

MANGALORE UNIVERSITY
Department of Materials Science
MSc Materials Science

MSS 554: COMPOSITE MATERIALS (3 Credits)

Objectives: This course provides an introduction to the composite material of different types, the effect of reinforcing materials and matrices, their properties and applications. The course also tries to emphasize on nature of interface and micromechanics involved in various types of composite materials, their properties and applications.

Expected course outcomes: An understanding of basics of interfacial interactions, properties of various metal, polymer and ceramic based composite materials is expected which would enable them to solve the problems in design of new materials for various applications.

Unit I

Introduction - Classification, Matrix materials, Reinforcing materials, Interfaces in composites, micromechanics of composites - Density, Mechanical properties – prediction of elastic constants, Thermal properties – Heat capacity, longitudinal and transverse conductivity, thermal expansion coefficient, Mechanism of load transfer from Matrix to fiber – (fiber elastic – matrix elastic, fiber elastic- matrix plastic).

Strength, Fracture and fatigue: Tensile strength, Compression Strength, Fracture modes in Composite, Designing with Composite Materials. 14 hours

Unit II

Reinforcing Materials - Fabrication, Structure, Preparation, application of glass, Carbon, aramid and ceramic fibers Concrete making Materials - Structure, Composition, properties and applications, special concrete, Reinforced and prestressed concrete. Polymer matrix composites- Fabrication, structure, interface, properties and applications. Advanced thermoplastic composites, Wood- microstructure, properties, wood-plastic composites, polymer-concrete composites.

14 hours

Unit III

Metal matrix composites- Fabrication, interface, properties and applications, Dispersion strengthened, particle reinforced, fiber and laminate reinforced composites, fiber reinforced super alloy composites, Superconducting composites-Introduction type and fabrication.

Ceramic matrix composites - Fabrication, interface, properties and applications

Carbon fiber composites- Fabrication, interface, properties and applications, Advanced C-C composites. 14 hours

References

1. Composite Materials-Engineering & Science – F L Mathews & R D Rawlings
(Chapman & Hall, 1990)
2. Composite Materials- Science & Engineering – K K Chawla (Springer-Verlag, 1987)
3. Principles of Materials Science & Engineering – William F Smith (McGraw-Hill, 1988)
4. A text book of Materials Science & Metallurgy – O P Khanna (Dhanpat Rai pub., 1999)
5. Selection of Engineering Materials – Gladis Lewis (Printice Hall, 1990)
6. Engineering Materials & their applications – R A Flinn & P K Trojan (Jaico pub., 1998)
7. Composite Materials – S C Sharma. (Narosa, 2000)

