



K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109
DEPARTMENT OF MECHANICAL ENGINEERING

CO-PO Mapping

Course: Mechanics of Materials		Course Code: 21ME44	
Type: Core			
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total hours/Week	Total teaching hours
3	2	5	50
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	4
Aim/Objectives of the Course			
<ol style="list-style-type: none"> To know the different types of stresses and strains developed in the member subjected to axial, bending, shear, torsion & thermal loads. To know behaviour & properties of engineering materials. To understand the stresses developed in bars, compounds bars, beams, shafts, and cylinders. To understand the concepts of calculation of shear force and bending moment for beams with different supports. 			
<ol style="list-style-type: none"> To expose the students to concepts of Buckling of columns and strain energy. 			
Course Learning Outcomes			
After completing the course, the students will be able to			
CO1	Develop the concept of stress and strain	Applying (K3)	
CO2	Derive the torsion equation for shafts	Applying (K3)	
CO3	Construct the concepts for cylinder and shafts in strength analysis	Applying (K3)	
CO4	Solve problems on compound loading	Applying (K3)	
CO5	Analyze the mechanics of beams.	Applying (K3)	
Syllabus Content			
Module 1: Stresses and Strains: Introduction, Properties of materials, Stress, Strain and Hooke's law, Stress strain diagram for brittle and ductile materials, True stress and strain, Calculation of stresses in straight, Stepped and tapered sections, Composite sections, Stresses due to temperature change, Shear stress and strain, Lateral strain and Poisson's ratio, Elastic constants and relations between them. LO: At the end of this session the student will be able to <ol style="list-style-type: none"> Understand the concept of stress, strain and its classification Analysis of stress and strain in structures of different cross section Evaluate the effect of temperature on stress development 			CO1 10 hrs PO1-3 PO2-3 PO3-2 PO4 - 1 PO5-1 PO12 -1 PSO1-3 PSO2-1

<p>Module 2: Deflection of Beams: Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Problems to calculate slope and deflection for determinant beams, Beams of uniform strength, Leaf springs.</p> <p>Torsion: Circular solid and hallow shafts, Torsional moment of resistance, Power transmission of straight and stepped shafts, Twist in shaft sections.</p> <p>LO: At the end of this session the student will be able to</p> <ol style="list-style-type: none"> 1. Analyze the deflection in beams 	<p>CO2</p> <p>10 hrs.</p> <p>PO1-3 PO2-3 PO3-2 PO4 - 1 PO5-1 PO12 -1 PSO1-3 PSO2-1</p>
<p>Module 3: Thick & Thin Cylinders: Thin cylinder: Hoop's stress, maximum shear stress, circumferential and longitudinal strains, Thick cylinders: Lames equations.</p> <p>Columns: Buckling and stability, Critical load, Columns with pinned ends, Columns with other support conditions, Effective length of columns, Secant formula for columns.</p> <p>Introduction to Strain Energy: Strain energy due to axial, shear, bending, torsion and impact load. Castigliano's theorem I and II and their applications.</p> <p>LO: At the end of this session the student will be able to</p> <ol style="list-style-type: none"> 1. Understand the difference between different thin and thick cylinder 2. Derive the lames equation <p>Analysis of stress and strain in solid and hallow cylinders.</p>	<p>CO3</p> <p>10 hrs</p> <p>PO1-3 PO2-3 PO3-2 PO4 - 1 PO5-1 PO12 -1 PSO1-3 PSO2-1</p>
<p>Module 4: Analysis of Stress and Strain: Introduction to three-dimensional state of stress, Stresses on inclined planes, Principal stresses and maximum shear stress, Principal angles, Shear stresses on principal planes, Maximum shear stress, Mohr circle for plane stress conditions.</p> <p>LO: At the end of this session the student will be able to</p> <ol style="list-style-type: none"> 1. Derive the equation for principal stresses in a loaded member 2. Failure analysis of structures 	<p>CO4</p> <p>10hrs</p> <p>PO1-3 PO2-3 PO3-2 PO4 - 1 PO5-1 PO12 -1 PSO1-3 PSO2-1</p>
<p>Module 5: Shear Force and Bending Moment: Type of beams, Loads and reactions, Relationship between loads, shear forces and bending moments, Shear force and bending moments of cantilever beams, Pin support and roller supported beams subjected to concentrated loads, uniformly distributed constant / varying loads. Concept of shear center.</p> <p>Stress in Beams: Bending and shear stress distribution in rectangular, I and T section beams.</p> <p>LO: At the end of this session the student will be able to</p> <ol style="list-style-type: none"> 1. Analyze the shear and bending stresses in beams 	<p>CO5</p> <p>10hrs</p> <p>PO1-3 PO2-3 PO3-2 PO4 - 1 PO5-1 PO12 -1 PSO1-3 PSO2-1</p>

Text Books

1. J M Gere, B J Goodno, "Mechanics of Materials", Cengage, 2013.
2. R K Rajput, "Fundamentals of Strength of Materials", PHI Learning Pvt. Ltd, 2013.

Reference Books

1. S. S. Ratan, "Strength of Materials", McGraw Hill Education, 2008

Useful Websites

- WI Nptel.ac.in
- https://en.wikipedia.org/wiki/Strength_of_materials
- https://en.wikipedia.org/wiki/List_of_materials_properties

Useful Journals

- Journal of ACTA Materialia
- Ain Shams Engineering Journal
- Materials Today: Elsevier

Teaching and Learning Methods

- 1. Lecture class: 68 hours

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 40 marks (30 marks -Average of three tests + 10 marks

Assignments)

Semester End Exam(SEE) : 100 marks (students have to answer all main questions) which will be reduced to 60 Marks.

Test duration: 1 :30 hours

Examination duration: 3 hours

CO to PO Mapping

PO1: Science and engineering Knowledge	PO7: Environment and Society
PO2: Problem Analysis	PO8: Ethics
PO3: Design & Development	PO9: Individual & Team Work
PO4: Investigations of Complex Problems	PO10: Communication
PO5: Modern Tool Usage	PO11: Project Mngmt & Finance
PO6: Engineer & Society	PO12: Life long Learning

PSO1: Ability to apply concept of mechanical engineering to design a system, a component or a process/system to address a real world challenges

PSO2: Ability to develop effective communication, team work, entrepreneurial and computational skills

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2
21 ME44	K-level														
CO1	K3	3	3	2	1	1	-	-	-	-	-	-	1	3	1
CO2	K3	3	3	2	1	1	-	-	-	-	-	-	1	3	1
CO3	K3	3	3	2	1	1	-	-	-	-	-	-	1	3	1
CO4	K3	3	3	2	1	1	-	-	-	-	-	-	1	3	1
CO5	K3	3	3	2	1	1	-	-	-	-	-	-	1	3	1


Course In charge


Head - Dept


Principal