SYLLABUS

FOR

B.TECH. PROGRAMME

IN

MECHANICAL ENGINEERING

INSTITUTE OF TECHNOLOGY

ZAKURA CAMPUS

UNIVERSITY OF KASHMIR

SRINAGAR J&K, 190006

COURSE STRUCTURE
B.Tech 3rd Semester in Mechanical Engineering
Zakura Campus, University of Kashmir

B.Tech. II. Year
Semester- III

Course Code	Course Title	Teaching Classes Per Week			Credits
		L	T	P	
MEE-3117	Mechanics of Materials-I	3	1	0	4
MEE-3217	Manufacturing Technology-I	2	1	0	3
MEE-3317	Theory of Machines	3	1	0	4
MEE-3417	Basic Engineering Thermodynamics- I	2	1	0	3
MTH-3517	Engineering Mathematics-III	3	1	0	4
MTH-3617	Electrical Engineering Technology	2	1	0	3
MEE-3117L	Mechanics of Materials-I Lab	0	0	2	1
MEE-3217L	Manufacturing Technology-I Lab	0	0	2	1
MEE-3317L	Theory of Machines Lab	0	0	2	1
MEE-3617L	Electrical Engineering Technology Lab	0	0	2	1
	Total	15	6	8	25

COURSE STRUCTURE
B.Tech 4th Semester in Mechanical Engineering
Zakura Campus, University of Kashmir

B.Tech. II. Year
Semester- IV

Course Code	Course Title	Teaching Classes Per Week			Credits
		L	T	P	
MEE-4117	Fluid Mechanics-I	3	1	0	4
MEE-4217	Applied Engineering Thermodynamics	3	1	0	4
MEE-4317	Engineering Mathematics-IV	3	1	0	4
MEE-4417	Materials Science	2	1	0	3
MEE-4517	Mechanics of Materials-II	3	1	0	4
MEE-4617	Industrial Engineering-I	2	1	0	3
MEE-4117L	Fluid Mechanics-I Lab	0	0	2	1
MEE-4217L	Applied Engineering Thermodynamics Lab	0	0	2	1
MEE-4617L	Industrial Engineering-I Lab	0	0	2	1
	Total	16	6	6	25

Course Code: MEE-3117
Mechanics of Materials-I
Course Credits: 04

S.No:	Topic	No. of Hrs
1.	Introduction to Cartesian tensors, range and summation conventions, free and dummy indices, coordinate transformations and definition of second order Cartesian tensor. Stress components, stress tensor, displacement field, strain components, strain in terms of displacement field, strain tensor.	04
2.	Introduction to mechanical properties of solids, proof stress, poisons effect, strain hardening, stress strain diagrams of ductile and brittle materials, idealized one dimensional stress strain laws, allowable stresses, factor of safety.	06
3.	Axially loaded members, Saint-Venant's Principle, Elastic Deformation, Principle of Superposition, Bars with Continuously Varying Loads or Dimensions, Statically Indeterminate Members, The Force Method of Analysis, Thermal Stress and Stress Concentrations.	08
4.	Plane Stress: Principal and Maximum Shear Stresses, Mohr's Circle, Hooke's Law, Triaxial Stress. Plane Strain: general equations of transformation, Mohr's circle, Absolute maximum shear strain, Tri axial stresses, strain energy density and Strain rosettes. Complex Stresses, Stresses on oblique planes, Material subjected to pure shear, mutually perpendicular direct stress, combined direct and shear stresses, Principal plane inclination in terms of the associated principal stress.	10
5.	Strain energy – tension, compression, shear, bending, torsion, three-dimensional principal stress system, Volumetric or dilatational, shear or distortional strain energy, Suddenly applied loads, Impact loads, axial load and bending applications. Torsion, Deformations of a Circular Bar of Linearly Elastic Materials, Non uniform Torsion, Stresses and Strains in Pure Shear, Relationship Between Moduli of Elasticity E and G, Transmission of Power by Circular Shafts, Statically Indeterminate Torsional Members, Strain Energy in Torsion and Pure Shear, Torsion of Noncircular Prismatic Shafts, Thin-Walled Tubes, Stress Concentrations in Torsion.	10
6.	Types of Beams, Loads, and Reactions, Shear Forces and Bending Moments, Relationships Between Loads, Shear Forces, and Bending Moments, Shear-Force and Bending-Moment Diagrams. Stresses in Beams, Pure Bending and symmetric Bending, Curvature of a Beam, flexure formula and its applications, Shear Stresses in Beams of Rectangular Cross Section, Shear Stresses in Beams of Circular Cross Section and in the Webs of Beams with Flanges, Built-Up Beams and Shear Flow, Beams with Axial Loads, Stress Concentrations in Bending.	12
	Total number of Hours	50

