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| Image result for nit meghalaya logo | | | | **National Institute of Technology Meghalaya**  An Institute of National Importance | | | | | | | | | | | | | | | | | | | | | | | **CURRICULUM** | | | | | |
| Programme | | | | **Bachelor of Technology in Civil Engineering** | | | | | | | | | | | | | Year of Regulation | | | | | | | | | | **2020** | | | | | |
| Department | | | | **Civil Engineering** | | | | | | | | | | | | | Semester | | | | | | | | | | **V** | | | | | |
| Course  Code | | Course Name | | | | | | | | **Pre requisite** | | | | Credit Structure | | | | | | | | Marks Distribution | | | | | | | | | | |
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| **CE319** | | **Composite Materials and Structures** | | | | | | | | **Nil** | | | | **3** | | **0** | | | **0** | **3** | | **50** | | | **50** | | | **100** | | | **200** | |
| Course  Objectives | | 1. To understand the definitions, compositions, advantages, and applications of Composite material. | | | | | | | | | | Course Outcomes | | | | CO1 | | | The students will be able to understand the definitions, compositions, advantages, and applications of Composite material. | | | | | | | | | | | | | |
| 1. To understand the mechanical behavior of Composite material. | | | | | | | | | | CO2 | | | The students will be to understand the mechanical behavior of Composite material. | | | | | | | | | | | | | |
| 1. To understand the micromechanical analysis of Composite material and elastic properties of the unidirectional lamina. | | | | | | | | | | CO3 | | | The students will be able to understand the micromechanical analysis of Composite material andelastic properties of the unidirectional lamina. | | | | | | | | | | | | | |
| 1. To understand and perform the analysis of laminated composites. | | | | | | | | | | CO4 | | | The students will be able to understand and perform the analysis of laminated composites. | | | | | | | | | | | | | |
| 1. To understand the failure theories of Composites. | | | | | | | | | | CO5 | | | The students will be able to understand the failure theories of Composites. | | | | | | | | | | | | | |
| No. | COs | | Mapping with Program Outcomes (POs) | | | | | | | | | | | | | | | | | | | | | | | Mapping with PSOs | | | | | | |
| PO1 | | PO2 | PO3 | PO4 | PO5 | PO6 | | PO7 | | PO8 | | PO9 | | | PO10 | | | PO11 | | PO12 | | | PSO1 | | | PSO2 | | | PSO3 |
| 1 | CO1 | | 3 | | 3 | 2 | 2 | 2 | 1 | | 1 | | 0 | | 1 | | | 1 | | | 1 | | 1 | | | 0 | | | 1 | | | 1 |
| 2 | CO2 | | 3 | | 3 | 2 | 2 | 2 | 1 | | 1 | | 0 | | 1 | | | 1 | | | 1 | | 1 | | | 0 | | | 1 | | | 1 |
| 3 | CO3 | | 3 | | 3 | 2 | 2 | 2 | 1 | | 1 | | 0 | | 1 | | | 1 | | | 1 | | 1 | | | 0 | | | 1 | | | 1 |
| 4 | CO4 | | 3 | | 3 | 2 | 2 | 2 | 1 | | 1 | | 0 | | 1 | | | 1 | | | 1 | | 1 | | | 0 | | | 1 | | | 1 |
| 5 | CO5 | | 3 | | 3 | 2 | 2 | 2 | 1 | | 1 | | 0 | | 1 | | | 1 | | | 1 | | 1 | | | 0 | | | 1 | | | 1 |
| SYLLABUS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No. | Content | | | | | | | | | | | | | | | | | | | | | | | Hours | | | | | | COs | | |
| I | **Introduction to Composite Materials**  Definitions: Composite material, Fiber, Matrix. Types of Fibers and Raw Fiber Properties, Types of Matrix, Prepregs, Fillers and other Additives. | | | | | | | | | | | | | | | | | | | | | | | **4** | | | | | | **CO1** | | |
| II | **Advantages and Applications**  Advantages of Composite Materials and Structures. Applications and Use of Composite materials in the present world. | | | | | | | | | | | | | | | | | | | | | | | **2** | | | | | | **CO1** | | |
| III | **Basics of Composites**  Mechanical Behaviour of Composite Materials. Lamina, Laminate: The basic building block of a composite material. | | | | | | | | | | | | | | | | | | | | | | | **6** | | | | | | **CO2** | | |
| IV | **Micromechanical Analysis of Composite Strength and Stiffness**  Properties of typical composite materials. Volume and Weight Fractions. Longitudinal Strength and Stiffness. Transverse Modulus. In-plane shear Modulus. Poisson’s ratio. | | | | | | | | | | | | | | | | | | | | | | | **8** | | | | | | **CO3** | | |
| V | **Elastic Properties of the Unidirectional Lamina**  Stress-strain relationships. Engineering Constants. Stress-strain relations of a Thin Lamina. Examples. | | | | | | | | | | | | | | | | | | | | | | | **6** | | | | | | **CO3** | | |
| VI | **Analysis of Laminated Composites**  Laminates, Basic Assumptions, Strain-Displacement Relationship, Stress- Strain Relationships, Equilibrium Equations, Laminate Stiffness, Determination of Lamina Stresses and Strains, Types of Laminate Configuration, Balanced Laminate, Anti-symmetric Laminate, Examples Multichannel Integration: Look at the Big Picture Wireless Applications Enter the Mainstream Middleware: Supporting the Integration Mandate What Is Common to All These Trends? | | | | | | | | | | | | | | | | | | | | | | | **5** | | | | | | **CO4** | | |
| VII | **Failure Theories**  Micromechanics of Failure of Unidirectional Lamina, Anisotropic Strength and Failure Theories, Importance of Shear Strength, Choice of Failure Criteria, Examples. | | | | | | | | | | | | | | | | | | | | | | | **5** | | | | | | **CO5** | | |
| Total Hours | | | | | | | | | | | | | | | | | | | | | | | | **36** | | | | | |  | | |
| **Essential Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Mukhopadhyay M., Mechanics of Composite Materials and Structures, Universities Press. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Jones R.M., Mechanics of Composite Materials,Technomic Publication. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Christensen R. M.,Mechanics of Composite Materials, Krieger Publishing Company, Florida, USA. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Supplementary Readings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Herakovich C.T., Mechanics of Fibrous Composites, John Wiley & Sons, Inc. New York, 1998. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Agarwal B.D. and Broutman L.J., Analysis and Performance of Fibre Composites, John Wiley & Sons, Inc. New York. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Hodgkinson J.M., Mechanical Testing of Advanced Fibre Composites, Woodhead Publishing Limited, Cambridge, 2000. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |