Modern Materials: Mechanics, Measurement and Manufacturing

Overview

Advanced and additive manufacturing technology has provided unprecedented control over the internal geometries of structures providing new ways to sculpt distribution of matter at multiple length scales. Such architectured materials provide a new paradigm of materials design that are rapidly revolutionizing lightweight, multifunctional and active materials with applications in small and medium unmanned vehicles, hypersonic aircrafts, automotive, robotic, marine, and civilian structures. These architectured materials possess intricate periodic internal structures which alternate with open spaces. The underlying architecture also serves as storage, flow channels, waveguides, thermal pathways, and sensor stows leading to new multifunctional possibilities and peculiar material properties combinations not typically found in nature. These laboratory-conceived 'modern materials' have already shown to exhibit negative Poisson's ratio, variable and tunable stiffness, anomalous damping and band gaps leading to new areas of application beyond current materials envelopes. The course aims to provide a wide overview of this area, teach the fundamental mechanics principles and tools necessary for analysis, design and the challenges in manufacturing and measurements in these systems. This short course is organized in three modules that should be taken together. Participants will learn how to use computational methods, theoretical calculations, and diagnostic tools such as digital image correlations (DIC). Course participants will learn these topics through lectures and hands-on experiments. Also, case studies and assignments will be shared to stimulate research and provide motivation to participants.

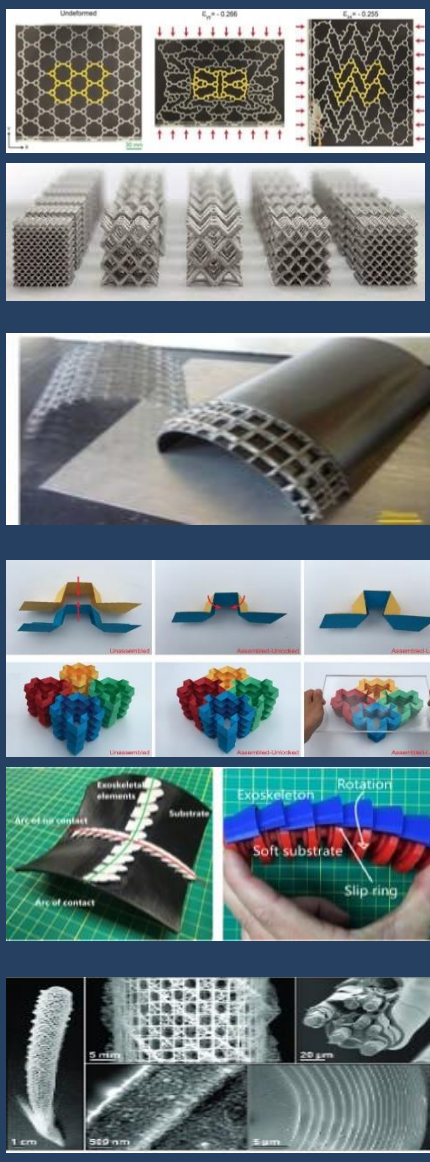
Modules	**A: Overview and fundamentals of architectured materials: Dec 11 - Dec 12, 2023** **B: Meta-surfaces and intrinsic multifunctionality: Dec 13-Dec 14, 2023** **C: Metrology, challenges, and applications – Dec 15, 2023** Number of participants for the course will be limited to fifty
You Should Attend If…	▪ Engineers, and researchers in aerospace, automotive, robotics and biomedical companies interested in advanced materials, and from R&D laboratories. ▪ Students or faculty from academic institutions interested in learning how to do research on architecture materials, biomimetic materials, metamaterials and understand the frontier. applications
Fees	The participation fees for taking the course are as follows: **Participants from abroad: US $250** **Industrial participants: INR 11,000+18% GST** **Faculty and Govt. Research Organizations: INR 6,000+18% GST** **Students and postdocs: INR 3,500+18% GST** The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided accommodation on payment basis.

The Faculty

Prof. Ranajay Ghosh is an Associate Professor of Mechanical and Aerospace Engineering at the University of Central Florida, Orlando USA and directs the Complex Structures and Mechanics of Solids Laboratory. He is also a faculty in the UCF's Center for Turbomachinery and Energy Research, and the Stephen Hawking Center for Microgravity Research. His expertise covers solid mechanics, additive manufacturing, and metamaterials. He is the winner of the prestigious US-National Science Foundation's Early Faculty CAREER Award in mechanics of materials. His research work has led to over 70 peer reviewed journal publications in top academic journals and his work has been covered by Newsweek, New York Times, Discovery, and New Scientist. He received his B.Tech. in Mechanical Engineering from IIT Kharagpur and PhD in Mechanical and Aerospace Engineering from Cornell University, Ithaca, NY.

Prof. Koushik Vishwanathan is an Assistant Professor of Mechanical Engineering at the Indian Institute of Science. His research focuses on advanced manufacturing, experimental mechanics, and metrology. He received his B.Tech. in Mechanical Engineering from IIT Madras and MS and PhD from Purdue University, West Lafayette, IN.

Dr. Aloke Kumar is an Associate Professor of Mechanical Engineering at the Indian Institute of Science, Bengaluru. He received his bachelor's and master's degrees from the Indian Institute of Technology, Kharagpur, India in 2005 and his Ph.D. in Mechanical Engineering from Purdue University, West Lafayette, USA in 2010. His doctoral work was among the founding works in opto-electro fluidics - an emerging area of microfluidics, which today is benefiting applications from colloidal physics to biomedical diagnostics. Dr. Kumar joined University of Alberta's Mechanical Engineering Department in 2013, where he was the Canada Research Chair in Microfluidics for Biological Systems. He moved to the Indian Institute of Science in 2017, where he currently directs his Soft Matter Lab with a focus on advanced microbial based materials fabrication, soft active matter like bacterial biofilms and complex fluids.



Apply Click here

Course Co-Ordinator

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