



# INTERNATIONAL **SUMMER &** **WINTER TERM**

MAY - JULY | DECEMBER 2015



INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

# INTERNATIONAL SUMMER & WINTER TERM

## INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

May - July | December 2015

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## Overview

Indian Institute of Technology Kharagpur started its first international summer and winter term (ISWT) in 2014 where national and international participants got an opportunity to seek knowledge and experience from reputed International faculty and national faculty through intensive study of subjects and personal interactions. By bringing together participants and faculty from India and around the world, ISWT was not only academically stimulating but also offered an opportunity to faculty and scholars to discuss their research topics and interact with international experts and fellow researchers.

The overwhelming response to the first International Summer and Winter Term (ISWT) in 2014 has led to the second one to be held during May-July 2015 and December 2015. Participants from Industry, Research Organisations, Faculty and Students from all over the world are welcome to register for the 10 courses being offered during the summer term and 13 courses during the winter term. These subjects are designed around current and multidisciplinary themes of Science, Engineering, Management and Law. The duration for each subject is of 2 weeks or 10 working days with a judicious blend of lectures and tutorials per day.

IIT Kharagpur will issue a course completion certificate to all participants who attend classes regularly. The students registered for these courses, optionally will have the opportunity to obtain additional academic credits based on the evaluation and grading process. His/her home university/Institute will be mainly responsible for transferring ISWT academic credits. IIT Kharagpur will only provide information on the grading system, subject syllabus, and the academic policy.



# About IIT Kharagpur

## History

First in the chain of IITs to be set up by the Government of India, Indian Institute of Technology, Kharagpur started in 1951 in the erstwhile Hijli Detention Camp. It has now blossomed into one of the finest technical institutions in the world, with 585 faculty members in 19 Departments, 9 Centres, and 12 Schools offering 6 M.Sc. programmes, 5 Joint M.Sc. - Ph.D. programmes, 15 B.Tech (Hons.) programmes, 49 joint M.Tech. - Ph.D programmes, 2 M.Tech. programmes (in video-conferencing mode), 1 Master of City Planning programme, 1 Master of Medical Science and Technology programme, 1 LL.B. in Intellectual Property Rights programme, 34 Dual-Degree (both B.Tech and M.Tech) programmes, and 2 Management programmes. It also has MS, Ph.D, and D.Sc. programmes.

## Location

Kharagpur is known world over for two landmarks. One, the longest railway platform, and the other, the Indian Institute of Technology, more commonly known as IIT. Situated about 120 km west of Kolkata, Kharagpur can be reached in about 2 hours by train from Howrah railway station of Kolkata or 3 hours by car from Kolkata Airport. Kharagpur is also connected by direct train services to most major cities of the country. The Institute is about 10 minutes drive (5 km) from the Kharagpur railway station. Private taxi, auto-rickshaw or cycle-rickshaw can be hired to reach the Institute.

## Weather

Winter (October to February) is moderate and pleasant (10 to 25°C) in Kharagpur. Summer (March to June) is hot (25 to 40°C) and sometimes humid. Rains are normally confined to the months of June to September.

## Banks

Three banks are located inside the Campus. The State Bank of India is close to the Institute and provides foreign exchange facilities also. The Syndicate Bank is situated on the first floor of the Institute main building. The Punjab National Bank is situated in the Tech Market where business transactions are carried out in the afternoon.

## Library

The Central Library offers about 300,000 volumes in an open shelf system on different fields of science and technology, humanities and social sciences. The library subscribes to about 1400 periodicals. The library system is fully computerized and users can access foreign university libraries through wide-area network facilities.

## Computer Network

The backbone of IIT Kharagpur network is based on gigabit fibre optic technology. All the Departmental LANs are connected to the gigabit fibre optic backbone as separate VLANs. Email and internet facilities are provided to all laboratories, faculties, all rooms in guest houses and halls of residences.

## Places to visit

Nehru Museum, Hijli Shahid Bhavan, Old Prison Cells, Martyrs Memorial.



# Accommodation

The institute is fully residential. Students are accommodated in 20 Halls of Residence and the staff is provided with quarters. Accommodation for visitors is arranged in the Technology Guest House, CEC Guest House, Alumni Guest House or CTS Visitors Hall, or if need arises, in a students' Hall of Residence.

## Accommodation Tariffs

Sl No.	Name of Guest House/Hostel	Type of Accommodation	Rate in ₹ per day per person
1.	Technology Guest House (TGH)	Double bedded room (AC) on sharing basis (per person)	600.00
2.	Technology Guest House (TGH)	Single occupancy in double Bedded (AC)	800.00
3.	Visveswaraya Guest House (VGH)	Double bedded room on sharing basis (per person) (AC)	200.00
4.	Visveswaraya Guest House (VGH)	Single occupancy in a double bedded room (AC)	300.00
5.	Visveswaraya Guest House (VGH)	Double bedded (Non-AC)	200.00
6.	Visveswaraya Guest House (VGH)	Single occupancy in double bedded room (Non-AC)	150.00
7.	Visveswaraya Guest House (VGH)	3/4 bedded room per person (Non-AC)	100.00
8.	Ashotosh Mukherjee Guest House (AMGH)	Single bedded (AC)	300.00
9.	Transit Hostel (Ladies only)	3/4 bedded rooms per person (Non-AC)	80.00



# Course Calendar

SUMMER TERM			
Course Code	Course Title	Principal Co-ordinator/s	Duration
15IST01	Enabling Internet of Things with Cloud and Big Data Networking	Prof. Sudip Misra	May 25 – Jun 7
15IST02	Healthcare Operations and Innovation	Prof. Ram Babu Roy	June 1 – 12
15IST03	Vibration and Flutter	Prof. Mohammed Rabiun Sunny	June 8 – 17
15IST04	Introduction to Nano Structured Polymeric Materials	Prof. Rabiurata Mukherjee	June 8 – 19
15IST05	Supply Chain Network - Modeling and Analysis	Prof. M. K. Tiwari Prof. S. P. Sarmah Prof. S. K. Kumar	June 15 – 26
15IST06	Deep Foundations including Seismic and Offshore Applications	Prof. D. K. Baidya	Jun 29 – Jul 10
15IST07	Microfluidics and Nanotechnology for Healthcare Engineering	Prof. Suman Chakraborty	Jun 29 – Jul 10
15IST08	Corporate Governance	Prof. Indrajit Dube	Jun 29 – Jul 12
15IST09	Mapping Creativity	Prof. Anjali Gera Roy	Jul 6 – 14
15IST10	Modelling River Catchment Interactions	Prof. Rajendra Singh	June 1 – 12
WINTER TERM			
15IWT01	Orthopaedic Biomechanics: Implants and Biomaterials	Prof. Sanjay Gupta Prof. Santanu Dhara	Nov 30 – Dec 11
15IWT02	Thin Film Technology for Waste Heat Recovery	Prof. Pallab Banerji	Dec 5 – 14
15IWT03	Ergonomics & Human Factors Engineering	Prof. Pradip Kumar Ray	Dec 7 – 17
15IWT04	Hydrodynamics of Riverbed Erosion and Scour at Structures	Prof. Subhasish Dey	Dec 7 – 18
15IWT05	Separation of Fine and Ultra-Fine Particulates in Fluid Medium: Fundamentals and Applications in Mineral and Coal Processing	Prof. Arun Kumar Majumder	Dec 7 – 18
15IWT06	Video Based Scene Understanding	Prof. Sudipta Mukhopadhyay	Dec 7 – 18
15IWT07	Logic and Applications of Logic	Prof. Chhanda Chakraborti	Dec 7 – 18
15IWT08	Probabilistic Safety Assessment	Prof. Neeraj Kumar Goyal Smt. Rajee Gupta	Dec 7 – 18
15IWT09	Planning and Management of Cultural Heritage Sites	Prof. Sanghamitra Basu	Dec 7 – 18
15IWT10	Smartgrid Operation with Renewables	Prof. A. K. Sinha	Dec 7 – 18
15IWT11	Special Topics in Robotics	Prof. C. S. Kumar Prof. D. K. Pratihar	Dec 7 – 21
15IWT12	Blasting Technology, Rock Fragmentation and Mine Productivity	Prof. Debasis Deb	Dec 8 – 19
15IWT13	Nanobiotechnology: A Discipline at a Crossroads	Prof. Sudarsan Neogi	Dec 14 – 28

