Course Code	Course Name	Credits
MTC404	**Strength of Materials**	**03**

Prerequisite: FEC104 Engineering Mechanics, MTC303 Engineering Materials and Metallurgy

Objectives:

1. To understand the nature of stresses developed in simple geometries such as bars, cantilevers, beams, shafts, cylinders and spheres subjected to various types of simple loads.
2. To calculate the elastic deformation occurring in various simple geometries for different types of Loading.
3. To study distribution of various stresses in the mechanical elements under different types of loads.

Outcomes: Learner will be able to…

1. Demonstrate fundamental knowledge about various types of loading and stresses induced.
2. Draw the SFD and BMD for different types of loads and support conditions.
3. Analyse the bending and shear stresses induced in beam.
4. Analyse the deflection in beams and stresses in shaft.
5. Analyse the stresses and deflection in beams and Estimate the strain energy in mechanical elements.
6. Analyse buckling phenomenon in columns.

Module	Detailed Contents	Hrs.
1.	**Moment of Inertia:** Mass Moment of Inertia , Area Moment of Inertia, Parallel Axis theorem, Polar Moment of Inertia, Principal axes, Principal moment of inertia. **Introduction-Concept of Stress** Deformation in solids- Hooke's law, stress and strain- tension, compression and shear stresses, Stress Strain Diagram, elastic constants and their relations- volumetric, linear and shear strains. Composite sections, Thermal stress and strain. Principal stresses and Principal planes- Mohr's circle. Moment of inertia about an axis and polar moment of inertia	8
2.	**Shear Force and Bending Moment in Beams:** Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations.	6
3.	**Stresses in Beams:** Theory of bending of beams, bending stress distribution, shear stress distribution for point and distributed loads in simply supported and over-hanging beams, cantilevers.	8

4.	**Deflection of Beams:** Deflection of a beam: Double integration method, Maxwell's reciprocal theorems for computation of slopes and deflection in beams for point and distributed loads. **Torsion:** Stresses in solid and hollow circular shafts.	6
5.	**Thin Cylindrical and Spherical Shells:** Stresses and deformation in Thin Cylindrical and Spherical Shells subjected to internal pressure **Strain Energy:** Strain energy stored in the member due to gradual, sudden and impact loads, Strain energy due to bending and torsion.	6
6.	**Columns:** Buckling load, Types of end conditions for column, Euler's column theory and its limitations and Rankine formula.	5

Assessment:

Internal Assessment for 20 marks: Consisting Two Compulsory Class Tests First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I). Duration of each test shall be one hour.

End Semester Theory Examination:

1. Question paper will comprise of total 06 questions, each carrying 20marks.
2. Total 04 questions need to be solved.
3. Question No: 01 will be compulsory and based on entire syllabus wherein sub-questions of 2 to 5 marks will be asked.
4. Remaining questions will be mixed in nature.(e.g. Suppose Q.2 has part (a) from module3 then part (b) will be from any module other than module 3)
5. In question paper weightage of each module will be proportional to number of respective lecture hrs as mentioned in thesyllabus.

References:

1. Strength of Materials by Ryder, Macmillan
2. Mechanics of Materials by James M. Gere and Barry J. Goodno, Cengage Learning, 6thEd, 2009
3. Mechanics of Materials by Gere and Timoshenko, CBS 2nd Edition
4. Elements of Strength of Materials by Timoshenko and Youngs, Affiliated East –West Press
5. Mechanics of Materials byBeer, Jhonston, DEwolf and Mazurek, TMHPvt Ltd., New Delhi
6. Mechanics of Structures by S.B.Junnarkar, Charotar Publication
7. Mechanics of Materials by S.S.Ratan, Tata McGraw Hill Pvt. Ltd
8. Introduction to Solid Mechanics by Shames, PHIStrength of Materials by S. Ramamrutham, Dhanpat Rai Pvt. Ltd
9. Strength of Materials by W.Nash, Schaum's Outline Series, McGraw Hill Publication, Special Indian Edition
10. Strength of Materials by R. Subramanian, Oxford University Press, Third Edition 2016