

(CE517) MECHANICS OF COMPOSITE MATERIALS

Objective of the Course:

To identify the properties of fiber and matrix materials used in commercial composites, as well as some common manufacturing techniques and to predict the elastic properties of both long and short fiber composites based on the constituent properties.

UNIT-I:

Introduction

Introduction to Composites, Classifying composite materials, commonly used fiber and matrix constituents, Composite Construction, Properties of Unidirectional Long Fiber Composites, and Short Fiber Composites

UNIT-II:

Stress Strain Relations

Concepts in solid mechanics, Hooke's law for orthotropic and anisotropic materials, Linear Elasticity for Anisotropic Materials, Rotations of Stresses, Strains, Residual Stresses

UNIT-III:

Analysis of Laminated Composites

Governing equations for anisotropic and orthotropic plates. Angle-ply and cross ply laminates. Static, dynamic and stability analysis for simpler cases of composite plates. Inter laminar stresses.

UNIT-IV:

Failure and Fracture of Composites

Netting Analysis, Failure Criterion, Maximum Stress, Maximum Strain, Fracture Mechanics of Composites, Sandwich Construction.

UNIT-V:

New Cement Composites

FRC-Ferro cement-Nano cement composite- SIFCON-Polymer concretes.

TEXT BOOKS:

1. Daniel and Ishai, "Engineering Mechanics of Composite Materials", Oxford University Press, 2005.
2. Jones R.M., "Mechanics of composite materials", McGraw-Hill, Kogakusha Ltd., Tokyo, 1975.

REFERENCE BOOKS:

1. Agarwal.B.D. and Broutman.L.J., "Analysis and Performance of fiber composites", John-Wiley and Sons, 1980.
2. Michael W.Hyer, "Stress Analysis of Fiber-Reinforced Composite Materials", McGraw Hill, 1999.
3. Mukhopadhyay.M, " Mechanics of Composite Materials and Structures", University Press, India, 2004.