SCHEME OF COURSE WORK

Course Details:

Course Title	:Mechanics of composite materials		
Course Code	: 13ME2207	**L T P C**	:4 0 0 3
Program:	: M.Tech.		
Specialization:	: CAAD		
Semester	: IInd		
Prerequisites	:-- Material science and metallurgy, Strength of materials		
Courses to which it is a prerequisite	:------		

Course Outcomes (COs):

The student will be able to

CO1	Classify composites, types of reinforcement and matrix phases.
CO2	Compute stress and strain , elastic constants of composites
CO3	Explain different fabrication methods to prepare composite materials.
CO4	Describe methods to characterize composite properties
CO5	Analyse different types of composite laminates using thin plate theory,

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	M	S	S	M	M	M	--	--	--	--
CO-3	--	--	S	S	M	M	M	--	M	--	--
CO-4	M	M	S	S	M	M	M	--	--	--	--
CO-5	--	--	S	S	M	M	M	--	M	--	--

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

Assessment Methods

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

1. Teaching-Learning and Evaluation

Week	Topic / Contents	Course Outcomes	Sample questions	Teaching-Learning Strategy	Assessment Method & Schedule
1	classification of composites,applications.	CO-1	1. Classify different types of composites 2. Give application of composite 3. discuss various types of reinforcement 4. Derive the expression for stress transformation	Lecture Demonstration Problem solving	Assignment - I (Week 2 - 4)
2	Raw materials: Resins: Reinforcement: fillers and parting agents.	CO-1			
3	Macromechanical behaviour of a lamina: transformation of stress and strain,	CO-1			
4	numerical examples of stress strain transformation, graphic interpretation of stress – strain relations.	CO-1			
5	Off -axis, stiffness modulus, elastic behaviour of unidirectional composites:	CO-2	1. derive relation between elastic constants and reduced stiffness components 2. Derive expression for youngs modulus for a composite. 3. Discuss pultrusion method in detail	Lecture Problem solving	Seminar - I (Week 6 - 8)
6	elastic constants of lamina, relationship between engineering constants and reduced stiffness and compliances,	CO-2			
7	analysis of laminated composites. sMicro mechanics: Introduction, weight and volume fractions, properties of lamina, representative volume element, micro mechanics, analysis of continuous and discontinuous	CO-2			

	fibres, reinforced composites, failure modes of unidirectional composites.				
8	Fabrication methods: Hand lay-up: materials, molding, bag molding, mating molds, spray up molding, matched - die molding, perform molding, filament winding, winding patterns and winding machines, pultrusion.	CO-3			
9	Mid-Test 1	CO-1, CO-2 CO-3			Mid-Test 1 (Week 9)
10	Experimental characterization and testing methods of composites: Properties of constituents: single filament tensile properties, matrix tensile properties, density, volume fractions,	CO-4	1.explain the procedure to find the tensile properties of composite 2. how to find the co-efficient of thermal expansion for a composite 3. explain different types of failure modes	Lecture Discussion Problem solving	Assignment - II (Wee12 - 14)
11	coefficient of thermal and moisture expansions, properties of composites: tensile test method, compression test method.	CO-4			
12	Strength of unidirectional lamina: Micro mechanics of failure, failure mechanisms,	CO-4			
13	strength of an orthotropic lamina, strength of a lamina under tension and shear maximum stress and strain criteria,	CO-4	1. how to determine first ply failure of composite	Lecture Discussion Problem solving	Seminar - II (Week 16 - 18)
14	Application to design. the failure envelope, first ply failure free-edge effects	CO-4			

15	Analysis of laminated composite plates: introduction, thin plate theory, specially orthotropic plate, cross and angle ply laminated plates,	CO-5	1. derive expression for [A] [B] [D] matrix for cross ply laminate 2. what are different modes of composite failure? explain.	Lecture Problem solving	
16	bending and vibration analysis of laminated composite plates using finite element method Fiber composites: Tensile and compressive strength of unidirectional fibre composites,	CO-5			
17	fracture modes in composites: single and multiple fracture, de-bonding, fibre pullout and de-lamination failure, fatigue of laminate composites	CO-5			
18	Mid-Test 2	CO-4, CO-5			Mid-Test 2 (Week 18)
19/ 20	END EXAM	All Cos			