S.No:	Text Books Recommended	Author	Publisher
1.	Mechanics of Materials	Beer and Johnston	McGraw Hill, 2015

S.No:	References Recommended	Author	Publisher
1.	Mechanics of Materials	J.M. Gere and S.P. Timoshenko	Cengage Learning,1997
2.	Introduction to Solid Mechanics	I.H. Shames and J.M. Pitarresi	Prentice Hall of India,1999
3.	Engineering Mechanics of Solids	Popov. E.P	Prentice Hall of India, 2004

Course Code: MEE-3217
Manufacturing Technology – I
Course Credits: 03

S.No:	Topic	No. of Hrs
1.	Casting: Pattern types, allowances and design considerations, moulding materials, core sands, sand testing of moulding sands, types of cores, mounding machines, centrifugal, die, investment, shell, and CO_2 casting methods, Casting defects and inspection of castings, automation in foundry.	13
2.	Classification of machining processes and machine tools, orthogonal cutting, cutting forces, Ernest Merchant metal cutting theory, basic geometry of single point tools, construction, working and machining operations on center lathe, Capstan and Turret lathe, drilling machines, shapers (mechanical and hydraulic type), planner, boring and broaching machines, surface broaching, slotters, milling machines, milling operations.	13
3.	Manufacture of grinding wheels, Selection of grinding wheel, working of surface and center less grinding machines, center less grinding (internal and external) dressing, turning, balancing and mounting of wheel defects and remedies in grinding. Metal finishing process: purpose of finishing surface, honing, lapping, polishing and buffing.	13
	Total number of Hours	39

S.No:	Text Books Recommended	Author	Publisher
1.	Materials and Processes in Manufacturing	Degarmo. E.P, Black. J.T. and Kohser. R.A	Prentice Hall of India, 2005

S.No:	References Recommended	Author	Publisher
1.	Manufacturing Processes for Engineering Materials	Serop. K and Steven. R.S.	Prentice Hall of India, 1998

Course Code: MEE-3317
Theory of Machines
Course Credits: 04

S.No:	Topic	No. of Hrs
1.	Introduction, Kinematics and dynamics, kinematic chain, Mechanisms and Degree of freedom (DOF), Lower pairs & higher pairs, Kutzbach criterion and Grubler's eqn., Grashof's law, inversions, and quick return mechanism, mechanical advantage, , Instantaneous centre, velocity and acceleration analysis.	09
2.	Friction of nut and screw, Screw jack, Torque required to lift and lower loads, efficiency, Pivot and collars & journal bearings, Friction clutches, Single and multidisc plate clutch, Brakes, classification, Braking of vehicle.	09
3.	Analysis of different types of governors (watt, porter, Hartnel and Proel), sensitivity, stability, hunting, Isochronism, effort and power of a governor. Analysis and importance of flywheel.	08
4.	Classification of cams and followers, Terminology for cams, types of motion curves and their analytical expressions, graphical construction of cam profile for different types of followers, pressure angle , force analysis of cam-follower systems.	08
5.	Rolling contact and positive drive, classification of gears, Nomenclature, Law of gearing, Conjugate teeth, involute and cycloidal profile system of gear teeth, Length of path of contact, arc of contact, contact ratio, Gear ratio, Interference and undercutting, Helical and spiral gears. Gear trains: Classification, Types, simple gear train, speed ratios, Compound, reverted, Epicyclic gear train, tabulation and algebraic method, Compound epicyclic train.	08
6.	Processional motion and angular acceleration, gyroscopic couple, reaction couple. Effects on an aeroplane, naval ship, Stability analysis of a two-wheel vehicle, Stability of a four-wheel drive on a curved path.	08
	Total number of Hours	50

S.No:	Text Books Recommended	Author	Publisher
1.	Theory of Mechanisms and Machines	Amitabha Ghosh and Ashok Kumar Mallik	EWP, 2007

