SYLLABUS

FOR

B.TECH. PROGRAMME

IN

MECHANICAL ENGINEERING

INSTITUTE OF TECHNOLOGY

ZAKURA CAMPUS

UNIVERSITY OF KASHMIR

SRINAGAR J&K, 190006

COURSESTRUCTUREFOR
B.Tech3rdSemesterMechanical
ATUNIVERSITYOFKASHMIR

CourseCode	CourseTitle	Teaching Periods per week			Credits
		L	T	P	
MEE -3117	Fundamentals of Dynamics	2	1	0	3
MEE -3217	Mechanics of Materials -I	3	1	0	4
MEE -3317	Fluid Mechanics	2	1	0	3
MEE- 3417	Basic Engineering Thermodynamics	2	1	0	3
MEE-3517	Manufacturing Technology-I	2	1	0	3
MEE-3617	Machine Drawing & Computer Modelling	0	2	2	3
MTH 3717	Mathematics-III	2	1	0	3
MEE-3217L	Mechanics of Materials -I Lab.	0	0	2	1
MEE-3317L	Fluid Mechanics Lab.	0	0	2	1
MEE- 3517L	Manufacturing Technology - I Lab.	0	0	2	1
	Total	**13**	**8**	**8**	**25**

MEE-3117
Fundamental of Dynamics

UNIT I

Kinematics of Particles: Introduction, rectilinear motion, plane curvilinear motion, rectangular co-ordinates (x-y), normal and tangential co-ordinates (n-t), polar co-ordinates (r-θ), space curvilinear motion, relative motion, constrained particle motion (vectorial approach to be adopted).

UNIT II

Kinetics of Particles: Review of force, mass, acceleration, impulse, momentum, work and energy, linear impulse and linear momentum, angular impulse and angular momentum, impact, central-force and motion, and relative motion, kinetics of systems of particles: introduction, Generalized Newton's second law, work, energy, impulse, momentum, conservation of energy and momentum, steady mass flow, variable mass.

UNIT III

Plane Kinematics of Rigid Bodies: Introduction, rotation, absolute motion, relative velocity, instantaneous center of zero velocity, relative acceleration, Coriolis acceleration motion relative to rotating axes, plane kinetics of rigid bodies: introduction, General equation of Motion, translation, fixed axis rotation, general plane motion, work energy relations, acceleration from work-energy; virtual work, impulse-momentum equation, gyroscopic motion analysis

Text Book:

Meriam, J.L., Kraige, L.G., "Engineering Mechanics: Vol.2, Dynamics". S.I., Version, *John Wiley & Sons Inc.*, 1996.

Reference Book:

Hibbeler, R.C., "Dynamics", *Prentice Hall*, N. Jersey, USA, 2000.

MEE-3217
Mechanics of Materials-I

UNIT I

General concepts: Free body diagram, section forces in beams, general concepts of stress and strain, stresses on inclined plane in an axial member, strain displacement equation, compatibility conditions, statically indeterminate structures, thermal effects.Analysis of stress and strain: Three dimensional states of stress, Mohr's circle, Cauchy's formula, principal stresses and principal planes, three dimensional state of strain, principal strains and principal axes, Generalized Hook's law, elastic constants and their relationships, measurement of strain, strain energy,pressure vessels, stresses and strains in thin cylindrical and spherical shells, thick cylinders,Lame's theory, radial deflection, compound cylinder, effective proportions, laminated cylinders.

UNIT II

Introduction to mechanical properties of solids: Stress – strain diagrams, resilience, hardness, impact strength, symmetric beam bending, the elastic flexural formula and applications, built-up and composite beams, integration method of solution, Macaulay's method of solution, area moment method, statically indeterminate beams, conditions for indeterminacy, energy methods for beams, strain energy and complementary strain energy**.**

UNIT III

Columns: Concept of elastic stability, Euler's theory of buckling of columns, eccentric loading, short columns,

Torsion: torsion of circular shafts, comparison between hollow & solid shafts, tapered circular shafts, torsion of thin circular tubes, statically indeterminate shafts.

Text Books:

1. Popov, E.P., Balan, T.A, "Mechanics of Solids", *Prentice Hall of India,* New Delhi, 2007.
2. Shames, I.H., Pitaresi, J.M., "Introduction to Solid Mechanics" *Prentice Hall of India.* 2006.
3.Kazmi, S.M.A, "Solid Mechanics", *Tata McGraw Hill, Place, 1998.*

Reference Books:

Fung, Y.C., "Foundations of Solid Mechanics", *Prentice Hall of India,* 1968.

MEE-3317
Fluid Mechanics

UNIT I

Introduction: 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, forces on plane and curved surfaces, buoyancy and the concept of stability of floating and submerged bodies.

UNIT II

Fluid kinematics: 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, continuity equation, momentum equation, energy equation, Euler's equation, Bernoulli equation, ideal fluids, Navier-stokes equations, exact solutions, laminar boundary layer, boundary layer equations, Blausius flow, momentum- integral equation of boundary layer.

