

**Maulana Abul Kalam Azad University of Technology, West Bengal**  
*(Formerly West Bengal University of Technology)*  
**SYLLABUS FOR BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING**  
**(Effective from academic session 2018-19)**

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| <b>Subject Code:</b> F                       | <b>Category:</b> Professional Elective Courses |
| <b>Subject Name:</b> Composite Materials     | <b>Semester:</b> Sixth                         |
| <b>L-T-P:</b> 3-0-0                          | <b>Credit:</b> 3                               |
| <b>Pre-Requisites:</b> Materials Engineering |  |

**Course Objectives:**

To understand the mechanical behaviour of composite materials.

To get an overview of the methods of manufacturing composite materials.

**Course Contents:**

| <b>Module No.</b> | <b>Description of Topic</b>  | <b>Contact Hrs.</b> |
|-------------------|--|---------------------|
| 1                 | Definition and applications of composite materials, Fibres- glass, carbon, ceramic and aramid fibres; Matrices- polymer, graphite, ceramic and metal matrices; characteristics of fibres and matrices. Lamina- assumptions, macroscopic viewpoint, generalized Hooke's law, reduction of homogeneous orthotropic lamina, isotropic limit case, orthotropic stiffness matrix, commercial material properties, rule of mixtures, transformation matrix, transformed stiffness.   | 12                  |
| 2                 | Manufacturing of composite materials, bag moulding, compression moulding, pultrusion, filament winding, other manufacturing processes  | 8                   |
| 3                 | Basic assumptions of laminated anisotropic plates, symmetric laminates, angle ply laminates, cross ply laminates, laminate structural moduli, evaluation of lamina properties, determination of lamina stresses, maximum stress and strain criteria, von Mises Yield criterion for isotropic materials, generalized Hill's criterion for anisotropic materials, Tsai-Hill's criterion for composites, prediction of laminate failure, thermal analysis of composite laminates. | 8                   |
| 4                 | Analysis of laminated plates- equilibrium equations of motion, energy formulation, static bending analysis, buckling analysis, free vibrations, natural frequencies.   | 8                   |

**Course Outcomes:**

Upon completion of this course, the students will have an overview of the mechanical behaviour and application of composite materials

**Learning Resources:**

1. R.F. Gibson, Principles of Composite Material Mechanics, 2<sup>nd</sup> Edition, McGraw Hill, 1994.
2. M.W. Hyer, Stress Analysis of Fiber-Reinforced Composite Materials, McGraw Hill, 1998.
3. K.K. Chawla, Composite Materials- Science and Engineering, Springer International Publishing, 2019.
4. M. Mukhopadhyay, Mechanics of Composite Materials and Structures, University Press, 2013.