S.No:	References Recommended	Author	Publisher
1.	Theory of Machines	Shigley	McGraw Hill, 1995
2.	Theory of Machines	Bevan	C.B.S Publication, 1997

Course Code: MEE-3417
Basic Engineering Thermodynamics-I
Course Credits: 04

S.No:	Topic	No. of Hrs
1.	Fundamental concepts and definitions: Introduction, microscopic and macroscopic views of matter, control volume, thermodynamic systems, properties, processes, cycles, thermal equilibrium, Zeroth law of thermodynamics, temperature, thermodynamic equilibrium, temperature scale, energy and the first law, mechanical concept of energy, internal energy, conservation of energy, energy transfer as work, various modes, energy transfer as heat, First law for closed system, limitations of first law of thermodynamics, PMM-I, the state postulate, pure substance, simple compressible substances, specific heat, isothermal, isobaric, isentropic compressibility.	09
2.	Steady flow systems and their analysis, steady flow energy equation, enthalpy, first law for cyclic processes, applications, second law of thermodynamics, entropy and second law, thermodynamic reservoirs, various statements and their equivalence.	09
3.	Reversible cycle, Carnot cycle, efficiencies of reversible cycle, Carnot's theorem, Thermodynamic temperature scale, Clausius's theorem, entropy concept, inequality of Clausius's principle's of increase of entropy and its applications, second law for closed system, second law for open system, PMM-II.	08
4.	Concept of exergy, Gibb's function, Helmholtz function, relationship between specific heats, Clapeyron equations, thermodynamic relations for ideal gases (computation of entropy and internal energy from measurable quantities), process with ideal gases and vapours, Maxwell's equations.	08
5.	Calculations involving heat transfer, work transfer and change in thermodynamic properties with various processes, ideal gas mixture, various definitions, Dalton's law, Gibb's-Dalton's law, Amagat-Leduc law.	08
6.	Internal energy, enthalpy, specific heat and entropy of an ideal gas mixture, air water-vapour mixture, complete and incomplete combustion analysis, heating value of fuels, analysis of products of combustion, Orsat apparatus.	08
	Total number of Hours	50

S.No:	Text Books Recommended	Author	Publisher
1.	Fundamentals of Engineering Thermodynamics	Moran. M.J. Shapiro	John Wiley,2005

S.No:	References Recommended	Author	Publisher
1.	Thermodynamics	Wark.K	McGraw Hill,2001
2.	Thermodynamics	Cengal. Y. Boles	*Mc-Graw Hill, 2001*
3.	Fundamentals of Classical Thermodynamics	Van-Wylen. G.J	*John Wiley, 2001*

Course Code: MEE-3517
Engineering Mathematics-III
Course Credits: 04

S.No:	Topic	No. of Hrs
1.	Laplace Transform, shifting Theorem, Laplace transforms of different functions, Heaviside's Unit function, Dirac Delta Function its Laplace transforms. Heaviside's Expansion Theorem, Inverse Laplace Transforms. Initial and final value theorems, Convolution theorem and Applications, Use of Laplace Transforms in the solution of linear Differential equations.	20
2.	Fourier Series, Harmonic Analysis, Definition of Fourier Transform, Fourier sine and cosine transform, Fourier integral Formula. Applications to solutions of boundary value problems.	15
3.	Definition, Linearity property, Z- Transform of elementary functions, Shifting Theorems. Initial and final value Theorem, Convolution theorem, inversion of Z-transforms.	15
	Total number of Hours	50

S.No:	Text Books Recommended	Author	Publisher
1.	Advanced Engg. Mathematics	Erwin Kreyzing	Wiley Eastern Publication, 2009

S.No:	References Recommended	Author	Publisher
1.	Laplace Transforms	Murray R. Speigal	Schaum's Outline Series, 2008
2.	Advanced Engineering Mathematics	Greenberg. M.D	Prentice Hall of India, 2011
3.	Higher Engg. Mathematics	Grewal. B.S	Khanna Publications, 2012

