering linkages.

Unit:3 **Braking systems:**

General braking requirement; Simple break classification of brakes; Hydraulic brakes vacuum brakes; power brakes.

Unit:4 **Chassis and Suspension, Frames, types of Frames:**

Frame, rear end suspension, spring shackles, shock absorbers.

Vehicle Dynamics:

Stability analysis of a linearlized model of vehicle; stability on a curve.

Unit:5 **Maintenance:**

Preventive maintenance; trouble shooting of standard transmission and steering system etc.

Text Book:

1. Automotive Mechanics by Joseph Heitner
2. Automotive Engineering by KM Gupta
3. Automotive Mechanics by Crause & Anglin

ME-318T STATISTICAL QUALITY CONTROL (Elective-I)

(III Year VI Sem)

Credit: 04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 Quality-Definition Basic concepts of quality, quality control of quality, cost of quality, quality control and inspection.

Total quality control, total quality management, Employee involvement Continuous Process Improvement, Supplier partnership Performance Measures, Deming's 14 points.

Unit:2 Basic statistical concept, concept of variance, frequency distribution. Theory of probability and probability distribution: Normal, bionomial, Piosson distributions.

Unit:3 Control charts for variables-Variability, Basis of sub grouping, frequency of sub grouping, chance of makingan error, drawing preliminary conclusion from control charts, some control chart pattern, control limit on the chart.

Control charts for attribute, choice between P-charts for attribute, choice between P-chart and np-chart, control chart for defects, comparison between attribute chart and variable chart.

Unit:4 Acceptance sampling, the operation characteristic curve (OC-curve), quality indices for sampling plan, sampling plans.

Reliability, quality control and reliability, need for reliable product definition for reliability, basic element of reliability, cost of reliability, mean time between failures, mean time between repair, quality and reliability, system reliability.

Unit:5 History of ISO-9000 series standard, ISO-9000 series of quality system, need for quality system, need for standardization. JIT, Taguchi Method

Text Books:-

1. Statistical Quality Control By Grant
2. Statistical Quality Control By M.Mahajan

ME-413T *TRIBOLOGY (IV year, VIIISem)*

Credit: 04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 Introduction to tribology, definition, scope, surface interactions contact of solids, contact of ideally smooth surfaces, distribution of pressure over elastic contact area of two curvilinear bodies, calculation formula for contact area, maximum pressure and approach in elastic contact of curvilinear bodies. Physico-mechanical properties of surface layers, characteristics of surface geometry, classes of surface roughness. Contact of rough surfaces, introduction of surface peaks, real and contour areas of contact.

Unt:2 Friction, laws of friction, friction theories, surface contaminants, effect of sliding speed on friction.

Unit:3 Wear, wear of metals, types of wear, classification of wear. Wear mechanism, Quantitative Laws of wear, hypothesis of Holm, Burewell and strong, Archard law, Rabinowicz's quantitative law for abrasive wear, Bayer- Ku surface fatigue theory, delamination theory of wear, wear resistant materials, Wear of polymers & ceramics, an introduction to wear reduction by surfaceimprovement.

Unit:4 Lubrication, generalized Reynolds equation, flow and shear stress, energy equation, Hydrodynamic bearing, mechanism of pressure development, plain slider bearing, step (Rayleigh step) bearing, infinitely long journal bearing infinitely short journal bearing. Bearing design, design of journal bearing. Introduction to thin film and boundaryLubrication.

Unit:5 Surface Coating (Plating & Anoding Processes, Fusion Processes, Vapor Phase processes), Selection of coating for wear and Corrosion resistance, potentital properties & parameters of coatings

Text book:

1. Tribology of bearings by B.C.Majumdar
2. Tribology Handbook Vol 1 &2.
3. Basic Lubrication theory by Acastaircameron.

ME-403 T **COMPUTER AIDED MANUFACTURING (VII Sem)**

Credits:04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**4**

Unit:1 Introduction to CAM and its role in Product cycle and importance of CAM. CAD/CAM computer hardware, types of systems. CAD/CAM system evaluation criteria, input devices, output devices, hardware integration and networking. Hardware trends. IBM PC compatible CAD/CAM soft wares. Operating systems.

Microcomputer based CAD/CAM systems, general features, hardware components and configuration, IBM PC compatible CAD/CAM system, microcomputer based CAD/CAM systems

Unit:2 Numerical Control: Introduction, numerical controls its growth and development, components of NC systems. Digital &analog output, application of NC machine tools, advantages and disadvantages of NC, operation of an NC machine tool system, machine centre, Microprocessor in CNC systems, CNC-DNC and adoptive control. Justification and economics of Numerical control part programming, syntax of part programming, languages, APT.

Unit:3 Part Programming: Introduction, manual part programming. Preparatory functions, feed rate functions, miscellaneous functions, spindle speed functions, tool change function. Data input labeling of programmers and sub programmers fixed cycles. Tool length compensation, Do loop, Macros, Verification. Documentation, Computer aided part programs, computer aided part programming languages, APT language structure.

