Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

ID6090 – Composite materials and manufacturing

Credit Distribution: C: 9 L: 3 T: 0 P: 0 E: 0 O: 6 TH: 0

Course Type: Theory

Description: To have basic knowledge about the properties of advanced composite materials 2. To understand the manufacturing and application of advanced composites.

Course Content: 1. Composite Materials: Definition, Characteristics, Classifications based on structure and matrices, Structural, Functional sensory and smart composites, Advantages and limitations, History, Industrial scene and applications. 2. Reinforcement Fibers: High strength manmade (glass, carbon, aramid, etc) and natural fibers, Structure, Characteristics, Properties and applications. 3. Whiskers: Characteristics, properties and applications. 4. Polymer Matrix Composites (PMC): Thermo set, thermoplastic and elastomeric polymers, their properties, characteristics and utilisation as matrices. Manufacturing methods for thermo set, thermo plastic and elastomeric PMC. Their characteristic features, properties of composites made and their applications. 5. Metal Matrix Composites (MMC): Metals, Inter-metallics and alloys used for MMC and their properties, Manufacture of MMC, their properties, characteristics and applications. 6. Ceramic Matrix Composites (CMC): Classification of ceramics and their potential role as matrices. Ultra structure processing of ceramics, Manufacture, properties and applications of CMC using fine ceramics, carbon ,glass, cement and gypsum as matrices. 7. Analysis of Advanced Composites: Micromechanics - Micromechanics - Failure theories. 8. Post-Processing Operations: Machining, cutting, polishing, welding of thermoplastic PMC, bonding, riveting and painting. Advanced post processing methods like ultrasonic welding, plasmacoating, waterjet cutting and laser machining.

Text Books:

- Chawla. K.K., Composite Materials - Science and Engineering, Springer, 2001.
- Jones, R.M., Mechanics of Composite Materials, Taylor and Francis, 1999.

Reference Books:

- Lubin, G., Handbook of Composites, Van Nostrand Reinhold Co., 1982.
- Eckold, G., Design and Manufacture of Composite Structures, Wood head Publishing Ltd., 1994.

Prerequisite: Nil