Course Code: MEE-3617
Electrical Engineering Technology
Course Credits: 03

S.No:	Topic	No. of Hrs
1.	Transformers: Single Phase Transformers: Introduction, classification, construction, electromotive force (e. m. f.) equation, Equivalent circuit model, Phasor diagrams, Losses and efficiency, Voltage regulation, Transformer tests, Auto-transformers, Introduction to three phase transformers, Applications of transformers in mechanical engineering.	5
2.	Principles of Electromechanical Energy Conversion: Energy conversion via electric and magnetic fields, Field energy and mechanical force.	2
3.	D.C. Generator: Construction and principle of operation, emf equation of D.C. generator, characteristics of D.C. generators, losses condition for maximum efficiency, Applications of D.C. Generator.	4
4.	D.C. Motor: Working principle, voltage equation, torque developed, operating characteristics of D.C. motor, speed control methods, Application areas of D.C. Motors.	4
5.	Basic Concepts in A.C. Rotating Electrical Machines: The rotating magnetic field, Magneto-motive force and flux distribution, Induced voltage, Production of torque.	3
6.	Induction Machines: Construction, Types, Principle of operation of an induction machines, Equivalent circuit, Torque/speed characteristics, Speed control, Applications of induction machines.	4
7.	Single-Phase Motors: induction motors, universal motor, Schrage motor, Applications of single phase motors.	2
8.	Synchronous Machines: Construction & Types, working principle, applications.	2
9.	Definition of basic terms used in measurements.	1
10.	Electro-mechanical indicating instruments: Classification, effects utilized in measuring instruments, errors and their types, various forces in an electro-mechanical indicating instrument, various methods of damping.	2
11.	Transducers; Definitions, Types of transducers and their applications for mechanical measurements.	1
12.	Galvanometers, Ammeters and Voltmeters (PMMC, Induction, Electrostatic and Dynamometer type), mathematical theory of the D'Arsonval galvanometer, Ammeters and voltmeters: Meter range extension and their connections in their circuits.	3
13.	Bridge methods to measure; Resistance, inductance and capacitance; various types of bridges and their applications for measuring, R, L and C.	3
14	Measurement of power and energy; watt meters, measurement of power using Watt meters, energy meters and measurement of electrical using energy meters.	2
15	Digital Instruments; Introduction to digital meters for the measurement of various electrical quantities.	1
	Total number of Hours	39

Course Code: MEE-3617
Electrical Engineering Technology
Course Credits: 03

S.No:	Topic	No. of Hrs
1.	Transformers: Single Phase Transformers: Introduction, classification, construction, electromotive force (e. m. f.) equation, Equivalent circuit model, Phasor diagrams, Losses and efficiency, Voltage regulation, Transformer tests, Auto-transformers, Introduction to three phase transformers, Applications of transformers in mechanical engineering.	5
2.	Principles of Electromechanical Energy Conversion: Energy conversion via electric and magnetic fields, Field energy and mechanical force.	2
3.	D.C. Generator: Construction and principle of operation, emf equation of D.C. generator, characteristics of D.C. generators, losses condition for maximum efficiency, Applications of D.C. Generator.	4
4.	D.C. Motor: Working principle, voltage equation, torque developed, operating characteristics of D.C. motor, speed control methods, Application areas of D.C. Motors.	4
5.	Basic Concepts in A.C. Rotating Electrical Machines: The rotating magnetic field, Magneto-motive force and flux distribution, Induced voltage, Production of torque.	3
6.	Induction Machines: Construction, Types, Principle of operation of an induction machines, Equivalent circuit, Torque/speed characteristics, Speed control, Applications of induction machines.	4
7.	Single-Phase Motors: induction motors, universal motor, Schrage motor, Applications of single phase motors.	2
8.	Synchronous Machines: Construction & Types, working principle, applications.	2
9.	Definition of basic terms used in measurements.	1
10.	Electro-mechanical indicating instruments: Classification, effects utilized in measuring instruments, errors and their types, various forces in an electro-mechanical indicating instrument, various methods of damping.	2
11.	Transducers; Definitions, Types of transducers and their applications for mechanical measurements.	1
12.	Galvanometers, Ammeters and Voltmeters (PMMC, Induction, Electrostatic and Dynamometer type), mathematical theory of the D'Arsonval galvanometer, Ammeters and voltmeters: Meter range extension and their connections in their circuits.	3
13.	Bridge methods to measure; Resistance, inductance and capacitance; various types of bridges and their applications for measuring, R, L and C.	3
14	Measurement of power and energy; watt meters, measurement of power using Watt meters, energy meters and measurement of electrical using energy meters.	2
15	Digital Instruments; Introduction to digital meters for the measurement of various electrical quantities.	1
	Total number of Hours	39