# Distinguished International Faculty

SUMMER TERM		
Course Code	International Faculty	Affiliation
15IST01	Prof. Dharma P. Agrawal	University of Cincinnati, Ohio, USA
15IST02	Prof. Paul Lilirank	Aalto University, Espoo, Greater Helsinki, Finland
15IST03	Prof. Rakesh K. Kapania	Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA
15IST04	Prof. Alamgir Karim	University of Akron, Ohio, United States
15IST05	Prof. Suresh P. Sethi	University of Texas, Dallas, USA
15IST06	Prof. M. Hesham El Naggari	Western University, Ontario, Canada
15IST07	Prof. Marc Madou	University of California, USA
15IST08	Prof. Anil Hargovan	University of New South Wales, Sydney, Australia
15IST09	Prof. Rob Cover	University of Western Australia, Australia
15IST10	Prof. Axel Bronstert	University of Potsdam, Germany
WINTER TERM		
15IWT01	Prof. Nico Verdonshot	Radboud University Medical Center Nijmegen & University of Twente, The Netherlands
15IWT02	Prof. Per Eklund	Linköping University, Sweden
15IWT03	Prof. Chia-Fen Chi (Christine)	National Taiwan University of Science & Technology, Taipei, Taiwan
15IWT04	Prof. Roberto Gaudio Prof. Bruce Melville	Università della Calabria, Rende, Italy The University of Auckland, New Zealand
15IWT05	Prof. Éric Climent	Institut de Mécanique des Fluides de Toulouse, France
15IWT06	Prof. Amit K. Roy Chowdhury	University of California, Riverside, California, USA
15IWT07	Prof. Esko Tapani Turunen	Tampere University of Technology, Finland
15IWT08	Prof. Carol Smidts	Ohio State University, USA
15IWT09	Prof. Jukka Jokilehto	Via Anicia, Rome, Italy
15IWT10	Prof. Tapan Kumar Saha	University of Queensland, Australia
15IWT11	Prof. Yves Belleouard	Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland
15IWT12	Prof. Bibhu Mohanty	University of Toronto, Toronto, Canada
15IWT13	Prof. Vuk Uskokovic	University of Illinois Chicago, USA

# Enabling Internet of Things with Cloud and Big Data Networking

## Overview

Cloud computing and the big-data analytics are the two new technologies that are evolving across the globe. IT organizations are moving towards the concept of seamless computing, and real-time processing of data with high degree of resource scalability. Moreover, cloud technology is continuously improving in security and data integration techniques. Business organizations are more concerned with the growing scope of data analytics, rather than selective storing of data from diverse resources. Thus, big-data and cloud technologies go hand-in-hand and as a result, most of the organizations are inclining towards cloud delivery models, in addition with the support of big-data analytics, especially for mission-critical workloads.

The collaboration of these two technologies enable the scope of another emerging technology – the Internet-of-Things (IoT). With the help of cloud and big-data networking, today it is possible to envision pervasive connectivity, storage, and computation, which, in turn, gives rise to different IoT solutions from environmental sensing to public safety. IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems, are gradually realizing the long-awaited dream of smart-cities. Hence, proper focus on Internet-of-Things, with the assistance of cloud and big-data technology, is of utmost importance in today's modern world.

### Modules

**Enabling Internet of Things with Cloud and Big Data Networking:** May 25 – June 7, 2015  
**Number of participants for the course will be limited to Sixty.**

### You Should Attend If...

You are a professional in the industry/academia or a student/Research Scientist having basic educational background in CSE / IT / EE / ECE / Instrumentation / Mathematics / Physics / allied areas and are interested to gain knowledge in the convergence of Wireless Sensor Networks, Internet of Things, Big-data Networking, and Cloud Networking.

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$500**

**Industry/ Research Organizations: ₹ 20000**

**Academic Institutions in India: ₹ 10000**

**TEQIP-II approved Institutions: ₹ 2000** (To be refunded after completion of course)

The above fee include 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.

## The Faculty



**Bhabani P. Sinha** joined the faculty of Electronics Unit of the Indian Statistical Institute, Calcutta in 1976, where he became a Professor in 1987. Since 1993, he has been serving as the Head of the Advanced Computing and Microelectronics Unit of the Indian Statistical Institute, Calcutta. He has published more than 125 research papers in various international journals and refereed conference proceedings. His recent research interests include parallel and distributed computing, mobile computing, wireless networks and algorithms. He is a Fellow of the IEEE, USA.



