Mechanics of Soft Active Materials

Overview

This course provides a comprehensive understanding of the mechanics of soft active materials, which are materials that can undergo significant deformations in response to external stimuli such as electric fields, magnetic fields, temperature changes, and chemical environments. The course covers the fundamental principles, modeling techniques, and applications of these materials in various fields, including biomedical engineering, robotics, and smart materials. Students will explore the theoretical and computational aspects of soft active materials and their emerging applications.

Soft Active Materials (SAMs) are used in various applications, such as adjustable actuators, vibration dampers, wave energy generators, artificial muscles, and devices with tunable properties like lenses. However, modelling these complex materials, which interact with multiple fields simultaneously, is a key challenge for their further development and industrial use.

This course will teach the mathematical, computational, and experimental techniques needed to understand and work with these materials, grounded in the principles of Continuum Mechanics. It will cover how to create models that describe how these materials behave under different forces and fields and how to use computational methods to solve the complex equations involved. The course will also explore the challenges of manufacturing and testing these materials, which often require specialized equipment and innovative e approaches.

Modules	**A: Introduction to Soft Active Materials: September 01, 2025 (Monday)** **B: Mechanics and Modeling of Soft Materials: September 02, 2025 (Tuesday)** **C: Stimuli-Responsive Materials and Applications: September 03, 2025 (Wednesday)** **D. Experimental and Computational Techniques: September 04, 2025 (Thursday)** **E. Advanced Topics and Case Studies in Soft Materials: September 05, 2025 (Friday)** **Kindly refer to the attached brochure for the entire course details.** **Number of participants for the course will be limited to fifty.**
Who can attend	▪ Students at various academic levels, including undergraduate (BTech), master's (MSc, MTech), and doctoral (PhD) programs, as well as faculty members from well-established and reputable academic and technical institutions. ▪ The course is addressed to doctoral students and postdoctoral researchers in mechanical, civil and aerospace engineering, material science, applied physics and applied mathematics; academic and industrial researchers, and practicing engineers.
Fees	The participation fees for taking the course is as follows: **Participants from abroad: US $200** **Industry/ Research Organizations: INR 30,000** **Academic Institutions: INR 5,000** **Students: INR 1,000** 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 with accommodation on payment basis. **Note:** There is no central registration on the GIAN portal (gian.iith.ac.in); registration will be managed directly by the hosting institute.

The Faculty

Prof. Prashant Saxena Prashant Saxena is a Senior Lecturer in the James Watt School of Engineering at the University of Glasgow. Prashant is interested in understanding the complex behavior soft solids display due to deformation under extreme multi-physics fields. Dr. Saxena has undergraduate degrees in Mechanical Engineering from Indian Institute of Technology Kanpur and a PhD in Applied Mathematics from the University of Glasgow. He has received postdoctoral training from Universities of Erlangen-Nuremberg and Lausanne. He has also worked as an Assistant Professor at the Indian Institute of Technology Hyderabad before returning to Glasgow. Dr. Saxena has received several awards for his work including the New Investigator award from EPSRC, Ramanujan fellowship from SERB, and a Gold Medal in the Indian national physics Olympiad.

Dr. Deepak Kumar is an Assistant Professor in the Department of Mechanical Engineering at MANIT-Bhopal. Prior to joining MANIT-Bhopal, he worked as a Postdoctoral Fellow with a research group on bio-mechanics and soft machines at Applied Mechanics Department of IIT-Delhi. His main areas of interest include Soft Materials Mechanics, Electro-magneto-elasticity, Electro-magneto-rheology. Dr. Kumar is a highly motivated dynamic scholar and fully dedicated to the original research. He is the recipient of AMIE Fellow award 2018 from a premier organization namely the Institution of Engineers India incorporated by Royal Charter 1935.

Dr. Aman Khurana is an Assistant Professor in Department of Mechanical Engineering at the Indian Institute of Technology Indore. He also worked as a Post-doctoral Researcher in Intelligent Materials Systems Lab, Saarland University, Saarbrucken, Germany. Dr. khurana received his Ph.D. in Mechanical Engineering (Specialized in Continuum Mechanics) from IIT-Roorkee in 2022. His research interest includes; Soft materials mechanics, Dynamics of minimum energy structures made up of electroactive polymers. He is the recipient of DST Inspire Faculty Fellowship 2022 from Ministry of Science and Technology, Government of India.

Course Co-ordinator

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Registration link
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Detailed Course Schedule Brochure
https://drive.google.com/file/d/1ukv0QkybB1miqQT6QZQmJTIErXzibYFV/view?usp=drive_link