S.No:	Text Books Recommended	Author	Publisher
1.	Electric Machinery	Fitzgerald, Kingslay, Umans	Tata McGraw-Hill

S.No:	References Recommended	Author	Publisher
1.	Electric Machinery Fundamentals	Chapman	McGraw-Hill Higher Education
2.	Electric Machines	Nagrath and Kothari	Tata McGraw-Hill
3.	Electrical Measurements and Measuring Instruments	Golding	Widdis Pitman
4.	Electrical Electronic Measurements	A.K.Sawhney	Dhanpat Rai

Course Code: MEE-3117L

Mechanics of Materials-I Lab

Course Credits: 01

S. No:	Experiment
1.	Tensile test of mild steel and aluminum bars.
2.	Shear test on specimen of two different metals.
3.	Bending tests on a steel bar.
4.	Impact tests on metals: a) Izod Test b) Charpy Test.
5.	Torsion test on specimen of different metals for determining the angle of twist for a given torque.
6.	Hardness tests on metal to determine Brinell and Rockwell hardness.
7.	Buckling load for a column.
8.	Compressive test of a specimen.

Course Credits: MEE-3217L
Manufacturing Technology-I Lab
Course Credits: 01

S. No:	Experiment
1.	Testing molding sand for permeability, shear strength and compression strength.
2.	Percentage of cross- sectional area reduction by rolling and wire drawing.
3.	SMAW, welding parameters selection for MS strips.
4.	Study of lathe machine.
5.	Performing step turning and taper turning on lathe machine.
6.	Performing drilling and boring operations on lathe machine.
7.	Performing external thread cutting on lathe machine.
8.	Study of bench type drilling machine.
9.	Performing various operations like drilling, reaming, counter boring and countersinking on drilling machine.
10.	Study of a surface grinding machine performing surface grinding on washers.
11.	Study of dividing head and performing gear milling.

Course Code: MEE-3317L
Theory of Machines Lab
Course Credits: 01

S. No:	Experiment
1.	Study of kinematic pairs & working of stroboscope.
2.	Slider crank motion, reciprocating engine mechanism, Inversion of four bar chain, Oscillating cylinder mechanism and Whitworth quick return mechanism.
3.	Various models of brakes and Working of a clutch using clutch model.
4.	Study the characteristics of a Watt Governor.
5.	Study the characteristics of a Proell Governor
6.	Study the characteristics of a Porter Governor
7.	Study the characteristics of a Hartnell Governor
8.	Generation of involute gear tooth profile.
9.	Involute teeth in contact & interference and under cutting of gear and its significance.
10.	Study of pairs of cams and follower
11.	Determine the velocity of precession of a given motorized gyroscope.

Course Code: MEE-3617L

Electrical Engineering Technology Lab

Course Credits: 01

S. No:	Experiment
1.	To perform open circuit and short circuit tests on a single-phase transformer
2.	To perform polarity test on a single phase transformer
3.	To determine the efficiency and voltage regulation of a single phase transformer
4.	To study various parts of a dc machine and draw sketches of the same
5.	To plot the external characteristic of a dc shunt generator.
6.	To plot the external characteristics of a dc series generator.
7.	To plot the external characteristic of a dc compound generator.
8.	To study the different parts of an Induction motor.
9.	To determine the equivalent–circuit parameters of a 3 -ϕ Induction motor by (i) No load test (ii) Blocked rotor test
10.	To determine the Torque / speed characteristics of a 3-ϕ Induction motor
11.	To Study of the construction of a synchronous machine

Course Code: MEE-4117
Fluid Mechanics-I
Course Credits: 04

S.No:	Topic	No. of Hrs
1.	Definitions, fluids, types of fluids, continuum approach to stress, fluid properties, fluid statics, body and surface forces, stress at a point, state of stress in fluid at rest and in motion, pressure distribution in hydrostatics, manometers.	08
2.	Forces on plane and curved surfaces, buoyancy and the concept of stability of floating and submerged bodies.	05
3.	Scalar and vector fields, Eulerian and Lagrangian approaches, material derivative, velocity and acceleration, streamline, streak line and path line, deformation, rotation and vorticity, deformation rate and strain rate tensor, circulation.	07
4.	Continuity equation, momentum equation, energy equation, Euler's equation, Bernoulli equation, ideal fluids, Navier-stokes equations, exact solutions.	07
5.	Laminar boundary layer, boundary layer equations, Blausius flow, momentum-integral equation of boundary layer.	07
6.	Laminar-Turbulent Transition, Fluctuations, Turbulent boundary layer equations, Shear stress models.	06
7.	Universal velocity distribution law, pipe flow, friction factor, fully developed pipe flow, pipe bends, pipe losses, dimensional homogeneity and Rayleigh methods.	07
8.	Buckingham's theorem, typical non dimensional parameters, geometric, kinematics and dynamics similarity, model testing.	03
	Total number of Hours	50