Unit:5 Group technology: Introduction, concept of group technology, GT loading, how GT works, stages for adopting a plant for GT, benefits of GT, Process planning and GT. Computer aided process planning (CAPP); Process regions for different process planning, integrated process planning systems CAPP implementation.

Flexible manufacturing systems (FMS): Objectives and benefits of FMS, Components of FMS. Problems with FMS, different types of FMS Technology required for FMS. Computer Integrated manufacturing (CIM): CIM systems, elements of CIM, different modules and information on flow, design aspect of CIM, CIM planning and implementation process.

Unit:5 Robotics: Introduction propose of robotics, law of Robotics, Basic element, degree of freedom, Work enclope, classification of Robots, Economic and social significances of Robots, Robotics applications.

Books Text:

1. Computer Aided Manufacturing-Rao, Tiwari & Kundra
   Principles and Applications by P N Rao

Reference:

1. CAD/CAM: CAE- Zimmars/ Groover
2. CAD/CAM: CAE- Jha & Surendra Kumar

ME-404T	**INDUSTRIAL MANAGEMENT (VIII SEM)**				
Credits 04		**L**	**T**	**P**	**Total**
Max. Marks:		**3**	**1**	**0**	**04**

1. Work study, method study & work measurement including time study, work sampling, production study, PMTS, MTM, importance of time standards, rating &allowance. Work study, incentive schemes, job description, analysis & evaluation.
2. Market research, principle of marketing, customers viewpoint &selective selling, functions & scope of marketing, sales forecasting techniques.
3. Performance measures of a Production system, Production, Productivity, Efficiency, Effectiveness, Quality, Flexibility, Agility etc.
4. Organization, organization structure, department on functional charts for business & industrial organization centralized &decentralized organizations, manpower planning, requirement & forecasting, recruitment training &placement.
5. Role of IT in Systems - MIS, FMS, Simulation, JIT, Kanban, Decision Support Systems.

Text Book:

1. Engineering Management by: Fraidoon Mazda

Reference:

2. Marketing Management by: Philip Kotler

ME-414T	**INDUSTRIAL MANAGEMENT (VIII SEM)**				
Credits 04		**L**	**T**	**P**	**Total**
Max. Marks:		**3**	**1**	**0**	**04**

1. Work study, method study & work measurement including time study, work sampling, production study, PMTS, MTM, importance of time standards, rating &allowance. Work study, incentive schemes, job description, analysis & evaluation.
2. Market research, principle of marketing, customers viewpoint &selective selling, functions & scope of marketing, sales forecasting techniques.
3. Performance measures of a Production system, Production, Productivity, Efficiency, Effectiveness, Quality, Flexibility, Agility etc.
4. Organization, organization structure, department on functional charts for business & industrial organization centralized &decentralized organizations, manpower planning, requirement & forecasting, recruitment training &placement.
5. Role of IT in Systems - MIS, FMS, Simulation, JIT, Kanban, Decision Support Systems.

Text Book:

1. Engineering Management by: Fraidoon Mazda

Reference:

2. Marketing Management by: Philip Kotler

ME-406 T REFRIGERATION AND AIR CONDITIONING (IV year, VIII Sem)

Credit: 04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 Unit of refrigeration, difference between engine, refrigerator and heat pump. Classification of refrigeration systems. Air Refrigeration System: Carnot refrigeration cycle or reversed carnot cycle using air as working substance, Bell-coleman cycle, analysis of these cycles, actual BellColeman cycle, advantages and disadvantages of the air refrigeration system. Necessity of cooling the aero plane, application of air refrigeration system in aero planes and different types of air refrigeration systems used in aero planes such as simple cooling and simple evaporative type, boot-strap and boot-strap evaporative type, regenerative cooling system and reduced ambient type cooling system, Coefficient of performance (C.O.P).

Unit:2 Vapor Compression Refrigeration System:

Single stage system: Simple system, Carnet vapor-compression cycle, Difference between air refrigeration system and vapor refrigeration system, diagrammatic layout of the components of this system and a brief description, construction of T-s, P-h, and h-s diagrams and their usefulness in solving the problems, Analysis of simple saturated cycle, actual cycle, use of p-h chart, Dry and wet compression, effect of pressure changes on COP &capacity, Sub cooling &superheating, effects of foreign material, advantages and disadvantages over air refrigeration system. Actual Vapor compression cycle.

Multistage vapor compression systems: - Purpose, Two stage vapor compression, Multi staging, optimum Inter stage pressure, Cascade refrigeration system.

Unit:3 **Refrigerants: Desirable properties of refrigerants. Common refrigerants such as Ammonia, Carbon Dioxide, Freon-11, Freon-12, Freon-22 and Freon-502 and their applications. Secondary refrigerants: - Purpose, Theory of brines, Pressure drop and heat transfer. Alternative refrigerant**. Refrigeration equipments & its design brief description of reciprocating compressor, centrifugal compressor (Design), capillary tube, thermostatic expansion valve, condenser and evaporator (Design). Duct design: - Introduction, Pressure drops in ducts, Methods of duct design.

