

The Faculty



Prof. Ravi F. Saraf is Lowell E. and Betty Anderson Distinguished Professor at the Department of Chemical Engineering, University of Nebraska at Lincoln (UNL). In the past 15 years, his research interest has been in interfacial properties of materials, nanometer scale devices and their processing. Recently his focus has been towards biophysics and bioengineering. An author/co-author of 53 US Patents and over 100 scientific publications, the style of his research has been towards solving of practical problems. Before joining UNL, he spent ~5 years in Virginia Tech and ~10 years at IBM's corporate research lab – Thomas J. Watson Research Center at Yorktown Heights. Prof. Saraf obtained his PhD and MS in Polymer Science, University of Massachusetts, Amherst and B.S from Indian Institute of Technology, Kanpur, India.



Dr. Ankur Gupta is faculty in the School of Mechanical Sciences at Indian Institute of Technology Bhubaneswar. He received his PhD degree in Mechanical Engineering at IIT Kanpur. As foremost credentials, he received "ISEES Young Scientist" award in 2017 and was selected as delegate to participate in "BRICS Young Scientist Conclave" held in Zhejiang University, China, 2017. His research interest lies in Micro-systems fabrication.

Registration Process

Step 1: Onetime Registration in GIAN web-portal

Interested participants will have to get registered by visiting the GIAN web portal on the following link on payment of a onetime non-refundable fee of Rs. 500 (excluding the participation fee as mentioned below) through online payment gateway:

<http://www.gian.iitkgp.ac.in/GREGN/index>

Step 2: Course Registration

Participants need to fill the registration format attached and deposit a course registration fee (as mentioned below) via online transfer or Demand Draft in favour of "CEP, IIT Bhubaneswar" (A/C No.: 24282010001960; IFSC Code: SYNB0002428; Bank name: Syndicate Bank; Branch: IIT Bhubaneswar). The scanned copy of (a) filled up registration form, (b) Demand Draft or receipt of online transfer and (c) Generated application form in step 1 GIAN web-portal must be sent to the course coordinators via email/post.

Deadline for registration: 10 May, 2019

The course registration fees are as follows:

- **Participants from abroad** : US \$250
- **Industry/ Research Organizations** : INR 8000
- **Academic Institutions (Faculty)** : INR 5000
- **M.Tech./B. Tech./M.Sc./ Ph.D. students** : INR 2000

The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, free internet facility. The participants will be provided with accommodation on payment basis in Hostels/Guest House on prior request. Lodging charges for Guest House-Single deluxe: Rs. 800/day; Guest House-Double deluxe: Rs.1200/day; For Students-Hostel: Rs.150/day.

Course Coordinator

Dr. Ankur Gupta
110, School of Mechanical Sciences
IIT Bhubaneswar
E-mail: ankurgupta@iitbbs.ac.in
Phone(O): +91 674 7137110
Mobile: +91 9794139955



A short-term course on

BioMEMS and Micro/Nanosystems

*Under the aegis of MHRD—Global Initiative of
Academic Networks (GIAN)*

11-16 May, 2019

School of Mechanical Sciences

IIT Bhubaneswar

Argul, Jatni-752050

Khurda, Odisha, India



Indian Institute of Technology Bhubaneswar

Overview

With the advent of powerful search engines on the internet, it has become fairly straightforward to acquire overall understanding of wide range of subjects. The convenient accessibility of information has fueled collaboration to solve complex problems of interdisciplinary nature because it has become possible for a physicist to learn biology, and vice versa. An aspect that is diminishing is fundamental understanding of the subject. In this series of lectures and discussions, the goal would be to introduce some of the ideas that are pervasively used in Nanotechnology and Nanoscience at more basic level so that its impact on current research is appreciated. Keeping the broadness in mind, list of topics chosen will do justice in kindling the audience excitement in micro/nanoscale science and technology. Underscoring the basic principle would optimistically aid the young audience in addressing problems in physics, life sciences as well as manufacturing aspects, who may be considering a career in small scale research.