UNIT III

Turbulent flow: Laminar-Turbulent Transition, Fluctuations, Turbulent boundary layer equations, Shear stress models, Universal velocity distribution law, pipe flow, friction factor, fully developed pipe flow, pipe bends, pipe losses, dimensional homogeneity, Rayleigh methods,

Buckingham's theorem, typical non dimensional parameters, geometric, kinematics and dynamics similarity, model testing.

Text Book:

1. White F.M.,"Fluid Mechanics", McGraw Hill, 2001.

Reference Books:

1. Munson, B.R., "Fundamental of Fluid Mechanics", *John Wiley*, 2002.
2. Cengal Y., "Fluid Mechanics", *McGraw Hill*, 2001.
3. Frank M. White, "Fluid Mechanics", *McGraw Hill*, 5th Edition, 2003
4. Robert W. Fox, "Introduction to Fluid Mechanics", *John Wiley*, 7th Edition, 2009

MEE-341
Basic Engineering Thermodynamics

UNIT I

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.

UNIT II

First law for open systems: 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, reversible cycle, Carnot cycle, efficiencies of reversible cycle, Carnot's theorem, Thermodynamic temperature scale, Clausius's theorem, entropy concept, inequality of Clausius'sprinciple's of increase of entropy and its applications, second law for closed system, second law for open system, PMM-II.

UNIT III

Energy: 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, 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, 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.

Text Books:

1. Moran, M.J., Shapiro, "Fundamentals of Engineering Thermodynamics", *John Wiley, 2005.*
2. Wark, K., "Thermodynamics", *Mc-Graw Hill, 2001*.

MEE-3517
Manufacturing Technology - I

UNIT I

Casting: Pattern types, allowances and design considerations, moulding materials, core sands, sand testing ofmoulding sands, types of cores, mounding machines, centrifugal, die, investment, shell, and CO_2 mounding methods, Casting defects and inspection of castings, automation in foundry.

UNIT II

Machine Tools: Classification of machining processes and machine tools, orthogonal cutting, cutting forces, Ernst 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.

UNIT III

Grinding Methods: 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.

Text Book:

1. Degarmo, E.P., Black, J.T. and Kohser, R.A., "Materials and Processes in Manufacturing",*Prentice Hall of India, Place*, 2005.

Reference Books:

1. Serop, K., Steven, R.S., "Manufacturing Processes for Engineering Materials", *Prentice Hall of India, Place,* 1998.

MEE-3617
Machine Drawing & Computer Modeling

UNIT I

Introduction: Drawing of the following with complete dimensions, tolerances, materials and surface finishmarks, assembly drawings from sketches,drawing actual machine components, pipe joints: hydraulic pipe joint, expansion joint (assembly),union joint, symbols for pipeFittings, keys and types of keys, cotter joints and knuckle joint, pulleys: fast and loose pulley (assembled drawing), V-Belt pulley, Steeped pulley.

UNIT II

Engine parts: Piston, connecting rod, crankshaft and flywheel assembly, cross head, stuffing box, machine parts: Tailstock, Machine Vice and pipe vice, steam stop valve, blow-off cock, screw jack, Process and flow charts.

UNIT III

Introduction to CAD: Theory of general engineering design, conceptual design, embodiment designinvolving layout and form designing to standard, geometrical modeling, introduction to any 3D-modelling software like AutoCAD, solid works, Autodesk inventor, etc., basic commands and development of 3D Drawings of simple machine parts and assemblies, tail stock,stuffing box, pipe vice, butterfly valve components and their assemblies.

Text Books:

1.Bhat, N.D., "Machine Drawing", *Charotar Publishing House Pvt. Ltd*., 2008.
2.Gill, P.S., "Machine Drawing", *Kataria and Sons*, New Delhi, 2008.

Reference Book:

Zeid I., "CAD/CAM Theory & Practice", *Tata Mc-Graw Hill*, New Delhi, 2008.

MTH-3717
Mathematics-III

UNIT 1

Laplace transforms: 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.

UNIT II

Fourier transform: Fourier Series, Harmonic Analysis, Definition of Fourier Transform, Fourier sine and cosine transform, Fourier integral Formula. Applications to solutions of boundary value problems.

UNIT III

Z-transform: Definition, Linearity property, Z- Transform of elementary functions, Shifting Theorems. Initial and final value Theorem, Convolution theorem, inversion of Z-transforms.

Text Books:

1. Laplace Transforms by Murray R. Speigal,2008.
2. Advanced Engg. Mathematics: Erwin Kreyzing- *Wiley Eastern. Pub*., 2009.
2. Higher Engg. Mathematics: B.S. Grewal - *Khanna publishers*, 2012.
3. Advanced Engineering Mathematics: *Michael D Greenberg-PHI*, 2011.
4. Higher engineering mathematics: H. K. Dass, RajnishVerma-S. Chand,2014.

MEE-3217L

Mechanics of Materials – I Lab

Experiments to be conducted:

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/wood.
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.

MEE-3317L

Fluid Mechanics-I

Experiments to be conducted

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.

MEE-3517L

Manufacturing Technology –I Lab

Experiments to be conducted

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.