Unit:4 Vapor Absorption Refrigeration System.

Diagrammatic layout of the components of this system and a brief description, properties of ideal refrigerant, properties of ideal absorbent, properties for ideal refrigerant absortJent combination, best combination, Theory of mixtures, Processes: Adiabatic mixing *of* two Systems, Diabatic mixing, Throttling process, advantages of vapor absorption system over vapor compression refrigeration system

Unit:5 Air conditioning: Definitions of different phychorometric properties such as dry air, moist air, water vapor, dry bulb temperature, wet bulb temperature, dew point temperature, specific humidity or humidity ratio, absolute humidity, degree of saturation, relative humidity, enthalpy of moist air.

Psychometric chart and psychometric processes: Sensible cooling or heating, bypass

factor, contact factor, cooling and dehumidification, cooling with adiabatic humidification of air or adiabatic saturation or evaporative cooling, heating and humidification, heating and dehumidification, adiabatic mixing of two air stream, numerical problems based on these process only.

Concepts of room sensible heat factor (RSHF), grand sensible heat factor (GSHF) and effective surface temperature.

Requirements of comfort air conditioning: A brief description of comfort chart and its use, diagrammatic layout of year round air- conditioning system providing summer cooling and winter heating and a brief description.

Text Book:

1. Refrigeration and Air-Conditioning by-C.P. Arora

Reference Book:

1. Refrigeration and Air-Conditioning by- R.Yadav
2. Refrigeration and Air-Conditioning by- S. Domkundwan

ME-407T POWER PLANT ENGINEERING (ELECTIVE-II) (IV YEAR, VII SEM)

Credit: 04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 Steam Power Plant

1. Cycles for steam power plants- Carnot, Rankine, Reheat, Regenerative and Binary vapor cycle and their analysis. Numerical problems.
2. Fuels for steam power plants: Different types of coals, proximate and ultimate analysis of coal, coals suitable for power plant, selection of coal for power plant, Indian coals, Liquid fuels and their advantages and disadvantages over solid fuels, Gaseous fuels and their advantages and disadvantages over solid fuels.
3. Coal handling- Preparation of coal at mine, outplant handling of coal, storage of coal at plant site, inplant handling of coal, A brief description about coal handling equipments such as coal preparation plant, Unloading equipments, Transfer equipments such as Belt conveyor, screw conveyor, bucket elevator, Grab bucket conveyor and Flight conveyor.
4. Coal feeding and burning methods-Overfeed stoker, underfeed stoker, Pulverised fuel system, Different types of pulverised fuel burners and their applications. Advantages and disadvantages of pulverised fuel firing over stoker firing.
5. Ash handling systems:- Mechanical handling system, Hydraulic system, Pneumatic system and steam jet system.
6. Dust collection equipments- Brief description about mechanical dust collectors (Dry type) such as Gravitational separators, cyclone separator, and Electrostatic separator.
7. Draught systems- Natural draught, Forced draught, induced draught and balanced draught. Chimney and its design.

Unit:2 High Pressure Boilers

Unique features of high pressure boilers, advantages of high pressure boilers, La Mont boiler, Benson boiler, Loeffler boiler, Schmidt Hartman boiler and velox boiler. Location of heating surfaces in water tube boiler, Furnace wall construction such as refractory walls, hollow air-cooled refractory walls and water walls, desirable properties of refractory material and different types of refractory materials, desirable properties of insulating materials and different types of insulating materials. Feed Water treatment- Necessity of feed water treatment, Different impurities in water and their effects, chemicals used for feed water treatment.

Unit:3 Nuclear Power Plant

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Unit:4 Fluctuating Loads on Power Plants

Definitions of load curve, load duration curve, connected load, maximum demand, Demand factor, Average load, load factor, Diversity factor, Plant capacity factor and plant use factor. Numerical problems.

Unit5 ……..

Reference books:

1. Steam Power station Gaffert
2. Power plant engineering F.T. Morse

Text Book:

1. Power Plant Engg. Mahesh Verma
2. Power Plant Engg. PKNAG
3. Power Plant Engg. Domkundwan

ME-408 TAdvanced Precession Machining Processes (APMP)(Elective III)

Credit: 04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1 **Electric Discharge Machining (EDM):**

Introduction, working principle, relaxation circuit &pulse generator, flushing &its types, Dielectric fluid and its essential requirements, EDM electrodes and its manufacturing, EDM tool design, material selection, tool wear, machining operation, metal removal rate, Application, EDG, WEDG.

Unit:2 **Electro Chemical Machining (ECM):**

Working principle and setup; ECM machine & its structure, electrolytes-flow and storage, applications, Electrochemical drilling, trepanning, turning, sawing, cutting off, honing debarring &Electrochemical Grinding (ECG),ECG, EC debulling (ECD), Anode shop prediction and tool design for ECM process.

