Course Code	Course Name	L-T-P-Credits	Year of Introduction
CE373	ADVANCED MECHANICS OF MATERIALS	3-0-0-3	2016

Prerequisite: CE201 Mechanics of Solids

Course objectives:

- To review and make more useful the methods and results presented in the first course on Mechanics of Materials.
- To show the limitations of the ordinary formulas of Strength of Materials, to consider the conditions under which these limitations are significant and to extend the subject to include a variety of important topics more complex than those usually involved in a first course.

Syllabus: Stress, Principal stresses, Strain energy, Failure & Failure criteria, Elements of theory of elasticity, strains and compatibility, Beams on elastic foundation, Curved Beams, Torsion

Expected Outcomes:

The students will be able to

i. apply the concepts of stress, strain and strain energy
ii. use failure criteria and fracture mechanics and buckling in analysis
iii. apply plane state of stress and strains to problems
iv. use strain and compatibility conditions in analysis
v. use the concept of beams on elastic foundations and curved beams
vi. use the principles of torsion for analysis

Text Books

1. R.D. Cook and W.C. Young, Advanced Mechanics of Materials, 2nd edition, Prentice Hall Intl,Inc.1999
2. Srinath L.S, Advanced Mechanics of Solids, Tata McGraw Hill, 3e, 2009

References :

1. A.P. Boresi and O.M.Sidebottom, Advanced Mechanics of Materials, 4th edition, John Wiley & Sons,Inc.1985
2. Edward Tsudik, Analysis of structures on Elastic Foundations, Cengage Learning , J.Ross Publishing, 2012
3. S P Timoschenko, Strength of Materials Vol II ,CBS Publishers, 2002
4. Shames, E.H., Mechanics of Deformable solids, Prentice Hall Inc., 1964
5. Timoshenko S.P and Goodier J.N, Theory of elasticity, McGraw Hill, 3e, 1970

COURSE PLAN

Module	Contents	Hours	Sem. Exam Marks %
I	**Stress, Principal stresses, Strain energy:** Stress at a point – stress on an arbitrarily oriented plane-stress transformations- strain theory-principal stresses & strains (2d & 3d)- Generalized Hooke's law-Equations of thermo-elasticity for isotropic materials-strain energy density- stress concentration.	6	15

II	**Failure & Failure criteria:** Modes of failure –yield failure criteria-introduction to fracture mechanics-cracks & brittle fracture-fatigue-elastic and inelastic buckling.	6	15
FIRST INTERNAL EXAMINATION			
III	**Elements of theory of elasticity :**Transformation of stress and strains: Plane state of stress - equations of transformation - principal stresses. Plane state of strain – analogy between stress and strain transformation - Mohr's circles of stress and strain – strain rosettes.	6	15
IV	Displacements-strains and compatibility-equilibrium equations and boundary conditions- stress field solutions for plane stress problems-polynomial solutions in Cartesian coordinates-displacements calculated from stresses-plane stress problems in polar coordinates.	6	15
SECOND INTERNAL EXAMINATION			
V	**Beams on elastic foundation:** General theory-infinite beam subjected to concentrated load- beams with uniformly distributed loads- short beams **Curved Beams:** Winkler Bach formula-Equivalent area method-Circumferential stresses in Curved beams with I and T sections- Closed ring with circumferential load and uniform loads -deflections of sharply curved beams.	9	20
VI	**Torsion :**Torsion of a cylindrical bar of circular cross section- St. Venant's semi inverse method-stress function approach-elliptical, equilateral triangle & narrow rectangular cross sections - Prandtl's membrane analogy-Hollow thin wall torsion members-multiply connected cross sections- thin wall torsion members with restrained ends.	9	20
END SEMESTER EXAMINATION			

QUESTION PAPER PATTERN (End semester examination)

Maximum Marks :100 **Exam Duration: 3 Hrs**

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

Note : 1.Each part should have at least one question from each module

2. Each question can have a maximum of 4 subdivisions (a,b,c,d)