Advanced Composite Structures

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Overview

Fiber reinforced composite materials are now being widely used in the aerospace, automotive, manufacturing, and construction industry. The instructor has worked with NASA and the U.S. Air Force on a variety of research projects that involved designing composite parts for new jet engines to designing cryogenic propellant tanks for the next generation space shuttle. This course introduces students to the issues of obtaining optimum performance from fiber-reinforced composite materials through efficient use of fiber architecture within a laminate, based on the fundamental principles of mechanics. Detailed discussions of both the micro-mechanics of a fiber-reinforced lamina and the macro-mechanics of a laminate are presented in this course. In addition to the conventional continuous and short-fiber composites, the course presents the state-of-the-art development of textile (woven) structural composites. The topics covered include: classical lamination theory, higher order theory for thick laminates, strength and failure theories, analysis of short fiber composites, sandwich panels, two-dimensional textile (woven) composites, fracture and fatigue in composite structures. The effects of temperature, moisture and processing parameters on laminate performance are also discussed. Development of a simple computer code for laminate analysis and design is envisioned.

In this course, the instructors will share his extensive experience in collaborating with NASA, the Army, the Air Force, DRDO, ISRO, etc on challenging research projects related to Advanced Composite Structures. The GIAN course on Advanced Composite Structures is designed to enable participants to be able to obtain optimum performance from fiber reinforced composite materials through the prudent use of fiber architecture within a composite laminate, based on the fundamental principles of mechanics. Development of a simple computer code (in Matlab or VB) for laminate analysis and design is envisioned.

Modules	**A: Basic concepts of advanced composites and its mechanics: December 17 – 20, 2016** **B: Modelling, buckling, vibration & shear Lag analysis of advanced composite structures: December 20 –27, 2016** **Number of participants for the course will be limited to fifty.**
You Should Attend If…	• You are an Aerospace/Mechanical/Civil Engineer interested in obtaining improved knowledge for the conceptual of advanced composite structures and its mechanics and detailed modeling, buckling, vibration & shear lag analysis of advanced composite structures. • You are a Graduate and undergraduate students from any engineering majors and employees of the aerospace industry who are interested in modeling of advanced composite structures**.**
Fees	The participation fees for taking the course is as follows: **Participants from abroad : US $500** **Industry/ Research Organizations: INR 30000** **Academic Institutions: INR 10000** The above fees include all instructional materials, computer use for tutorials and assignments, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

The Faculty

Professor Samit Roy (email id:sroy@eng.ua.edu) is the William D. Jordan Chair Professor of Aerospace Engineering and Mechanics at University of Alabama, Tuscaloosa. Before moving to an academic position, he was a Senior Research Engineer at the Southwest Research Institute (SWRI), San Antonio, Texas. Dr. Roy has authored 64 journal papers, 12 book chapters, 1 text book, and more than 80 conference papers. Prof. Roy's research interest is directed toward multi-scale modeling and failure prediction of fiber reinforced polymer composites and structural adhesives subjected to environmental conditions, using the finite element method. His research centers around the development of mechanism-based multi-scale structural durability models that would accurately predict long-term performance of materials based on data from short-term tests. He is also actively involved in the application and simulation of nanostructured reinforcements in enhancing performance of composite materials. He is a Fellow of ASME and an Associate Fellow of AIAA.

Professor B. N. Singh is Professor and currently Head of the Department of Aerospace Engineering at the Indian Institute of Technology Kharagpur, India. Prof. Singh has more than 22 years of teaching and/or research experience in the institute of importance in India and abroad as well. His research interest is directed towards modeling of advanced composite materials. He is working in the area of aerospace composite structures and its uncertainty quantification and has developed several stochastic and deterministic mathematical models and its applications in aerospace structural components made of smart composites. His current research interests also include plates and shells, functionally graded materials, analytical and finite element modeling, shear deformation theories, aeroelasticity, and nonlinear adaptive FEM. He has published more than 110 research papers in the Journals of repute and more than 80 research papers in Conference proceedings.

Course Co-ordinator

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