# MECHANICS OF FIBER REINFORCED POLYMER COMPOSITE STRUCTURES

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**TYPE OF COURSE** : New | Elective | UG/PG
**COURSE DURATION** : 12 Weeks (24 Jan' 22 - 15 Apr' 22)
**EXAM DATE** : April 24, 2022

**PRE-REQUISITES :** No specific pre-requisite. Fundamental knowledge of Shength of Materials / Solid Mechanics.

**INTENDED AUDIENCE :** Undergraduate and postgraduate students of Mechanical/ Civil/ Aerospace Engineering and similar branches; Faculty members associated with Mechanical/ Civil/ AerosPace Engineering;Practicine ensineers associated with design of composite structures.

**INDUSTRIES APPLICABLE TO :** DRDO,ISRO, NAL

**COURSE OUTLINE :**

This is introductory course on Mechanics of Fiber Reinforced Composite Structures. One course is basically aimed at introducing the students of mechanical/civil engineering streams to the basics of design and analysis of structural components made of FRP composites. The contents of the course is so designed that it requires the first course on strength of materials/solid mechanics as a prerequisite which is anyway a core course for mechanical/civil undergraduates. It introduces the students first to the basic mechanics (stress strain and load deformation relations) of fiber composites, possible failure modes and corresponding failure theories proposed. Next, the course introduces the design and analysis using those concepts along with the design of some components made of such materials. At the end a few topics of slightly advanced nature (for UG students) are kept for brief introduction only.

**ABOUT INSTRUCTOR :**

Prof. Debabrata Chakraborty is currently a Professor in the Department of Mechanical Engineering of the Indian Institute of Technology Guwahati. He did his BE(Hons) in Mech Engg from Gauhati University in 1987 and MTech and PhD in Mechanical Engineering from IIT Kharagpur in 1993 and 1999 respectively. His research area is stress analysis of FRP composite structures with specific interest in design optimization of laminated structures and analysis of laminated composites with internal flaws. Dr Chakraborty has more than 25 years of experience in teaching and research. He has been a faculty member of Mechanical Engineering Department at IIT Guwahati since 1999 and guided nine PhD students and more than 50 Masters students in the broad area of design and analysis of FRP composite structures and taught the course on Composite Materials to both UG and PG students several times.

**COURSE PLAN :**

**Week** 1**:** Introduction to FRP Composites

**Week** 2**:** Review of Elasticity

**Week** 3**:** Macromechanics of Lamina

**Week** 4**:** Macromechanics of Lamina

**Week** 5**:** Micromechanics of Lamina

**Week** 6**:** Micromechanics of Lamina (contd)

**Week** 7**:** Micromechanics of Lamina (contd)

**Week** 8**:** Elastic Behaviour of Multidirectional Laminates

**Week** 9**:** Failure analysis of multidirectional Laminates

**Week** 10**:** Design examples

**Week** 11**:** Interlaminar stresses in Laminates

**Week** 12**:** Buckling and free vibration of laminated plates