

OE942ME

**COMPOSITE MATERIALS
(OPEN ELECTIVE)**

Instruction: 3 periods per week

CIE: 30 marks

Credits: 3

Duration of SEE: 3 hours

SEE: 70 marks

Course Objectives:

- *Study the concepts of composite construction*
- *Learn analysis and designs of composite beams, floors, columns and trusses as per the recommendations of IS codes of practice.*
- *Apply the concepts for design of multi-storey composite buildings*
- *Scope of analysis is restricted to skeletal structure subjected to prescribed dynamic loads.*

Course Outcomes:

- 1. Understand the fundamentals of composite construction, and analysis and designs of composite beams.*
- 2. Analyse and design the composite floors*
- 3. Select suitable materials for composite columns*
- 4. Analyse composite trusses and understand connection details*
- 5. Analysis and design the multi storey composite buildings*

UNIT-I

Introduction: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT-II

Reinforcements: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT-III

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT-IV

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

10/4/2024
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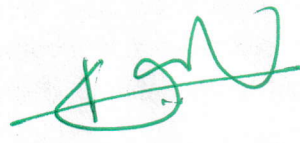
UNIT-V

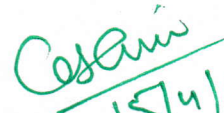
Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Suggested Reading:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.
3. Hand Book of Composite Materials-ed-Lubin.
4. Composite Materials – K.K.Chawla.
5. Composite Materials Science and Applications – Deborah D.L. Chung.
6. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi

OE942ME
Syllabus. 2023-2024
10/4/2024
C-BOYCA, MED


Prof. P. Ramesh Babu


15/4/2024