Chemical Machining (CHM):

Working principle, chemical blanking, process steps, process characteristics, and applications. Chemical milling its process steps, characteristics and application.

Unit:3 **Ultrasonic Machining (USM):**

Principle of working and machine setup, tool holder, tool material and size, process characteristics and application.

Unit:4 **(a) Abrasive Flow Machining (AFM):**

(a) Abrasive finished processes: Abrasive flow finishing (AFF), working principle, Abrasive flow machining system, process variables, Analysis and modeling of abrasive flow machined surfaces, process performance, applications.

(b) Magnetic abrasive finishing (MAF): Introduction, working principle of MAF, Material removal mechanism and surface finish analysis of performance parameters.

Unit:5 Abrasive Jet machining (AJM), Water Jet Machining (WJM), Abrasive water jet Machining (AWJM), Their working principle and machining system; Machine tooling & media, process variables, performances characteristics, process capabilities, limitations & applications.

Unit:6 **Laser Beam Machining (LBM):** Working principle, types of lasers, process variables characteristics, advantages, limitations &applications.

Ion Beam Machining (IBM): Working & setup, equipments, process Performance and characteristics, advantages & limitations, process applications.

Unit:7**Electron Beam Machining (EBM):** Working principle, process characteristics, variables advantages & limitations.

Plasma Arc Machining (PAM): Principle, setup and machine parts, gases used in PAM, process characteristics, advantages & limitations, applications, plasma turning.

Unit:8 **Micromachining aspects:** Introduction, mechanical advanced micromachining processes, thermal advanced micromachining processes, Electrochemical micro machining, Advanced nano finishing processes, Advanced applications.

Books: 1. Text Book: Production Technology by HMT, Bangalore

2. Ref. Book: Advanced Machining processes by V. K. Jain.

ME-409 T **COMPOSITE MATERIALS (ELECTIVE) (IV year)**

Credit: 04	**L**	**T**	**P**	**Total**

Max. Marks: **3 1 0 04**

1. Introduction to composite materials, definition, distribution and contiguous classification and characteristics of composite materials, Fibrous Composites, Laminated composites, Particulate composites. Brief description of mechanical behavior of composite materials. Basic terminology of laminated fiber- reinforced composite materials, Laminate, laminates, Brief description of manufacturing methods of laminated fiber- reinforced composite materials. Current and potential advantages of composite materials, strength and stiffness advantage, cost advantage composite modals-Law of mixtures, Interfaces.

2. Macro mechanical behavior of a lamina, stress strain relations for an isotropic materials, engineering constants for orthotropic materials, restrictions on elastic constants for isotropic and orthotropic materials, stress-strain relations for plain stress in an orthotropic material, stress-strain relations for a lamina of arbitrary orientation.

3. Strength of an orthotropic lamina, strength concepts, experimental determination of strength and stiffness. Biaxial strength thesis for an orthotropic lamina, maximum stress theory, maximum strain theory, Tsai-Hill Theory, Effect of variability of fiber strength fracture modes in composites fracture and safety of different composites under static and dynamic loading-mechanism of fracture, fracture mechanics of fiber matrix composite.

4. Micro mechanical behavior of a lamina, basic approaches to micro mechanics, Mechanics of load transfer from matrix to fiber, load transfer in particulate composites. Mechanics of materials approach to stiffness, determination of E1, E1, Y12, and G12. Elasticity approach to stiffness. Comparison of approaches to stiffness for particulate composite &fiber reinforced composites. Mechanics of materials approach to strength, tensile strength in Fiber direction, and compressive strength in Fiber direction. +

5. Nano Composite ……..

Text Book: 1. Mechanics of Composite Materials by R.M. Jones

Reference Book:

1. Principles of Composite material mechanics by R.Gibson.
2. Stress Analysis of Fiber Reinforced composite materials by M.Hyer.

ME-417T: ADVANCED MANUFACTURING SYSTEMS

Credit: 04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit 1 Computer integrated manufacturing (CIM) – scope, segments of CIM. Automated process planning, code structures, generative process planning.

Unit 2 Group technology, Cellular manufacturing, Just-in-time in manufacturing,

Unit 3 Flexible manufacturing system, Measures of flexibility, Lean manufacturing, Concept of agility, Agile manufacturing.

Unit 4 Automated guided vehicles, Application of automated guided vehicle in manufacturing systems.

Unit 5 Computer aided quality control in manufacturing, Non-contact inspection methodology, In process and post process metrology, Coordinate measuring machines and their types.

