SEMESTER S4

ADVANCED SOLID MECHANICS

(Common to Civil Engineering branches)

Course Code	**PECET411**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	**ESE Marks**	60
Credits	3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	(PCCET205) or equivalent	**Course Type**	Theory

Course Objectives:

1. To explain three-dimensional state of stress, strain and strain energy stored in Elastic body
2. To explain behaviour of curved beams, thick cylinders and compound cylinders
3. To explain fracture mechanics and mechanics of composite materials.

KTU SPECIAL

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Elementary concept of elasticity, stresses in three dimensions, Principal Stresses, Stress Invariants, Mohr's Circle for 3-D state of stress, Octahedral Stresses, State of pure shear, plane stress. Differential equations of equilibrium, plane stress problems and plane strain problems comparison.	**9**
2	Analysis of strain, State of strain at a point, Strain Invariant, Principal Strains, Plane state of strain, Strain measurements. Compatibility conditions. **Energy Methods:** Work done by forces and elastic strain energy stored. Reciprocal relations, Theorem of virtual work.	**9**
3	**Bending of beams:** Asymmetrical bending, Shear centre, Bending of curved beams, Stress distribution in beam with rectangular, circular and trapezoidal cross- section, Deflection of thick curved bars. **Axisymmetric problems:** Thick walled cylinder subjected to internal and external pressures, Compound cylinders, Shrink fit,	**9**

4	**Introduction to Mechanics of Composite Materials:** Lamina and Laminates, Micromechanics of FRP Composites. **Introduction to Fracture Mechanics:** Basic modes of fracture, Fracture toughness evaluation.	**9**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

KTU SPECIAL

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	To explain the three-dimensional state of stress in a body and methods to reduce computational effort.	**K3**
CO2	To explain the state of strain in a body and establish relation between elastic strain energy stored.	**K3**
CO3	To explain stress distribution in curved beams of various cross-sections and thick-walled cylinders subjected to internal and external pressure.	**K3**
CO4	To explain the mechanics of composite materials.	**K2**
CO5	To explain basic modes of fracture and fracture toughness	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

KTU SPECIAL

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2								1		
CO2	3	2								1		
CO3	3	1								1		
CO4	3	1								1		
CO5	3	2								1		

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Advanced Mechanics of Materials	Arthur P. Boresi, Richard J. Schmidt	John Wiley & Sons	6th, 2022
2	Advanced Mechanics of Solids	L. S. Srinath	McGraw Hill Education	3rd, 2017
3	Mechanics of Composite Material	Robert M. Jones	CRC Press	2nd, 1998
4	Fracture Mechanics: Fundamentals and Application	T. L. Anderson	CRC Press	4th, 2017
5	Computational elasticity	Mohammed Ameen	Narosa publishing house	2008

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Engineering Solid Mechanics: Fundamentals and Applications	A.R. Ragab, and S.E.Bayoumi	CRC Press,	1999
2	"Elasticity: Theory, Applications and Numerics",	M.H.Sadd	Academic Press	2006
3	Engineering Mechanics of Solids	Egor P Popov	Pearson Education India	2016

Video Links (NPTEL, SWAYAM…)	
Sl. No.	**Link ID**
1	https://archive.nptel.ac.in/courses/105/106/105106049/

KTU SPECIAL