

NANOMECHANICS OF BIOLOGICAL SYSTEMS

Overview

Mechanics determines the function of many biological tissues and organs. For example heart is a mechanical pump; mechanical properties are implicated in the function and dysfunction of orthopaedic tissues. While much insight has been gained by focusing on tissue and organ level mechanics, recent research focus has shifted to much smaller scales. It is important to understand the molecular and cellular basis of tissue mechanical properties. Also research has shown mechanotransduction playing significant role in cell signalling and function. This course will introduce basic principles, experimental techniques, and modelling approaches in nanomechanics applied to biomedical systems.

Objectives:

The primary objectives of the course are as follows:

- To identify the experimental techniques used to measure forces at the nano and micro scales
- To illuminate the underlying physics involved in the generation; regulation; interaction and function of nanomechanical forces
- To appreciate how small scale mechanics can have direct impacts on large scale properties of tissues

The Faculty



Dr. Delphine Dean is the Gregg-Graniteville Associate Professor of Bioengineering at Clemson University. She earned her Ph.D. in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology (MIT) in 2005 and started her faculty position at Clemson in January 2007. Her lab leads a wide range of studies focused on understanding mechanics and interactions of biological systems across length scales. Her expertise is in nano- to micro-scale characterization of biological tissues including experimental techniques such as atomic force microscopy and mathematical modeling such as finite element analysis. She is the recipient of the 2011 Phil and Mary Bradley Award for Mentoring in Creative Inquiry at Clemson, where she currently mentors 12 undergraduate creative inquiry research and design teams. These student teams work on a variety of projects including investigating the

use of dental pulp stem cells for help with dental tissue regeneration, developing mathematical models to predict of cell growth and migration, redesign of medical training simulators, investigating the use of robotics for solving biomedical problems, predicting rotator cuff injury from ultrasound, and also developing low cost medical technology for the developing world. She is recipient of many awards and honors such as NIH NHLBI Mentored Transition to Independence (MTI) study section - 2018-2022, Clemson President's Leadership Institute - 2016, Clemson National Scholars Program 2013 –2018, Murray Stokely Award for Excellence in Teaching from Clemson College Engineering and Science, 2012 and Outstanding Academic Faculty Award from the President's Commission on the Status of Women from Clemson University, 2012. She is also a member of American Chemical Society, ACS, American Physical Society, APS, Biomedical Engineering Society, BMES and Society for Biomaterials, SFB. She has published more than 40 research articles in international journals and obtained five patents.



Dr. P. Rani is a Professor in the Department of Biotechnology, PSG College of Technology, Coimbatore, and Tamil Nadu. Completed Ph.D in Biochemistry from Indian Institute of Technology, Madras and Post-Doctoral Research in Protein Engineering from Indian Institute of Science, Bangalore. She has more than 20 years of teaching and research experience. Her current field of research is on Neurodegenerative disorders, Bioprinting and electrochemical immuno biosensor development. Her team is working on RAGE protein expression and its interaction with A β ligand in Alzheimer's disease, development of cost effective inkjet printer for paper based sensor development and development of electrochemical Immuno sensors for diagnosis of infectious and noninfectious diseases. She also works on ELISA dot blot based immuno sensor for detection of different viruses in banana plant at field level. Her Areas of expertise include Selenoproteins, Oxidative damage and Neurological disorders, Development of ELISA and electrochemical based immunosensors.



Dr. G. Viveka is an Assistant Professor in the Department of Biotechnology, PSG College of Technology, Coimbatore, and Tamil Nadu. She has more than 12 years of research experience. She completed her Ph.D (Biology Biomedical Life Science), at National University of Singapore, Singapore. Her research interests lie in development of computational models of biological systems mainly focusing on studying pathophysiology at cellular level. Her team is working towards developing a mathematical model to study the effect of surface topography on bacterial attachment. In addition to scientific research, she focuses on Pedagogy in Technical education. Her current interest is in developing teaching methods for effective learning in laboratory courses. She is a recipient of Young Investigator Award (Silver) in 6th World Congress on Biomechanics in 2010.

Course	August 19th to August 23rd 2019 Number of participants for the course will be limited to fifty (on first come, first serve basis).
Host Institute	PSG College of Technology, Peelamedu, Coimbatore, Tamilnadu-641004
You Should Attend If...	You are an <ul style="list-style-type: none"> - Executive, engineer or researcher from manufacturing, service and government organizations including R&D laboratories. - Student at all levels (BTech/B.E/M.Sc/M.Tech/PhD) or Faculty from reputed academic institutions and technical institutions.
Fees	The participation fees for the course is as follows: The participation fees (excluding lodging and boarding) for taking this course is as follows: <ul style="list-style-type: none"> ● Students: Rs. 1,000/- (without grading) and Rs. 2,000 (with grading) ● Faculty members from academic institutions: Rs.3000/- ● Persons working in Industry/ Research Organizations: Rs. 4,000/- <p>The above fee includes all instructional materials, computer use for tutorials and assignments, and Session refreshments. Limited number of participants can be provided with accommodation (first Come, first serve) on payment basis.</p>
How to Register?	Step-1: Web Portal Registration: Visit http://www.gian.iitkgp.ac.in/GREGN/index and create login User ID and Password. Fill up registration details and complete the registration by paying Rs. 500/- online through Net Banking / Debit / Credit card. This provides the user with life time registration to enroll in any number of GIAN courses offered. Step-2: Course Registration: Login to the GIAN portal with the user ID and Password already created in Step 1. Click on Course Registration option at the top of Registration Form. Select the Course titled " Nanomechanics of Biological systems " from the list and click on Save option. Confirm your registration by clicking on Confirm Course. The selected participants will be intimated by us through email, regarding the payment modality for this course.
Course Coordinator	Dr. P.Rani Professor, Department of Biotechnology PSG College of Technology, Peelamedu, Coimbatore, Tamilnadu-641004 Phone: 0422-2572177 Extn:4583, 09443161653 E-mail: rani.bio@psgtech.ac.in