SCHEME OF COURSE WORK

Course Details:

Course Title	**: Advanced Mechanics of Materials**		
Course Code	**: 15ME2203**	**L P C**	**: 4 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):

At the end of the program, the students in CAAD will be able to

PO 1	acquire knowledge in latest computer-aided design and analysis tools
PO 2	create 3D models of real-time components using latest CAD software
PO 3	acquire technical skills to formulate and solve engineering and industrial problems
PO 4	carry out analysis for the design of new products
PO 5	have proficiency to solve problems using modern engineering design tools
PO 6	have capability to work in multidisciplinary streams
PO 7	apply project and finance management skills to organise engineering projects
PO 8	prepare technical reports and present them effectively
PO 9	engage in lifelong learning
PO 10	realize professional and ethical responsibilities
PO 11	conduct surveys, analyse data, plan, design and implement new ideas into action

Course Outcome versus **Program Outcomes:**

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

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	Three dimensional state of stress at a point, stress components on an inclined plane ,principal stresses, stress invariants and Octahedral 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, 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 straight beams having rectangular sections	CO3	Explain briefly about unsymmetrical bending of straight beams	▫ Lecture ▫ Discussion ▫ Problem solving	
7	Unsymmetrical bending of I and T-sections.	CO3	Explain about the unsymmetrical bending of I and T-sections	▫ Lecture ▫ Discussion ▫ Problem solving	
8	Stresses induced and the neutral axis	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 :Castigliano's first and second theorems, application to members subjected to axial, transverse and torsional loads ,application to statically indeterminate structures	CO4	Explain the Castigliano's first and second theorems	▫ Lecture ▫ Discussion	**Assignment-2 (Week 14- 16)**
15	Plastic deformation: Elasto-plastic material,plastic deformation of circular shafts under torsion .	CO5	Explain about plastic deformation of circular shafts under torsion	▫ Lecture ▫ Discussion	
16	Residual stresses in circular shafts ,plastic deformation of members with a single plane of symmetry under bending, residual stresses in beams	CO5	Determine the residual stresses in circular shafts	▫ Lecture ▫ Discussion	
17	Torsion on non circular members: Rectangular, elliptical and equilateral triangular cross-sections, torsion of thin walled tubes .	CO5	Explain the torsion of thin-walled tubes	▫ Lecture ▫ Discussion	**Seminar - 2 (Week 17)**
18	**Mid-Test 2**				**Mid-Test 2 (Week 18)**
19/20	**END EXAM**				**END EXAM**