S.No:	Text Books Recommended	Author	Publisher
1.	Fluid Mechanics	White. F.M	McGraw-Hill, 2003

S.No:	References Recommended	Author	Publisher
1.	Fundamental of Fluid Mechanics	Munson. B.R	John Wiley, 2002
2.	Fluid Mechanics	Robert. W. Fox	John Wiley, 2009
3.	Introduction to Fluid Mechanics	Cengel.Y	McGraw Hill, 2001

Course Code: MEE-4217
Applied Engineering Thermodynamics
Course Credits: 04

S.No:	Topic	No. of Hrs
1	Carnot vapour power cycle, drawbacks as a reference cycle, Rankine cycle and its modification, *T-S* and *H-S* diagrams, Comparison of Carnot and Rankine cycles. Effects of pressure and temperature on Rankine cycle performance. Actual vapour power cycles, Reheat Rankine cycle, Ideal and practical regenerative Rankine cycles, open and closed feed water heaters, Binary/multi-fluid cycles.	08
2.	Theoretical (Stoichiometric) air for combustion of fuels. Excess air, mass balance, Exhaust gas analysis, A/F ratio. Energy balance for a chemical reaction, enthalpy of formation, enthalpy and internal energy of combustion. Combustion efficiency. Equilibrium considerations, Combustion of fuels in boilers, power plant thermal efficiency, emissions,	08
3.	Steam boilers and their classification, subcritical and supercritical boilers, fluidized bed boilers, fire-tube and water-tube boilers, mountings and accessories.	08
4.	Flow through varying area, Convergent divergent nozzle and diffuser, Critical pressure ratio, Effect of variation of back pressure on nozzle performance, Effect of friction, Steam flow through nozzle: velocity of steam, discharge through the nozzle and condition for its maximum value, Equilibrium and super saturated steam flow through nozzles.	08
5.	Introduction to steam turbines, Impulse and reaction turbines, degree of reaction, Velocity diagrams & blade design, velocity and pressure compounding, Losses in Turbines, Overall efficiency, Stage efficiency and reheat factor, Polytrophic efficiency, Axial and radial flow steam turbines, Turbine control/governing.	08
6.	Steam Condensers, Classification of steam condensers and their analysis, Sources of air in condensers, Effects of air leakage in condensers, Methods of obtaining maximum vacuum in condensers, vacuum efficiency, condensers efficiency, Cooling ponds/ Cooling towers analysis, Environmental aspects of power plant operation.	10
	Total number of Hours	50

S.No:	Text Books Recommended	Author	Publisher
1.	Applied Thermodynamics	Eastop. T.D	Pearson, 1990

S.No	References Recommended	Author	Publisher
1.	Principles of Turbomachinary	Turton. R.K	Chapman and Hall, 1997
2.	Marine Boilers	Flanagan. G.T.H	Elsevier, 1991
3.	Steam Plant Operation	Woodruff. E.V	Mc. Graw Hill, 1974
4.	Steam Turbine Theory and Practice	Kearton. W.J	CBS Publication, 1960

Course Code: MEE-4317

Engineering Mathematics-IV

Course Credits: 04

S.No:	Topic	No. of Hrs
1.	Special functions: Solution of series, Legendre's functions, Rodriguess formula, generate functions for Legendre's, polynomials and recurrence formulae, Bessel's functions, recurrence formulae and Bessel's functions of integral order.	10
2.	Numerical solution of partial differential equations: Finite difference approximation of partial derivatives, solution of Laplace equations, solution of one dimensional heat flow equation by Crank Nicolson method.	10
3.	Advanced statistics: Testing hypothesis, null hypothesis, errors, level of significance, test of significance, confidence limits, test of significance of large samples, sampling distribution of the proportions.	15
4.	Estimation of the parameters of the population, comparison of large samples, T distribution, testing for difference between means of two small samples, Chi-square distribution.	15
	Total number of Hours	50