**Nabanita Das** is a Professor in the Advanced Computing and Microelectronics Unit of Indian Statistical Institute, Kolkata, India, since 1986. Her area of interest includes Mobile Ad Hoc Networking, Pervasive Computing, Parallel and Distributed Computing and Multi-Core Computing. She is a senior member of IEEE. She served as the Chair of Women in Engineering (WIE) affinity group of IEEE Calcutta section during 2009-2011.



**Sudip Misra** is an Associate Professor in the School of Information Technology at the Indian Institute of Technology, Kharagpur, India. Prior to this he was associated with Cornell University, Ithaca, NY, USA, Yale University, New Haven, CT, USA, Nortel Networks, Mississauga, ON, Canada and the Government of Ontario (Canada). He received the Ph.D. degree in Computer Science from Carleton University, Ottawa, ON, and the Masters and Bachelors degrees respectively from the University of New Brunswick, Fredericton, NB, Canada, and the Indian Institute of Technology, Kharagpur, India. He has several years of experience working in the academia, government, and the private sectors in research, teaching, consulting, project management, architecture, software design and product engineering roles.



**Dharma P. Agrawal** has been the OBR Distinguished Professor at the University of Cincinnati, since August 1998. He is coauthor of textbooks Introduction to Wireless and Mobile System (4th edition), and Ad hoc and Sensor Networks (2nd edition) and co-edited Encyclopedia on Ad Hoc and Ubiquitous Computing. He is the Fellow of IEEE, ACM, AAAS, NAI, IACSIT, and WIF. He is a Golden Core member of the IEEE-CS and recipient of the IEEE Third Millennium Medal. He has

published over 650 articles, 29 keynote speeches, 42 intensive courses, 7 patents and 25 invention disclosures, supervised 70 Ph.D. dissertations and led UCBT Bluetooth package. He has been on the editorial boards of IEEE Transactions on Computers, IEEE Computer, Journal of High Speed Computing, JPDC, and is serving IJCN, JECE, IJSIA, IJDSN, IJAHUC, IJAHSWN, JDSN, and IJWMC and founding EIC of the Central European Journal of Computer Science. His research interests include sensor networks, vehicular networks, and other wireless networks. G-Index: 63, H-Index: 51.

## Course Co-ordinator

**Prof. Sudip Misra**

Ph.D. (Carleton, Canada),

IEEE Senior Member,

Humboldt Fellow (Germany),

Associate Professor

School of Information Technology

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<http://www.cep.iitkgp.ac.in/iswt>

# Healthcare Operations and Innovation

## Overview

The course deals with the managerial aspects of healthcare service provision industry. It includes service production processes and systems, supply chains, regional service distribution and networks, business- and revenue models, economic incentives, and information systems for healthcare operations management.

The first three days of the course is structured on two dimensions. First, healthcare is divided into the seven Demand and Supply based Operating logics (DSO), i.e. areas that are managed in a similar way across various clinical contents. These are: prevention, emergency, one visit, elective, cure processes, care processes, and projects. Second, each of the DSOs are examined and discussed in basic Operations Management terms, such as: demand structure (scheduled, random, free or forced choice, etc.), process types (standard, routine, nonroutine), integration and coordination, quality and performance measurement, supply chains, revenue models, skillsets and human resources. Subsequently, the course covers various aspects of infrastructure planning, public healthcare planning especially rural healthcare. The course brings out the techno-managerial innovations in healthcare service provision in the purview of telemedicine. Finally, the strategies for developing information systems and use of analytics in healthcare for data-driven knowledge management systems and decision making in healthcare will be discussed.

The Business Model Canvas (BMC) would be used as a template for developing entrepreneurial ideas. Experienced practitioners will be invited to give talks on specific topics, such as hospital design, patient information systems, entrepreneurial endeavors, and public policy. Each day will include 3 hours of interactive lecture sessions and case discussions.

### Modules

- A: Innovations in Healthcare Operations Management** : June 1 – June 5, 2015  
**B: Innovations in Healthcare Information Systems** : June 8 – June 12, 2015  
**Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

- you are a healthcare practitioner interested in improving your service operations
- you are an entrepreneur interested in developing business models for healthcare services
- you are a researcher interested in healthcare operations management

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$500**

**Industry/ Research Organizations: ₹ 30000**

**Academic Institutions: ₹ 10000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The above fees include 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.

