SCHEME OF COURSE WORK

Course Title	: Manufacturing methods and Mechanics of composites			
Course Code	: 13ME2108	L T P C	: 4 0 0 3	
Program:	: M.Tech.			
Specialization:	: CAD/CAM			
Semester	: I			

Course Outcomes (COs):

At the end of the course, the student will be able to

1	Explain basic concepts and characteristics of natural and manmade composites; recognize the reinforcement materials like fibers, glass, silica, kevlar etc.
2	Describe micromechanics of unidirectional composites and their properties and point out the characterization; discuss different manufacturing methods
3	Compute coordinate transformations and Hookes law for different type of materials
4	Examine elastic behaviour of unidirectional composites
5	Estimate strength of unidirectional lamina and explain failure mechanisms

Program Outcomes (POs)

At the end of the program, the students in CAD/CAM will be able to

1. acquire fundamentals in the areas of computer aided design and manufacturing
2. apply innovative skills and analyze computer aided design and manufacturing problems critically
3. identify, formulate and solve design and manufacturing problems
4. carry out research related to design and manufacturing
5. use existing and recent CAD/CAM software
6. collaborate with educational institutions, industry and R&D organizations in multidisciplinary teams
7. apply project and finance management principles in engineering projects
8. prepare technical reports and communicate effectively
9. engage in independent and life-long learning and pursue professional practice in their specialized areas of CAD/CAM
10. exhibit accountability to society while adhering to ethical practices
11. act independently and take corrective measures where necessary

Course Outcome versus **Program Outcomes:**

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

S - Strongly correlated, *M - Moderately* correlated, *Blank - No correlation*
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Teaching-Learning and Evaluation

WEEK	TOPIC / CONTENTS	COURSE OUTCOMES	SAMPLE QUESTIONS	TEACHING-LEARNING STRATEGY	ASSESSMENT METHOD & SCHEDULE
1	Basic concepts and characteristics: Geometric and Physical definitions, natural and man-made composites. Aerospace and structural applications, types and classification of composites.	CO1	1. Explain about the different types and classification of composites.	Lectures , Seminar	
2	Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and boron carbide fibres.	CO1	2. Explain about Metal matrix and ceramic Composites.		
3	Particulate composites. Polymer composites, Thermoplastics, Thermosets, Metal matrix and ceramic composites.	CO1	3. What are the properties of typical compositematerials?		Assignment (week 7)
4	Micromechanics: Unidirectional composites, constituent materials and properties, elastic properties of a lamina.	CO1	4. Briefly explain about elastic properties of a lamina.		
5	Properties of typical composite materials, laminate characteristics and configurations.Characterization of composite properties.	CO2	1. Explain Hooke□s law for two dimensional unidirectional lamina. 2. Explain about off - axis compliance. 3. Describe the relationship between engineering constantand reduced stiffnessand compliances.	Lectures , Seminar	
6	Manufacturing methods: Autoclave, tape production, moulding methods, filament winding, man layup,	CO2			

	pultrusion, RTM.				
7	Coordinate transformations: Hooke□s law for different types of materials, Hooke□s law for two dimensional unidirectional lamina.	CO2			
8	Transformation of stress and strain, Numerical examples of stress strain Transformation.	CO2			
9	Mid-Test 1	CO-1, CO-2			
10	Graphic interpretation of stress – strain relations. axis, stiffness modulus, off - axis compliance.	CO3	1. Explain the effect of topology and geometry on boundary models. 2. Differentiate between CSG and B-rep. 3. What are the different solid entities.?	Lectures , Seminar	
11	Elastic behaviour of unidirectional composites: Elastic constants of lamina, relationship between engineering constants and reduced stiffness and compliances.	CO3			
12	Analysis of laminated composites, constitutive relations.	CO4	1. Explain the analysis of laminated composites. 2. Explain about micro mechanics of failure and failure mechanisms. 3.Explain the different applications to design.	Lectures , Seminar	Seminar (week 11-16)
13	Strength of unidirectional lamina: Micro mechanics of failure, Failure mechanisms, Strength of an orthotropic lamina.	CO4			
14	Strength of a lamina under tension and shear maximum stress and strain criteria, application to design.	CO4			

15	The failure envelope, first ply failure, free-edge effects.Micro mechanical predictions of elastic constants.	CO5	1. Explain about thin plate theory. 2. What are the problems using in thin plate theory? 3. Explain about cross and angle ply laminatedplates.	Lectures , Seminar	
16	Analysis of laminated composite plates: Introduction, thin plate theory, specially orthotropic plate.	CO5			
17	Cross and angle ply laminated plates, problems using thin plate theory.	CO5			
18	Mid-Test 2	CO-3, CO-4, CO-5			
19/20	END EXAM	All Cos			