

Composite Materials and Structures - Web course

COURSE OUTLINE

1. Introduction to fibrous composites:

Fibre, matrix: materials, properties and fabrication processes, types/classification of composites, fabrication methods of composites, advantages and applications.

2. 3D constitutive equations (principal material and global directions), thermal, hygroscopic effects and hygrothermoelastic constitutive equation.
3. Plane stress (or reduced) constitutive equations (principal material and global directions) and hygrothermoelastic constitutive equation, lamina engineering constants.
4. Lamination theory, hygrothermoelastic lamination theory.
5. Designing with laminates.
6. **Test methods:** Quality assessment, physical and mechanical property characterization.
7. **Micromechanics:** Strength of materials and continuum approaches for effective properties.
8. Failure mechanisms, lamina failure theories.
9. Damage mechanics of composites.
10. Fracture mechanics of composites.
11. Interlaminar stresses.
12. Composite joints.
13. Nanocomposites.
14. Stitched composites.
15. 3D composites.

References:

1. Mechanics of Fibrous Composites, C.T. Herakovich, John Wiley & Sons, Inc. New York, 1998.
2. Analysis and Performance of Fibre Composites, B.D. Agarwal and L.J. Broutman, John Wiley & Sons, Inc. New York.
3. Mechanics of Composite Materials, R.M. Jones, Technomic Publication.
4. Mechanics of Composite Materials, RM Christensen, Krieger Publishing Company, Florida, USA.
5. Mechanical Testing of Advanced Fibre Composites, J.M. Hodgkinson, Woodhead Publishing Limited, Cambridge, 2000.
6. ASTM standards.
7. Research articles.



NP-TEL

NPTEL

<http://nptel.iitm.ac.in>

Aerospace Engineering

Pre-requisites:

1. Mechanics of solids or Strength of Materials.

Additional Reading:

1. Fibrous Materials, K.K. Chawla, Cambridge University Press, Cambridge, 1998.

Hyperlinks:

1. composite.about.com
2. www.gurit.com
3. www.rapra.net/vircon/1sub.asp
4. www.compositesworld.com
5. www.netcomposites.com/EducationIntro.asp

Coordinators:

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