Lesson Plan

Subject: Composite Materials
Branch: 2nd semester Machine Design & Analysis (Mechanical Engg).
Course code and L.T.P: 4-0-0
CR: 4
Assigned Assistant Professor: Johnson B Lakra

Sl. No.	Lectures/ Classes	Topic	Remark
1	1	Introduction – what is a composite material? Classification and characteristics of composite materials	Module 1
2	2	What are fibrous composite and different types of fibrous composites?	Module 1
3	3	What are laminated composite and different types of laminated composites?	Module 1
4	4	What are Particulate composite and different types of particulate composites?	Module 1
5	5	Composite matrix and different matrix materials	Module 1
6	6	Basic terminologies used in composite materials	Module 1
7	7	Mechanical behaviour of composite materials	Module 1
8	8	What is a laminae and Laminates from mechanical behaviour point of view.	Module 1
9	9	Fillers, additives	Module 1
10	10	Application and advantages of a composite material.	Module 1
11	11	In general materials used in composite material with their properties	Module 2
12	12	Introduction to Manufacturing of laminated fiber-reinforced composite materials.	Module 2
13	13	Initial form for different constituent materials of a composite.	Module 2
14	14	Different methods for manufacturing composite materials for fiber reinforced plastics.	Module 2
15	15	Quality control	Module 2
16	16	different test methods	Module 2
17	17	Current and potential advantages of fiber-reinforced composite materials	Module 2
18	18	Strength and stiffness advantages in a composite material	Module 2
19	19	Cost advantages; current and potential use of composite materials	Module 2
20	20	Summery of module I & II	
21	21	Stress- strain relation for anisotropic, monoclinic, orthotropic, transverse isotropic and isotropic material.	Module 3
22	22	Engineering constants for orthotropic and isotropic material	Module 3
22	22	Restriction of elastic constants in orthotropic and isotropic material	Module 3

23	23	Stress-strain relations for plane stress in orthotropic materials	Module 3
25	25	Stress-strain relation for lamina of arbitrary orientation	Module 3
26	26	Invariant properties of an orthotropic lamina	Module 3
27	27	Strength concepts of an orthotropic lamina; experimental determination of strength and stiffness	Module 3
28	28	Biaxial strength theories of an orthotropic lamina – maximum stress and strain theory	Module 3
29	29	Tsai-hill theory, tsai-wa tensor theory	Module 3
30	30	problems	Module 3
31	31	Introduction to classical lamination theory; stress-strain behaviour of lamina; strain and stress variation in a laminate; force and moment in a laminate.	Module 4
32	32	Stiffness of a single layer configuration, symmetric, antisymmetric and non symmetric laminates.	Module 4
33	33	Comparison of theoretical and experimental determination of laminate stiffness- inversion of stiffness equation.	Module 4
34	34	Cross-ply laminate stiffness; Theoretical and experimental determination of cross-ply laminate stiffness	Module 4
35	35	Angle-ply laminate stiffness; Theoretical and experimental determination of Angle-ply laminate stiffness	Module 4
36	36	Laminate strength analysis procedure; laminate strength criteria.	Module 4
37	37	Thermal and mechanical stress analysis; strength of cross-ply and angle-ply laminate.	Module 4
38	38	Classical lamination theory (inter-laminar stress); elasticity formulation and solution results; implication of inter-laminar stress.	Module 4
39	39	Invariant laminate stiffness concepts; special results for invariant laminate stiffness	Module 4
40	40	Use of invariant laminate stiffness in design; laminate joints.	Module 4

Reference Books:

1. R.M.Jones – Mechanics of composite Materials, Mc Grew Hill Book Co.
2. Fibre-Reinfored composites-Materials, Manufacturing and Design by P.K.Mallick Marcel Dekken, Inc. New York & Basel.
3. Composite Materials: science &enginnering by Krishan k chawala, springer .