Content-wise, this course aims at providing fundamentals of design and manufacturing of miniaturized technology to engineers/researchers of various fields. It will develop understanding of microsystems design aspects, various characterization schemes/ biomedical/ chemical testing practices and processing at the nanoscale. This short term course would be highly relevant for sensor engineers and technologists, healthcare experts, nano/micro-manufacturing engineers, material scientists etc. A considerable portion of this short term course would also focus on current research and development reported in topical reviews and publications specially those which have resulted in technological revolutions. The course is intended to be highly interdisciplinary in nature and the discussions would be mostly based on practical research problems and solutions.

You should attend if.....

- You are faculty from reputed academic institution or technical institution, or student at any level (B.Tech./ M.Sc./ M.Tech./ Ph.D.)
- Practicing engineers and scientists working in MEMS industries, as well as, in government research organizations.

Tentative Lecture Schedule

Day 1: Introduction to BioMEMS

Introduction to cell biology, related structure and function, Biochips/ biosensors, Introduction to device fabrication, Introduction to Cell biology, DNA & protein chemistry, The advantages in processing, performance and potential that is not possible in macro-world.

Tutorial 1: Discussion on details like SPR, electron tunnelling etc. Open-ended, informal interaction.

Tutorial 2: Discussion on Insights into Micro/Nanosystems: Fundamentals and applications.

Day 2: Processing at micro/nano-scales

Methods emerging from Si technology and their extensions, such as soft lithography, Bottom-up approaches, Self-assembly and directed self-assembly to make complex structures.

Tutorial 3: Functions that may emerge from the assembly structure, Details and other versions of soft-lithography, electro-spinning, layer-by-layer deposition.

Tutorial 4: Lecture on simplest routes for nanostructures development and surface modification for the fabrication bio-nano devices.

Day 3: Measurements at micro/nanoscale

Scanning probe methods, tapping mode SPM and its versions, Nano-optical and near-field optical methods, NSOM, SPR, and other microscopes beyond diffraction limit.

Tutorial 5: Detailed analysis of tapping mode SPM, measurement of displacement at sub-nanometer scales. Analysis of near-field optics.

Tutorial 6: Various characterization techniques for nano scale materials.

Day 4: Bio-Nanodevices and their applications

Nanoelectronic devices, Devices from nanomaterials, Bio-Nanodevices in nature, Electronics of photosynthesis and enzymes, Nanoelectronic devices in water, Physical electronics meeting biology.

Tutorial 7: Physical laws and principles governing performance of nanodevices, Physics of single electron devices.

Tutorial 8: Microsystem design, Lab-on-chip devices, Dielectrophoresis, PCR, implantable bio-devices and related issues.

Day 5: Nano-electrochemistry and molecular biology on chip

Electrochemistry at nanoscale, Electrochemical methods and fundamental concepts such as, electrical double layer and its application in nanotechnology, Integrated gene analysis systems. Discussions on a chip technology.

**A short-term course on
BioMEMS and Micro/Nanosystems
(approved under the MHRD Scheme on GIAN)**

REGISTRATION FORMAT

Name [in BLOCK LETTERS]:.....

Designation:.....

Organization:.....

Address:.....

E-mail:.....

Phone (Office):.....(Mobile):.....

Registration Id (from GIAN portal of IIT Kharagpur, enclose copy):.....

Category of Registration:.....

Amount:.....

Payment Method: Demand Draft / NEFT (please tick)

Date:Bank Details:.....

Accommodation required: YES / NO (please tick)
(If YES, please write to coordinator for details)

Hostel/Guest House (please tick)

Date: Signature of Applicant

The completed registration forms along with payment details should be sent to:

Dr. Ankur Gupta

Course Co-ordinator

110, School of Mechanical Sciences

IIT Bhubaneswar, Arugul, Khurda-752050, Odisha

E-mail: ankurgupta@iitbbs.ac.in Phone(O):+91

674 7137110 Mobile: +91 9794139955