S.No:	Text Books Recommended	Author	Publisher
1.	Advanced Engineering Mathematics	Jain and Iyenger	Narosa Publication, 2007

S.No:	References Recommended	Author	Publisher
1.	Higher Engineering Mathematics	Grewal. B.S	Khanna Publications, 2001
2.	Advanced Engineering Mathematics	Das. H.K	S. Chand &Co, 2007

Course Code: MEE-4417
Materials Science
Course Credits: 04

S.No:	Topic	No. of Hrs
1.	Introduction to material science and engineering, Why to study material science and engineering, classification of materials, modern and advanced materials, human needs and materials selection, and design considerations.	04
2.	Atomic structure and bonding, fundamentals of electron arrangements and modern periodic table, primary bonds and secondary bonds, energy related concepts, structure of metals and ceramics, concept of unit cells and lattice arrangements.	04
3.	Ceramic crystal structure and density computations, polymorphism and allotropy, crystal systems, crystallographic directions and planes, atomic densities (linear and planar), single crystals, polycrystalline materials anisotropy.	08
4.	X-ray diffraction and determination of crystal structures, polymer structure, hydrocarbon molecules, polymer molecules and their chemistry, molecular weight and shape and structure, thermoplastic and thermosetting polymers, imperfections in solids, point defects, line defects and volume defects.	10
5.	Grain size determination, diffusion mechanism, steady state diffusion, non steady state diffusion, factors that influence diffusion, diffusion in ionic and polymeric materials.	08
6.	Deformation and strengthening mechanisms, plastic deformation of polycrystalline metals, deformation by twining strengthen by grain size reduction.	08
7.	Phase diagrams, solubility limit, phases, micro-structure and phase equilibrium, dielectric materials, Gauss equations, electro-thermo elasticity.	08
	Total number of Hours	50

S.No:	Text Books Recommended	Author	Publisher
1.	Fundamentals of Materials Science and Engineering	Callister. W.D	John Wiley & Sons, 2011

S.No:	References Recommended	Author	Publisher
1.	Physical Metallurgy	Cahn. R.W., Haasen. P.	North-Holland, 1991

Course Code: MEE-4517
Mechanics of Materials-II
Course Credits: 04

S.No:	Topic	No. of Hrs
1.	Analysis of statically indeterminate beams, Slope-Deflection Method, Slope-Deflection Equations, Basic Concept of the Slope-Deflection Method, Analysis of Continuous Beams, Moment-Distribution Method, Clapeyron's "three-moment" equation.	8
2.	Theories of failure, maximum principal stress theory, maximum principle strain theory, maximum shear stress theory, total strain energy theory, distortion energy theory, octahedral stress theory, Mohr's theory.	8
3.	Composite Beams, Transformed-Section Method, Doubly Symmetric Beams with Inclined Loads, Bending of Unsymmetrical Beams, The Shear-Centre Concept, Shear Stresses in Beams of Thin-Walled Open Cross Sections, Shear Stresses in Wide-Flange Beams, Shear Centres of Thin-Walled Open Sections.	8
4.	Energy methods, Principle of Virtual Work, Deflections of Beams by the Virtual Work Method, Conservation of Energy and Strain Energy, Castigliano's Second Theorem, Maxwell's Law of Reciprocal Deflections.	8
5.	Columns,Buckling and Stability, Types of inelastic instabilities, definition of critical load, Columns with Pinned Ends, Columns with Other Support Conditions, Columns with Eccentric Axial Loads, The Secant Formula for Columns, Elastic and Inelastic Column Behavior,Inelastic Buckling, initially bent members and eccentrically loaded columns.	8
6.	Thick cylinders, Lame's theory, Longitudinal, radial and circumferential stress, Maximum shear stress, Compound cylinders, Compound cylinders -graphical treatment, Shrinkage or interference allowance, Hub on solid shaft, Force fits, Uniform heating of compound cylinders of different materials, Wire-wound thick cylinders, Difference in treatment between thin and thick cylinders, Thick cylinder - internal pressure only, Comparison with thin cylinder theory, Graphical treatment, Thin cylinders under internal pressure, Hoop or circumferential stress, Longitudinal stress, Changes in dimensions, Thin rotating ring or cylinder, Thin spherical shell under internal pressure, Change in internal volume Vessels subjected to Fluid pressure, Cylindrical vessel with hemispherical end Effects of end plates and joints, Wire-wound thin cylinders. Rings, Discs and Cylinders Subjected to Rotation, Thin rotating ring or cylinder, Rotating disc with a central hole, Rotating thick cylinders or solid shaft, Rotating disc of uniform strength.	10
	Total number of Hours	50

