ADVANCED MECHANICS OF SOLIDS

Course Code	22MEMD1T1	**Year**	I	**Semester**	I
Course Category	Programme core	**Branch**	ME	**Course Type**	Theory
Credits	4	**L-T-P**	4-0-0	**Prerequisites**	Mechanics of Solids
Continuous Internal Evaluation:	40	**Semester End Evaluation:**	60	**Total Marks:**	100

Course outcomes: At the end of the course, the student will be able to:

CO	Statement	BTL	Units
CO1	Understand the concept of theory of elasticity equations for solving various engineering problems.	L2	1
CO2	Study the failure modes of different structural members.	L3	2
CO3	Compute the shear centre for various sections and calculate the bending stresses and deflections of beams under unsymmetrical loading.	L3	3
CO4	Determine the bending stresses in curved beams and stresses in axisymmetric rotating members.	L3	4

Contribution of Course outcomes towards achievement of programme outcomes & Strength of correlations (High:3, Medium: 2, Low:1)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	2				2			1		2	3	2
CO 2	3	3	2				2			1		2	3	2
CO 3	3	3	2				2			1		2	3	2
CO 4	3	3	2				2			1		2	3	2

Syllabus		
Unit	**Contents**	**Mapped CO**
1	**Theories of stress and strain**: Definition of stress at a point, stress notation, stress in arbitrary plane, stress transformation, principal stresses, strain notation, strain displacement relation, strain compatibility relations, principal strains.	CO 1

	Yield Criteria: General concepts, maximum Principal Stress Criterion, Maximum Principal Strain Criterion, Strain Energy Density Criterion, Maximum Shear Stress Criterion, Distortion Energy Density Criterion	
2	**Failure criteria**: Modes of failure, Failure criteria, Excessive deflections, Yield initiation, fracture, Progressive fracture, (High Cycle fatigue for number of cycles $N > 10^6$, buckling. **Application of energy methods**: Elastic deflections and statically indeterminate members and structures: Principle of stationary potential energy, Castiglione's theorem on deflections, Castiglione's theorem on deflections for linear load deflection relations, deflections of statically determinate structures.	CO 2
3	**Shear Center**: Bending axis and shear center-shear center for axi-symmetric and unsymmetrical sections. **Unsymmetrical Bending**: Bending stresses in Beams subjected to Nonsymmetrical bending, Deflection of straight beams due to nonsymmetrical bending.	CO 3
4	**Curved Beam Theory**: Winkler Bach formula for circumferential stress, Limitations, Location of Neutral axis of cross section, stresses in crane hooks, closed ring subjected to concentrated load-stresses in chain links. **Axi-Symmetric Problems**: Rotating Discs, Flat discs, Discs of uniform thickness, Discs of uniform strength.	CO 4

Learning Resources

Text Book(s):

1. Advanced Mechanics of Materials, (6th Edition) by Arthur P. Boresi and Richard J. Schmidt, Wiley India (P.) Ltd, New Delhi, 2012.

References:

1. Advanced strength of materials by Den Hortog J.P., Dover Publications, 1988
2. Advanced Mechanics of Solids by L.S Srinath, Mcgraw Hill Education, 2010.
3. Mechanics of Materials (10th Edition) by B.C Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, 2015.
4. Strength of Materials (Revised Edition) by R. K. Rajput, S Chand & Pvt. Ltd., 2014.
5. Strength of Materials, (11th Edition) by Dr. Sadhu Singh, Khanna Publishers, New Delhi, 2007.