SCHEME OF COURSE WORK

Course Details:

Course Title	**: Advanced Mechanics of Materials**		
Course Code	**: 15ME2202**	**L P C**	**: 3 0 3**
Program:	**: M.Tech.**		
Specialization:	**: CAAD**		
Semester	**: First**		
Prerequisites	**: Mechanics of solids**		
Courses to which it is a prerequisite	**: Mechanics of solids**		

Course Outcomes (COs):

The student will be able to
1. Relate loading and deformation states to the proper components of stress and strain, determine the principal stresses and principal strains
2. Analyze and design the columns
3. Determine the stresses due to unsymmetrical bending and locate the shear centre of thin –walled sections
4. Determine the stresses in curved beams and apply Castigliano's theorems for deflection of statically determinate and indeterminate structures
5. Calculate the residual stresses in members under torsion/bending and analyze the torsion of noncircular cross-sections

Program Outcomes (POs):

A postgraduates of CAAD will have the

1. Proficiency in latest computer aided design and analysis tools
2. An ability to create 3D model of real time components using latest CAD software.
3. An ability to carry out analysis for the design of new products
4. Acquired skills to perform finite element analysis by using software tools
5. An ability to design and conduct experiments, as well as to analyze and interpret the data.
6. Acquiring technical skills to formulate and solve engineering and industrial problems.
7. Inculcated broad education necessary for understanding the impact of engineering solutions in a global, socio-economic and environmental context.
8. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
9. Capability to work in multidisciplinary streams
10. Realization of professional and ethical responsibilities
11. A recognition of the need for, and an ability to engage in lifelong learning.
12. Ability to carry out the research related to design and analysis

Course Outcome versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1			S		S			M	M		M	S
CO-2	M		S	M	S	M		M	M		M	S
CO-3			S		S	M		M			M	S
CO-4			S	M	S	S		S			M	S
CO-5	M	M	S	M	S	S		S	S		M	S

S - Strongly correlated, *M - Moderately* correlated, *Blank - No correlation*

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	The state of stress at a point, stress components on an inclined plane ,principal stresses, stress invariants and Octahedral stress and the plane state of stress	CO1	Explain the three dimensional state of stress at a point	▫ Lecture ▫ Demo class ▫ Problem solving	
2	Rectangular strain components, state of strain at a point ,principal strains ,plane state of strain stress-strain relations for isotropic materials	CO1	Determine the principal strains for a given state of strain at apoint	▫ Lecture ▫ Discussion ▫ Problem solving	
3	Euler's buckling load of a column for different support conditions, Effective length of a column, Rankine's formula	CO2	Derive the relation for the Euler's buckling load for the condition of both ends fixed	▫ Lecture ▫ Discussion ▫ Problem solving	
4	Column subjected to eccentric loading-Secant formula, critical load of a column having initial curvature, stresses .	CO2	Explain the column subjected to eccenctric loading	▫ Lecture ▫ Discussion	
5	Beam column with a concentrated load at mid-span	CO2	Derive the relation for beam column with a concentrated load at mid span	▫ Lecture ▫ Discussion ▫ Problem solving	**Assignment - 1 (Week 5 - 7)**
6	Unsymmetrical bending of Euler-Bernouli hypothesis	CO3	Explain briefly about unsymmetrical bending of straight beams	▫ Lecture ▫ Discussion ▫ Problem solving	
7	Problems on unsymmetrical bending	CO3	Explain about the unsymmetrical bending of I and T-sections	▫ Lecture ▫ Discussion ▫ Problem solving	
8	Stresses induced and the neutral axis and introduction to shear centre	CO3	Explain about the stress induced and the neutral axis	▫ Lecture ▫ Discussion ▫ Problem solving	**Seminar - 1 (Week 8)**
9	**Mid-Test 1**				**Mid-Test 1**

					(Week 9)
10	Shear Centre of simple thin –walled sections.	CO3	Determine the shear centre of simple thin –walled sections	▫ Lecture ▫ Discussion ▫ Problem solving	
11	Shear stresses in thin-walled open sections	CO3	Explain the shear stresses in thin-walled open sections	▫ Lecture ▫ Discussion ▫ Problem solving	
12	Bending of curved beams: Winkler-Bach formula, shift of neutral axis for various cross-sections	CO4	Derive the Winkler-Bach formula for the stresses in curved beams	▫ Lecture ▫ Discussion ▫ Problem solving	
13	Stresses in curved beams, stresses in cranehook, stresses in circular rings	CO4	Explain about the stresses in curved beams	▫ Lecture ▫ Discussion ▫ Problem solving	
14	Energy Methods : Strain energy principles, Castigliano's first and second theorems, application to members subjected to axial, transverse and torsional loads ,application to statically indeterminate problems	CO4	Explain the Castigliano's first and second theorems	▫ Lecture ▫ Discussion	**Assignment-2 (Week 14- 16)**
15	Elasticity: Isotropic elastic bodies and anisotropic hyper elastic solids .	CO5	Explain about isotropic elastic bodies	▫ Lecture ▫ Discussion	
16	Plasticity: Rate-independent functional representation	CO5	Discuss about rate independent functional representation	▫ Lecture ▫ Discussion	
17	Representation by means of internal variables, Elasto plasticity .	CO5	Explain the representation by means of internal variables	▫ Lecture ▫ Discussion	**Seminar - 2 (Week 17)**
18	**Mid-Test 2**				**Mid-Test 2 (Week 18)**
19/20	**END EXAM**				**END EXAM**