COURSE MODULE

Mechanics of Materials			III
Course Code	**BME301**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	**2:2:0:0**	SEE Marks	50
Total Hours of Pedagogy	**40**	Total Marks	100
Credits	**03**	Exam Hours	03
Examination nature (SEE)		**Theory**	

Course objectives:
- To provide the basic concepts and principles of strength of materials.
- To give an ability to calculate stresses and deformations of objects under external loadings.
- To give an ability to apply the knowledge of strength of materials on engineering applications and design problems

Teaching-Learning Process (General Instructions) These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
- Chalk and Talk method for Problem Solving.
- Adopt flipped classroom teaching method.
- Adopt collaborative (Group Learning) learning in the class.
- • Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information.

MODULE-1

Simple stress and strain: Definition/derivation of normal stress, shear stress, and normal strain and shear strain – Stress strain diagram for brittle and ductile materials - Poisson's ratio & volumetric strain – Elastic constants – relationship between elastic constants and Poisson's ratio – Generalised Hook's law – Deformation of simple and compound bars, Resilience, Gradual, sudden, impact and shock loadings – thermal stresses.

MODULE-2

Bi-axial Stress system: Introduction, plane stress, stresses on inclined sections, principal stresses and maximum shear stresses, graphical method - Mohr's circle for plane stress.

Thick and Thin cylinders: Stresses in thin cylinders, Lame's equation for thick cylinders subjected to internal and external pressures, Changes in dimensions of cylinder (diameter, length and volume), simple numerical

MODULE-3

Bending moment and Shear forces in beams: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads and combination of these loads – Point of contra flexure

MODULE-4
Theory of simple bending – Assumptions – Derivation of bending equation - Neutral axis – Determination of bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T and Channel sections – Design of simple beam sections, Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, and T sections

MODULE-5
Torsion of circular shafts: Introduction, pure torsion, assumptions, derivation of torsional equations, polar modulus, torsional rigidity / stiffness of shafts, power transmitted by solid and hollow circular shafts.   **Theory of columns** – Long column and short column - Euler's formula – Rankine's formula.

Course outcome (Course Skill Set) At the end of the course, the student will be able to:
CO1: Understand the concepts of stress and strain in simple and compound bars.
CO2: Explain the importance of principal stresses and principal planes & Analyse cylindrical pressure vessels under various loadings
CO3: Apply the knowledge to understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
CO4: Evaluate stresses induced in different cross-sectional members subjected to shear loads.
CO5: Apply basic equation of simple torsion in designing of circular shafts & Columns

Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.
Continuous Internal Evaluation:
• For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
• The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
• Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
• For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment
Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours).

1. The question paper will have ten questions. Each question is set for 20 marks.

2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

3. The students must answer 5 full questions, selecting one full question from each module.

4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Mechanics of Materials, S.I. Units, Ferdinand Beer & Russell Johnstan, 7th Ed, TATA McGrawHill-2014

2. Mechanics of Materials, K.V.Rao, G.C.Raju, Subhash Stores, First Edition, 2007

3. Strength of Materials by R.K. Bansal, Laxmi Publications 2010.

Web links and Video Lectures (e-Resources):

1. Statics and Strength of Materials, Shehata, 2nd edition, 1994. (http://www.astm.org/DIGITAL_LIBRARY/JOURNALS/TESTEVAL/PAGES/JTE12637J. htm)

2.http://www.astm.org/DIGITAL_LIBRARY/JOURNALS/TESTEVAL/PAGES/JTE12637J.htm

3. http://www.freeengineeringbooks.com/Civil/Strength-of-MaterialBooks.php

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Subject Code: BME301	TITLE; Mechanics of materials								Faculty Name: Dr. Srinivasa.K			

List of Course Outcomes	Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	
CO-1	3	3	1	-	-	-	-	1	-	-	-	-	
CO-2	3	3	1	-	-	-	-	1	-	-	-	-	
CO-3	3	3	2	1	1	-	-	1	-	-	-	1	
CO-4	3	3	1	1	1	-	-	1	-	-	-	1	
CO-5	3	3	1	-	-	-	-	1	-	-	-	-	

Program Specific Outcomes (PSOs)

	PSO1	PSO2	
CO-1	2	-	
CO-2	2	-	
CO-3	2	1	
CO-4	2	1	
CO-5	2	-	

Note: 3 = Strong Contribution   2 = Average Contribution   1 = Weak Contribution   - = No Contribution