Semester	**:**	**III**		
Course No.	**:**	**FS-231**	**Credit Hrs.**	**: 3(2+1)**
Course Title	**:**	**Engineering Mechanics**		

SYLLABUS

Objectives : (i) To make the students acquainted with the Principles of Engineering Mechanics.

(ii) To make the students acquainted with the calculation of different stresses to be helpful for design of engineering structures.

THEORY

Basic concepts of Engineering Mechanics, Statics, Dynamics, Kinetics, Scalar quantities, Vector quantities, Systems of units; Composition and resolution of forces, Analytical method, Graphical method; Laws of Forces, Moments and their Application, Levers, Parallel forces and Couples; Equilibrium of Forces, Free body diagrams. Centre of gravity (CG) of simple geometrical figures, CG by moments, plane figures, Axis of references, CG of symmetric sections, Unsymmetrical sections, Solid bodies and Cut sections; Moment of inertia: methods of finding out M.I., Methods of integration, M.I. of different sections, Theorem of perpendicular axes, parallel axes, M.I. of composite sections and cut sections, Frictional forces, Static friction, Dynamic friction, Limiting friction, Normal reaction, Angle of friction, Coefficient of friction, Laws of friction, Equilibrium of a body lying in horizontal and inclined planes, Ladder friction; Wedge friction, Screw friction, Screw jack; Analysis of simple framed structures, Methods of sections, Force table, Methods of joints, Hinged joints, Roller support, Vertical and Inclined loads; Simple stresses and strain, Hooke's Law, Poisson's ratio, Modulus of elasticity, Strain related problems. Shear force and bending moment, Fundamentals of shear force and bending moment, SFD and BMD of cantilever and simply supported and overhanging beams, Point of contra-flexture; Torsion of circular shaft, Torsional effect, Hoop stress, Power transmitted by a shaft; Principal stresses and strain, Analysis of plane and complex stress, Principal planes and Principal stresses, Mohr's circle, Finding out principal stresses, Different analysis.

PRACTICAL

Problems on composition and resolution of forces; Study the moments of a force; Problems related to resultant of a concurrent- coplanar force system; Problems related to non-concurrent coplanar force system; Systems of couples in space; Problems related to centroids of composite areas; Problems on Moment of Inertia, radius of gyration of composite areas; Analysis of equilibrium of concurrent coplanar and non-concurrent coplanar force system; Problems involved with frictions; Analysis of simple trusses by methods of joints and methods of sections; Analysis of simple trusses by graphical method; Problems on simple stress and strains; Problems on shear and bending moment diagrams. Problems on stresses on beams. Problems on torsion of the shafts; Analysis of plane and complex stresses.

TEACHING SCHEDULE

THEORY [FS-231]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Introduction	Basic concepts of Engineering Mechanics, Static, dynamic, kinetic, scalar quantities, Vector quantities, Systems of unit	25
2 - 3	Composition and Resolution of Forces	Composition and resolution of forces, Analytical method, Graphical method	
4 - 7	Moments, Equilibrium of Forces, Parallel Forces and Couples	Laws of forces, Moments and their application, levers, Parallel forces and couples; Equilibrium of forces, Free body diagrams	
8 - 11	Centre of Gravity	Centre of gravity (CG) of Simple geometrical figures, CG by moments, plane figures, axis of references, CG of symmetric sections, Unsymmetrical sections, Solid bodies and Cut sections	25
12 - 14	Moment of Inertia	Methods of finding out M.I., Methods of integration, M.I. of different sections, Theorem of perpendicular axes, parallel axes, M.I. of composite sections and cut sections	
15 - 18	Friction	Frictional forces, static friction, dynamic friction, limiting friction, normal reaction, angle of friction, coefficient of friction, laws of friction, equilibrium of a body lying in horizontal and inclined planes, ladder friction; wedge friction, screw friction, screw jack	25
19 - 21	Analysis of Perfect Frames	Analysis of simple framed structures, Methods of sections, force table, methods of joints, hinged joints, roller support, vertical and inclined loads	
22 - 25	Simple Stresses and Strain	Simple Stresses and Strain, Hooke's Law, Poisson's ratio, Modulus of elasticity, Strain related problems	25
26 - 28	Shear Force and Bending Moment	Shear force and Bending moment, Fundamentals of shear force and Bending moment, SFD and BMD of cantilever and simply supported and overhanging beams, Point of contra-flexture	
29 - 30	Torsion	Torsion of circular shaft, torsional effect, hoop stress, power transmitted by a shaft	
31 - 32	Principal Stresses and Strain	Principal stresses and strain, Analysis of plane and complex stress, Principal planes and Principal stresses, Mohr's circle, Finding out Principal stresses, Different analysis	
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [FS-231]

Exercise No.	Exercise Title
1	Problems on composition and resolution of forces
2	Study the moments of a force
3	Problems related to resultant of a concurrent-coplanar force system
4	Problems related to resultant of a non-concurrent coplanar force system
5	Problems on systems of couples in space
6	Problems related to centroids of composite areas
7	Problems on Moment of Inertia, radius of gyration of composite areas
8	Analysis of equilibrium of concurrent coplanar and non-concurrent coplanar force system
9	Problems involved with frictions
10	Analysis of simple trusses by methods of joints and methods of sections
11	Analysis of simple trusses by graphical method
12	Problems on simple stresses and strains
13	Problems on shear and bending moment diagrams
14	Problems on stresses on beams
15	Problems on torsion of the shafts
16	Analysis of plane and complex stresses.

Suggested Readings [FS-231]:

1. Bansal R.K. 2005. A Text Book of Engineering Mechanics. Laxmi Publishers, New Delhi.
2. Khurmi R.S. 2006. Strength of Materials. S. Chand Publishing.
3. Khurmi R.S. 2018. A Text Book of Engineering Mechanics. S. Chand Publishing.
4. Prasad I.B. 2004. Applied Mechanics and Strength of Materials. Khanna Publishers, New Delhi.
5. Prasad I.B. 2004. Applied Mechanics. Khanna Publishers, New Delhi.
6. Sundarajan V. 2002. Engineering Mechanics and Dynamics. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
7. Timoshenko S. and Young D.H. 2003. Engineering Mechanics. McGraw Hill Book Co., New Delhi.