ME-412T	MECHANICAL VIBRATION			
Credit: 04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

1. Introduction- Vector representation and addition of harmonic motion, beats phenomenon, W.O. by harmonic forces Fourier series and harmonic analysis.
2. Single degree of freedom system- undamped vibration. Derivation of differential equation, energy method, equivalent stiffness of spring in series and parallel, positional vibration.
3. Single degree freedom system- Damped Vibration. Force vibration with constant hormonic excitation, force vibration with rotating and reciprocating unbalance force, vibration due to excitation of support vibration isolation and transmissibility vibration, measuring instruments i.e. vibrometer, accelerometer and frequency meter.
4. Two degree freedom system; Principal modes, double pendulum tensional systems combined sub linear and angular mode' damped force system, undamped forced vibration with harmonic excitation system, undamped forced vibration and .harmonic excitation.
5. Multi-Degree vibration:-

   Principal modes, torsional systems, combined sublinear and angular mode, damped force system, undamped force vibration with harmonic excitation, critical speed of a light shaft having a single disc with and without damping. Critical speed of a shaft with multiple discs. Electrical analogy. Principle of electrical analogy, truly analogous circuits.

Text Books:

1. Mechanicalvibration: G.K.Groover
2. Mechanical Vibration : S. S. Rao

Reference Books:

Mechanical vibration: Francis S.Tse, Ivan E. Morse Rollard T. Hunkle. (Theory and application)

ME-475T	NON-CONVENTIONAL ENERGY SOURCES (Pool ELECTIVE)			
Credit: 04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**04**

Unit:1(a) Introduction to Energy sources Energy consumption as a measure of Prosperity. Energy Sources and their availability, Renewable Energy Resources.

1(b) Introduction to solar radiations and instruments for Solar Radiation Measurements, solar Energy collectors principles of conversion of Solar Radiation into Heat, Flat Plate collectors, concentrating collectors. Performance evaluation of fled plate and concentrating collector. Design of fled plate collector. Solar energy storage system, solar ponds, few applications of solar energy.

Unit:3 Introduction to wind Energy, basic principles of Wind Energy Conversion, (WEC) wind data and energy estimation, site selection considerations, basic components of wind energy conversion system, Wind turbine operation and control, Classification of WEC System, horizontal & vertical axis type turbines. Application of wind energy.

Unit:4 Introduction to energy from biomass, biomass conversion technologies, fludised bed combustion of Bio-mass biogas generation, factors affecting generation of gas, classification of biogas plants, material used for biogas generation.

Unit:5 Introduction to geothermal energy, nature of geothermal fields, geothermal sources, hydrothermal resources, geopressured resources, petrothermal systems, Vapor dominated power plant, Liquid-dominated systems, Hybrid systems, application of geothermal, energy, geothermal energy in India, Prospects.

Unit:6 Introduction to Energy from ocean, Ocean Thermal Energy Conversion (OTEC), open cycle OTEC system, modifications of open OTEC cycle, closed OTEC system, Prospects of OTEC in India. energy from tides, basic principles of Tidal power, advantages & limitation of tidal power generation, prospects of tidal

energy in India ocean waves, introduction, advantages & disadvantages of wave energy, wave energy conversion devices.

Books: 1. Non-Conventional Energy Sources by G.D. Rai

2. Non-Conventional Energy Sources by Dr. R.K.Singal

(ME-415T)	Value Engineering			
Credit: 04	L	T	P	Total
Max. Marks:	3	1	0	04

Chapter 1: Introductory concepts in value and cost analysis. Value engineering and value assurance.

Chapter 2: Product lifecycle and value oriented efforts. Value engineering job plan. Value tests.

Chapter 3: Techniques of value engineering. Value analysis and decision theory. Decision tree and decision matrix. Purchase price analysis. Evaluation of value alternatives.

Chapter 4: Fast diagramming. Function cost matrix, matrix evaluation. Brain storming and creativity.

Chapter 5: Elements of product cost and cost classification. Investment criteria in value analysis. Case studies in value engineering.

ME-416 T	GAS DYNAMICS (Elective-IV)			
Credit: 04	L	T	P	Total
Max. Marks:	3	1	0	04

Introduction and Basic definitions- difference between compressible and incompressible flow, assumptions made for the analysis of compressible flow, continuum, control volume, bulk modulus of elasticity, adiabatic bulk modulus, isothermal bulk modulus, coefficient of compressibility.

1. Fundamental equations of one dimensional steady flow, equation of continuity or law of conservation of mass, momentum equation, steady flow energy equation, adiabatic energy equation, adiabatic energy transformation, stagnation enthalpy, stagnation temperature, stagnation velocity of sound, stagnation pressure, stagnation density, stagnation- state, various regions of flow. Reference velocities such as velocity of sound, maximum fluid velocity, critical velocity of sound, Mach number M* Crocco number derivation of Bernoulli equation from adiabatic energy equation, equivalent of Bernoulli equation for isentropic compressible flow, effect of Mach No. on compressibility, (Numerical problems).
2. Wave Motion- Wave propagation in gases or compressible media, wave front, a brief description about various types of waves such as infinitesimal pressure wave or sound wave, non-step pressure wave, steep pressure wave, expansion wave, equation of acoustic velocity in a compressible fluid, Mach Number, Mach cone, Mach angle.
3. Isentropic flow with variable Area- Comparison of isentropic and adiabatic flows on T-S and P-V diagram, Equation for Mach number variation, Expansions in nozzles, compression in diffusers, stagnation and critical states, Area ratio as a function of Mach number, impulse function, mass flow rate flow through convergent nozzle and convergent-divergent nozzle under varying pressure ratios.
4. Flow with normal shock waves- Formation 'of a normal shock wave. Governing relations of the normal shock, Prandt L - Meyer-relation, Mach. No. Downstream of the normal shock wave, Static pressure ratio across the shock, temperature ratio across the shock, density ratio across the shock (The Rankine-Hugoniot equation), stagnation pressure ratio across the shock, moving normal shock wave.
5. Flow through constant area ducts with friction but without heat transfer, governing equations, Fannolines. Flow through constant area ducts with heat

