

Mechanics and Modeling of Soft Materials: From Natural Rubber to Biomaterials

Overview

There is a rapidly growing interest in understanding and exploiting the unique responses of soft solids (rubbery polymers, hydrogels, etc.) for a variety of engineering and medical purposes. Compared to the relatively stiff natural or man-made materials, soft solids show a wider array of responses and are sensitive to small changes in stimuli making them an exciting area of research and commercial potential.

This course will deal with the foundations of how the mechanical behavior of soft materials are modelled and describe the current state of the art and future directions in this area. The overarching aim is to provide students with the requisite knowledge based to understand how models are built, the underlying assumptions and uncertainties. This will enable students to pursue research in this area whether they are interested in theory or computational simulations

The objective of the course is to enable the course participant to (1) describe the fundamental ingredients of mechanics based modelling, (2) identify the idealized models and their variations to describe different canonical responses-elasticity, viscoelasticity and inelasticity, (3) study the behaviour of rubbery materials and compare and contrast with bio-tissues, (4) consider the various experimental responses of materials and develop/evaluate finite deformation based models for them

To cater to this, the course is organized in five modules. Some of the modules will have hands-on and assignments to help learning the course material better and to stimulate research interest in this area. The modules include: Introduction and philosophy of modeling, foundations of modeling soft materials, idealized modes of their behavior, actual behavior of these materials, models to simulate the real behavior including effects that are unique to these materials.

Dates for the Course	June 13, 2016 to June 19, 2016
Host Institute	IIT Madras
No. of Credits	1
Maximum No. of Participants	50
You Should Attend If...	<ul style="list-style-type: none"> ▪ You are a mechanical / aerospace / biomedical / civil / materials engineer or a researcher interested in understanding the behavior and modeling soft materials such as natural rubber and biological tissues. ▪ You are a practicing engineer working on design and simulation of products and processes that involve soft materials. ▪ you are a student or faculty from academic institution interested in learning how to do research in the area of soft materials modeling and testing.
Course Registration Fees	<p>The participation fees for taking the course is as follows: Student Participants: Rs.1000 Faculty Participants: Rs.2500 Government Research Organization Participants: Rs.5000 Industry Participants: Rs.10000</p> <p>The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges.</p> <p>Mode of payment: Demand draft in favour of “Registrar, IIT Madras” payable at Chennai The demand draft is to be sent to the Course Coordinator at the address given below.</p>
Accommodation	The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: http://hosteldine.iitm.ac.in/iitmhostel

Course Faculty



Prof. Arun Srinivasa,

Holderedge/Paul Endowed Professor and Associate Department Head of the Dept of Mechanical engineering at Texas A&M University, CollegeStation, Texas, USA. His research interests are in the modelling and design of compliant systems including soft solids, smart materials, biomechanics, and the plasticity of metals and polymers; His focus is in the thermomechanics of dissipative processes.



Prof. Sivakumar M. Srinivasan

Dean (Students) and Professor of Applied Mechanics, IIT Madras. His research interests include smart material and structural systems, inelasticity / plasticity, fatigue of materials and computations in inelasticity.



Prof. Srikanth Vedantam

Professor of Engineering Design, IIT Madras. His research interests include design of novel materials, mechanical behavior of materials, wetting, microstructure evolution and granular flow.

Course Coordinator

Name: Sivakumar M. Srinivasan

Phone: +91 94452 84085

E-mail: mssiva@iitm.ac.in

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URL: <http://apm.iitm.ac.in/smlab/mss>