SCHEME OF COURSE WORK

Course Title	Composite Materials		
Course Code	19ME21P2	L T P C	2 0 0 2
Program	M.Tech.		
Specialization	Open Elective for M. Tech Programmes		
Semester	II		

Course Outcomes (COs):

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

CO1	Explain the advantages and applications of composite materials.
CO2	Describe the properties of various reinforcements of composite materials
CO3	Summarize the manufacture of metal matrix, ceramic matrix and C-C composites
CO4	Describe the manufacture of polymer matrix composites
CO5	Formulate the failure theories of composite materials

Program Outcomes (POs):

PO Code	Program Outcome (PO)
PO1	acquire fundamentals in the areas of computer aided design and manufacturing
PO2	apply innovative skills and analyze computer aided design and manufacturing problems critically
PO3	identify, formulate and solve design and manufacturing problems
PO4	carry out research related to design and manufacturing
PO5	use existing and recent CAD/CAM software
PO6	collaborate with educational institutions, industry and R&D organizations in multidisciplinary teams
PO7	apply project and finance management principles in engineering projects
PO8	prepare technical reports and communicate effectively
PO9	engage in independent and life-long learning and pursue professional practice in their specialized areas of CAD/CAM
PO10	exhibit accountability to society while adhering to ethical practices
PO11	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
CO-1	S										
CO-2	S	M									
CO-3	S			M							
CO-4	S				M						
CO-5	S			M							

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

Teaching - Learning and Evaluation

WEEK	TOPIC / CONTENTS	COURSE OUTCOMES	SAMPLE QUESTIONS	TEACHING - LEARNING STRATE	ASSESSMENT METHOD & SCHEDULE
1.	Definition – Classification and characteristics of Composite materials	CO1	1. Classify various types of composite materials. (L4) 2. Describe the applications of composite materials. (L2) 3. Explain the roles of reinforcement and matrix in a composite material. (L2)	Lecture and PPT	Assignment
2.	Applications of composites.	CO1			
3.	Functional requirements of reinforcement and matrix.	CO1			
4.	Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance	CO1			
5.	Preparation-layup, curing, properties and applications of glass fibers	CO2	1. Explain the preparation, layup and curing of composites. (L2) 2. Describe characteristics of various reinforcements. (L2) 3. Calculate the properties of composites. (L3)	Lecture and PPT	Seminar
6.	Carbon fibers, Kevlar fibers and Boron fibers.	CO2			
7.	Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites:	CO3			
8.	Rule of mixtures, Inverse rule of mixtures. iso-strain and iso-stress conditions	CO4			
9.	**Mid - Test 1 on CO1 and CO2**				
10.	Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications	CO3	1. Explain manufacturing methods of metal matrix composites. (L2) 2. Discuss manufacturing methods of ceramic matrix composites. (L2) 3. Describe manufacturing methods of C-C composites. (L2)	Lecture and PPT	Assignment
11.	Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications	CO3			
12.	Manufacturing of Polymer Matrix Composites: Preparation of Molding compounds and prepregs	CO4	1. Explain manufacturing methods of polymer matrix composites. (L2) 2. Describe various manufacturing methods of polymer matrix composites. (L2) 3. Discuss properties and applications of polymer matrix composites. (L2)	Lecture and PPT	Seminar
13.	Hand layup method – Autoclave method – Filament winding method	CO4			
14.	Compression molding – Reaction injection molding. Properties and applications	CO4			
15.	Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria	CO5	1. Explain theories for failure of composites. (L2)	Lecture and PPT	Open Book Exam

16.	Interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength	CO5	2. Calcululate the strength of composite. (L3) 3. Design a composite material for a particular application. (L6)		
17.	Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations	CO5			
18.	**Mid - Test 1I on CO3, CO4 and CO5**				
19/ 20	**END EXAM on All COs**				