transfer but without friction, governing equations, Raleigh lines.

Books:

1. Gas dynamics By S M Yahaha
2. A text book on compressible flow by Rathakrishan
3. Fluid Mechanics and Machines by Modi and Seth

ME-418T	Maintenance Management			
Credit: 04	**L**	**T**	**P**	**Total**
Max. Marks:	**3**	**1**	**0**	**4**

Reliability: Hazard rate, mean time to failure. Hazards models. Constant hazard Weibull model. System Reliability: Series, parallel and mixed configurations. Economics of introducing a standby or redundancy into a production system, optimum design configuration of a series/parallel system. Maintainability: Maintainability increment Equipment and mission availability. Replacement Decisions: Economic models block replacement policy, age replacement, replacement policies to minimize downtime, economics of preventive maintenance. Inspection Decisions: Optimal inspection frequency to profit maximizing, minimization of downtime and availability maximization.

Overhaul and Repair Decisions: Optimal overhaul/repair/replace maintenance policies for equipment subject to breakdown finite and infinite time horizon. Optimal repair effort of a maintenance work force to meet fluctuating taking into subcontracting opportunities. Spares Maintenance Organization: Computer application in maintenance management, MIS for maintenance.

ME-422T	**Principles of Robotics**			
Credits: 04	**L**	**T**	**P**	**Total**
Max. Marks:	**2**	**1**	**1**	**04**

Unit-1: Introduction: Definition, configurations, work envelops, specifications, and other basic parameters of robots.

Unit-2: Kinematics principles: Position and orientation, Co-ordinate systems, Relative frames, Homogenous Co-ordinates, Direct and inverse kinematics, Differential motions and the Jaconians.

Unit-3: Introduction to Dynamics: Types of motions: Slew, joint-interpolated, straight line interpolated motions, planning of manipulator Trajectories and Control, Drive basic Electrical, Hydraullic and Preumatic drives-basic and relative merits.

Unit-4: Components: Harmonic reduction units, servo valves and grippers.

Unit-5: Sensors and Actuators: Basic types including vision force-torque wrist sensors, Basic types of actuators including intelligent and smart actuators, piezoelectric actuators, shape memory alloy actuators etc., Programming various methods, levels, typical languages like VAL, Industrial applications, Robot cell formation, Case studies.

References Books: 1. Robotics Technology and Flexible automation by Deh, S.R, Tata Mc Graw Hill

2. Robotics: Mechanics and control by Craig, J. J, Addison Wesley

Text Book: 1. Industrial Robots-Technology, Programming and applications by Mikell. P. Grooveretal, Mc Graw Hill

ME 473T	**Syllabuses of Pool Electives Work Study (Pool Elective)**				
Credit: 04		**L**	**T**	**P**	**Total**
Max. Marks:		**3**	**1**	**0**	**04**

Unit:1 Productivity: Factors affecting productivity, causes of low productivity, remedies to increase productivity. Work study and productivity.

Unit:2 Work Study- definition, purpose & scope, value of work study, human aspects in work study, basic approach. Work study techniques and their comparison.

Unit:3 Method study- definition, purpose and scope, basic approach or procedure, recording techniques, outline process charts, flow process charts, their construction and analysis flow diagrams, string diagram photographic aid, models. Critical examination techniques, primary and secondary questions, development, installation and maintenance methods.

Unit:4 Motion Economy Principle- Micro motion study, Therbligs, motion analysis, simo charts, motion study.

Unit:5 Work Measurement definition, purpose & scope, basic procedure, work measurement techniques, introduction to stop watch time study, work sampling & predetermined motion calculation using rating.

Unit:6 Rating its techniques & scope, application of rating normal time, standard time calculation usingrating.

Unit:7 Industrial Relation & Industrial legislation- Introduction, industrial disputes & their causes and their settlement, workers participation management and ways to improve. Industrial harmony, common industrial legislations, India boilers act 1973, payment of wages act 1936, Industrial dispute act 1948, minimum wages act, 1948.

Text Book: 1. Work study by ILO.

