Sem – 1

Course Code: ESC102	**Category: Engineering Science Courses**
Subject Name: Engineering Mechanics (Statics)	**Semester: I**
Credit: 2	**L - T - P: 1-1-0**
Pre-Requisite: Physics, Mathematics	

Objective:

1. Provide an introductory exposure of Engineering Mechanics to all the students of engineering
2. Prepare a good foundation for taking up advanced courses in the area in the subsequent semesters
3. A working knowledge of statics with emphasis on force equilibrium and free body diagrams provides an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems

Proposed Syllabus – Engineering Mechanics

MODULE	DETAIL SYLLABUS	HOURS
I	**Vectors and tensors:** Introduction to Vectors and tensors and their applications	4
II	**Force & Equilibrium Systems:** Basic concepts, ; Rigid Body equilibrium (2-D & 3-D); System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Concept of Free body diagrams, Equations of Equilibrium of Coplanar Systems, Lami's Theorem	3
III	**Friction:** Laws of Friction, Static and Dynamic Friction;, wedge friction and screw jack	3

IV	**Basic Structural Analysis:** Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members.	3
V	**Centre of Gravity & Moment of Inertia:** Centre of Gravity and its implications; Centroid of simple figures from first principle, centroid of composite sections; Area moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Concept of Mass moment inertia.	5
VI	**Basic Concept of Bending Moment :** Transverse loading on beams, Concept of shear force and bending moment, Different type of beams and loading., relationships between shear force and bending moment, shear force and bending moment diagrams of point loading on cantilevers and simply supported beams	3
VII	**Virtual Work and Energy Method:** Virtual displacements, principle of virtual work for rigid bodies, degrees of freedom. Mechanical efficiency, energy equation for equilibrium. Applications of energy method for equilibrium.	3
Total		**24**

Text books:

1. B B Ghosh, Satyajit Chakrabarti, Samir Ghosh "Engineering Mechanics" S Chand Publisher.
2. J. L. Meriam, L. G. Kraige, J. N. Bolton "Engineering Mechanics: Statics", Wiley, 2011.
3. F. P. Beer and E. R. Johnston, Vector Mechanics for Engineers, Vol I – Statics. 9th Ed, Tata McGraw Hill
4. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press
5. S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati, Engineering Mechanics (In SI Units) (SIE).
6. M. F. Beatty, "Principles of Engineering Mechanics", Springer Science & Business Media, 1986.
7. Manoj K. Harbola, "Engineering Mechanics", Cengage Learning India Pvt. Ltd, 2018
8. D.S. Bedi & M.P. Poonia, "Engineering Mechanics", Khanna Publishing House, 2019

9. R.K. Bansal, “Engineering Mechanics”, Laxmi Publications
10. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
11. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
12. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

Course Outcome:

After completion of this course, the learners will be able to

1. understand the application of force, couple and develop free body diagram of different arrangements.
2. Elaborate the theory of friction and understand the application of stress strain in truss member.
3. understand the application of CG & MI.
4. Understand the concept of bending moment on beam and application of virtual work and energy method for rigid body.