S.No:	Text Books Recommended	Author	Publisher
1.	Introduction to Solid Mechanics	I.H. Shames and J.M. Pitarresi	Prentice Hall of India, 1991

S.No:	References Recommended	Author	Publisher
1.	Mechanics of Materials	R. C. Hibbeler	Prentice Hall of India, 2009
2.	Mechanics of Materials	J.M. Gere and S.P. Timoshenko	Cengage Learning, 2001
3.	Engineering Mechanics of Solids	Popov. E. P	Prentice Hall of India, 2003

Course Name: MEE-4617
Industrial Engineering-I
Course Credits: 03

S.No:	Topic	No. of Hrs
1.	Concept of industrial productivity, Introduction and significance of Industrial engineering with brief explanation of its techniques, functions of industrial engineering, definitions and explanation of productivity with significance in industries, productivity measurements, factors affecting productivity, basic work content and excess work content, industrial applications to calculate total and partial productivities, introduction to work study and its basic procedures, definitions and concept of work study with examples, human factor in the application of work study, factors for selecting the work study, ergonomics, scope and objectives of ergonomics, application of human factors in engineering work place design, etc.	12
2.	Introduction to work study and basic procedures, method study, Record, examine and develop, process charts, and diagrams,outline PC, Flow process charts, two hand process charts, MAC, simo chart, flow diagram, string diagram, cycle graph, chronocycle graph, travel chart, the principles of motion economy.	15
3.	Work measurement and its applications, Time study, work sampling, rating and their methods, breaking the jobs into elements, types of elements, allowances and their calculations, calculation of standard time, examples of time study, PMT systems, synthetic data, various applications and examples.	12
	Total number of Hours	39

S.No:	Text Books Recommended	Author	Publisher
1.	Motion and Time Study, Design & Measurement of Work	Barnes. R.L	John Wiley & Sons, 1990

S.No:	References Recommended	Author	Publisher
1.	Introduction to Work Study	International Labor Office, Geneva	Geneva, 1991

Course Code: MEE-4117L
Fluid Mechanics Lab
Course Credits: 01

S.No:	Topic
1.	To determine the viscosity of a fluid by falling sphere (ball) viscometer.
2.	Critical Reynolds number in pipe flow.
3.	Verification of the Bernoulli's theorem.
4.	To find co-efficient of discharge for Venturimeter.
5.	Calibration of a Rotameter.
6.	Measurement of velocity in the wind tunnel with Pitot static tube.
7.	Measurement of pressure with pressure sensors.
8.	Flow visualizations past bluff and streamline bodies in a smoke tunnel.
9.	Calculation of flow rate using an orifice meter.

Course Code: MEE-4217L
Applied Engineering Thermodynamics Lab
Course Credits: 01

S.No:	Topic
1.	Study of typical boiler.
2.	Calculation of dryness fraction of steam.
3.	Calculation of heat balance sheet of a boiler.
4.	Determination of COP of a refrigeration system.
5.	Study of cooling tower.

Course Code: MEE-4617L
Industrial Engineering-I Lab
Course Credits: 01

S.No:	Topic
1.	Ergonomic design study (present/proposed/new) of a product, equipment or work environment (human- machine interface).
2.	To assembly a product (electrical holder, etc.), record the cycle time and draw learning curve of the operator performing the assembly.
3.	Draw out line process chart and two hand flow process charts for the assembly performed in experiment no. 2, and analyze the present method and also suggest improved method/s.
4.	Study and draw of flow process charts (some suitable assembly operation).
5.	Study and draw multi activity chart of a suitable method and propose better method/s.(Man and machine).
6.	Study suitable movements/travel of man, material or equipment, and draw string diagram, travel chart and flow diagrams.
7.	To calculate the standard time of a suitable job, using predetermined time standard techniques.