LIST OF OPEN ELECTIVES

Material Imperfection and Their Application (PH-429T)
L P T (3 1 0) CREDIT-4

Structure of Crystalline Solids: Fundamental concepts, unit cell, crystallographic directions and planes, Crystal systems, Metallic crystal structures.

Imperfections in Solids: Introduction, Point defects: Vacancies and self-interstitials colour centres, in purities is solids, Linear defects dislocations, Interfacial defects, Bulk or volume defects.

Diffusion in Solid: Diffusion, diffusion Mechanisms: vacancy diffusion, interstitial diffusion, steady state diffusion: Fick's first law, non-steady state diffusion: Fick's second law, Factors that influence diffusion, Applications.

Amorphous Materials: Definition, types, structure, methods of preparation of amorphous materials, Applications: optical fibers, amorphous semi-conductor, optical memories, solar cells.

Plastic deformation & Strengthening Mechanisms: Plastic deformation, the tensile stress-strain curve, modes of plastic deformation-slip and twinning, the shear strength of perfect and real crystals, the stress to move a dislocation, mechanisms of strengthening in metals by grain size reduction, solid solution strengthening, strain hardening.

Lasers: Principle, population inversion, Einstein's and B coefficients, types: Ruby laser, he-Ne laser, semi conductor lasers.

Books:	Non Crystalline materials:	by Davis & Mott
	Amorphous Solids:	by S.R. Elliot
	Solid State Physics:	by M.A. Wahab

Polymeric Materials and Their Applications (CY-401T)
L P T (3 1 0) CREDIT-4

1. **Basic Polymer Chemistry:** Definition, Classification, Types of polymerization.
2. **Resins and Plastics:** Thermoplastic and thermosetting resins, constituents of plastics, fabrication of plastic materials, Important resins, Cellulose derivatives, Polyethylene, Teflon, Polystyrene, Polyvinylacetate, PVC, Nylons, Phenolic resins Phenol-Formaldehyde, Urea and Malamine-Urea and melamine-Formaldehyde resins, Epoxy resins, Polyester, Silicones, Lon exchange resins.
3. **Rubbers/Elastomers:** Natural rubber, compounding of rubber, Properties, uses, reclaimed rubber, Synthetic rubber, Buna-S, Nitrile rubbers, Fibre reinforced plastics (FRP).
4. **Biopolymers:** Importance and applications of few important biopolymers eg. Proteins, carbohydrates etc.

Engineering Economics (HU-402T)
L P T (3 1 0) CREDIT-4

UNIT:1 **Economics Micro and Macro:** Definition, Importance and Uses, Interdependence between Micro and Macro Economics.

UNIT:2 **Concept in Economics:** Law of Demand, Law of Diminishing Marginal Utility, Law of Equi-marginal Utility, elasticity of Demand, Indifference Curve Analysis-Price effect. In-come effect and substitution effect.

UNIT:3 **Theory of Production:** Production Function, Laws of Variable proportions, Laws of Returns of to Scale, Cost Function-Meaning of Fixed Cost and Variable Cost, Location of Firms, Wabers theory of Location of the firms.

UNIT:4 **Theory of the Firm:** Perfect Competition, Monopoly and monopolistic Competition:- Meaning, Assumptions, Equilibrium of the firm in Short run and Long run period of time.

UNIT:5 **International Trade:** Meaning, Nature and Scope of International Trade, Types and Effects of Tariffs and Quotas, Objective and Functions of International Monetary Fund (I.M.F.).

Open-Elective, (Final Year)

Code: HU-449 T **Subject : Principle of Management** **Credits 4(3-1-0)**

UNIT 1: Management as a discipline: Definition, nature, scope, functions, managerial Skills, Management. Thought-Historical Prospective, Social Responsibility, of Business.

UNIT2: Planning: Concept and purpose, planning process, Management, By Objectives(MBO), Decision making.

UNIT3: Organization: Concept and purpose of organisation, types of organisation, bases of Departmentation, concept of Authority and Responsibility, Span of Management, Line and Staff Authority, Functional Authority, Delegation of Authority, Centralization and Decentralization of Authority, Coordination Staffing.

UNIT4: Directing: Leadership Concept, Ingredients, Traits, Styles, Roles Communication Concept. Types, Process Barriers, Making Communication effective, Importance.

UNIT5: Controlling: Concept, Provides, Requirements, for adequate control, controlling and earning, Budgeting control Importance, Management Audit, Management in future.

Subject: Operation Research **Code: MA-491T** **Credits: 4**
Branches: EI **Semester :VII** **LPT:310**

UNIT 1: Introduction: Definition of O.R. and it's scope, modeling in O.R. General methods for solving O.R. models. The Monte-carlo technique, main characteristic of O.R. main phases of O.R. Linear programming problems. Graphical method for solve L.P.P., Two phase Method, Big-M Method, problems of tie.

UNIT 2: Assignment Model : Mathematical formulation of assignment model, Reduction theorem, problems of maximization & minimization. Hungarian process, travelling salesman problems.

UNIT 3: Transportation Model : Mathematical formulation of transportation problem. Definition of BFS, IBFS, Optimum solution. Algorithms of N-W rule, Least-cost & VAM and their problem

UNIT 4: Sequencing : Introduction, principle assumptions processing of jobs through two, three & m machine's.

UNIT 5: Game Theory : Characteristic of Games. Basic definitions, mini-max criterion and optimal strategy. Equivalence of rectangular Games, Dominance process, Arithmetic method for solving zero-sum-two person Games. Graphical and simplex methods for solving the games.

UNIT 6: Replacement: Replacement of item that fail completely.

UNIT 7: Inventory : Elementary Inventory Models, Inventory models with price breaks.

List of Pool Elective:

1. EI-402 PCB Design & Technology
2. EI-456 Aircraft Instrumentation

3. EC-458 Digital Image Processing
4. EC-460 Microwave Integrated circuit

PH 419 T **Futuristic Materials** **Credits 4(3-1-0)**

Semiconductors :

Introduction of semiconductors. intrinsic and extrinsic, II-VI and IIIV semiconductors and its alloys, Advantages and necessity of the tailoring of semiconductor, Semiconductors and it alloys used of LED and other devices, Utility of semiconducting alloys like GaAIAs, GaAIN, GaAIP etc.

Superconductors:

Fundamenal Phenomena associated with sumerconductors. Type I & II superconductors, Meissner Ochenfeld effects, Josephon effects, fundamental of BCS theory. Novel High Temperature Superconductors. Hole superconductors, TIBa CaCuO single and bilayer. Electron superconductors NdCuO etc. Doping effects in superconductors, Organic superconductors, fullerenesl. Application of the superconductors in science, medical and commercial sectors.

Material for Magnetic media:

Material useful for magnetic recording head, magnetic disk, magnetic tape media, Magneto optic recording materials. Holography, data storage materials.

Holography:

Fundamentals of holography, Difference between conventional photography and holography. Techniques to make a hologram. Advantages of holography over other techniques.

Introduction of following with applications :

Fibre optics, Lasers,Ceramics, Dielectric Chactrization of Materials

Books:

1) Superconductivity Today: T.V. Ramakrishnan & C.N.R. Rao Wiley astern Pvt. Ltd, New Delhi, 1992

2) Solid State Physics: Ashcrost/Mervin

Quantitative Methods in Economics (HU-409T)
L P T (3 1 0) CREDIT-4

UNIT:1 **Statistics:** Definition, Importance, Scope and Limitations of statistics, primary and secondary data. Classification of Meaning objectives and types of classification. Frequency Distribution-Discrete, Grouped and continuous frequency distributions. Fundamentals of frequency distribution.

UNIT:2 **Measures of Central Tendencies:** arithmetic mean, Median, Mode, Geometric Mean and Harmonic Mean, Demerits and Uses of all methods.

UNIT:3 **Measures of Dispersion:** Mean deviation Method about Mean, Median and Mode, Merits and Demerits of Mean Deviation. Coefficient of M.D. Standard Deviation (S.D.) Method with simple short-cut and step deviation methods. Merits and Demerits of S.D. Coefficient of S.D.

UNIT:4 **Correlation:** Introduction, Types of Correlation, Karl Pearson's Coefficient of Correlation. Interpretation of 'r'. Probable Error, Uses of Probable Error.

UNIT:5 **Linear Regression Analysis:** Introduction, Two method of Linear Regression Analysis:- (1) Line of Regression of Y on X and (2) Line of Regression and X on Y. Why two lines of regression Coefficient of Regression. Relation between the coefficient of correlation and Regression.

UNIT:6 Index Number: Definition, Uses and Types of Index Numbers, Methods of Construction Index Numbers-(1) Simple Aggregate Method (2) Weighted Aggregate Method (3) Fisher's Ideal Index Numbers (4) const of living Index Numbers (5) Chain Base Index Numbers. Base Shifting. Limitations of Index Numbers.

Foreign Trade (HU-407T)
L P T (3 1 0) CREDIT-4

UNIT:1 **Nature of foreign Trade:** Meaning, Nature, Scope and Distinct Features of International Tansactions.

UNIT:2 **Theories of International Trade:** The Classical Theory:-Absolute Advantage Model of Adam Smith, comparative Advantage Model of David Ricardo, the Neo-classical Analysis:-International trade Equilibrium under Constant cost, Increasing Cost and Decreasing cost conditions.

UNIT:3 **Tariffs and Quota:** types and Effect of tariffs and Quotas, Quota vs. Tariff.

UNIT:4 **International Monetary fund (I.M.F.):** Nature, Objectives and functions of I.M.F. International Monetary System, since the demise of Bretton Woods System.

UNIT:5 **International Financial Institutions:** World Bank (IBRD, International Financial Corporation (I.F.C.), International Development Association (I.D.A.).

UNIT:6 **India's Trade Policy:** Trends of Exports and Imports of India since independence, Composition o India's Foreign Trade.