## The Faculty



**Prof. Paul Lillrank** has been Professor of Quality and Service Management at Aalto University since 1994. He has served as the Head of the Department of Industrial Engineering and Management for eight years and been Academic Dean of the school's MBA program. Professor Lillrank has conducted research in several service industries, such as software, telecom, airlines and retailing. During the recent past his focus has been in healthcare. He has been a pioneer in introducing industrial management methods to the study of healthcare service production. He has been a frequent speaker and advisor to several healthcare producers and government agencies.



Surgeon Rear Admiral **Dr. V. K. Singh**, VSM (Retd.) MBBS, has completed Masters in Hospital Administration, Diplomate National Board in Hospital and Health Care Management and M Phil. Dr. Singh served in Armed Forces Medical Services of India for 37 years in various National & International assignments. Presently, he is an Adjunct Research Professor-International Health Innovation Center, Ivey School of Business, University of Ontario, Canada and Director Healthcare Asia for Lean Healthcare Excellence-Simpler. He is a Member of Telemedicine Society of India and National Public Health Committee of Confederation of Indian Industry (CII).



**Dr. Uttam Kumar Sarkar**, a Professor at the Management Information System Group of Indian Institute of Management Calcutta, had obtained his B.Tech, M.Tech, and Ph.D. in Computer Science and Engineering from Indian Institute of Technology Kharagpur. He had earlier served as a senior member in a design automation company, as a faculty member of Indian Institute of Technology Delhi, and as a Visiting Faculty at the University of Miami, Coral Gables, Florida, USA. His current research interests include Business Data Mining and Social Network Analysis.



**Dr. Ram Babu Roy** is an Assistant Professor in the Rajendra Mishra School of Engineering Entrepreneurship at Indian Institute of Technology Kharagpur. He has worked as a Scientist in Defense Research and Development Organization (DRDO). His research interests include modeling and analysis of complex networked systems, Information systems, business intelligence and healthcare operations management.

## Course Co-ordinator

**Prof. Ram Babu Roy**

Rajendra Mishra School of Engineering

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<http://www.cep.iitkgp.ac.in/iswt>

# Vibration and Flutter

## Overview

Flutter is defined as an unstable vibration of an elastic structure as a result of its interaction with the surrounding fluid medium. Flutter can be a reason behind catastrophic failures of structures. Therefore, consideration of flutter is important for designing structures exposed to aerodynamic loads such as aircrafts, bridges. The aim of this course is to give an insight of dynamic analysis of structures with special focus on flutter.

The content of the course can be broadly classified into two parts. The first part will be on the theory of vibration. Topics of this module include vibration of single and multi degree of freedom systems, review of principle of virtual work and Lagrange equations, Vibration of continuous systems such as rods, beams, and plates, method of modal superposition, steady state response and Fourier transform. The second part will cover the aeroelastic phenomena of divergence and flutter. Topics include introduction to aeroelasticity and divergence, flutter of a wing, and 3D flutter model. In this course, the instructor will share his experience of working on challenging research projects related to flutter.

### Modules

**Vibration and Flutter** : June 8 – June 17, 2015

**Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

- you are an aerospace engineer or research scientist interested in the analysis and design of structures for flutter
- you are a student or faculty from an academic institution interested in learning how to do dynamic and aeroelastic analysis of structures.

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$500**

**Industry / Research Organizations: ₹ 30000**

**Academic Institutions: ₹ 10000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The above fee includes all instructional materials, computer use for tutorials and assignments, free internet facility. The participants will be provided with accommodation on payment basis.

## The Faculty



**Dr. Rakesh K. Kapania**, Norris and Laura Mitchell Professor of Aerospace Engineering at Virginia Polytechnic Institute and State University, is a very well known researcher in the field of Aerospace Structures. As a researcher he has made significant contribution to the area of Computational Structural Mechanics with applications in Aeroelasticity, Structural Dynamics, Multidisciplinary Analysis and Design, Probabilistic Structural Mechanics etc. He has published about 150 research papers in major technical journals. He has been a member of the editorial board of several reputed journals such as the Composites Engineering, AIAA Journal, Applied Mechanics Reviews, Smart Structures and Systems etc.



**Dr. B. N. Singh** is a Professor and the Head of the Department of Aerospace Engineering at Indian Institute of Technology Kharagpur. His research interest is directed towards analytical and finite element modeling of structures, aeroelasticity, nonlinear vibration, development of shear deformation theories, functionally graded materials, and multi-scale modeling of advanced materials. He has more than 100 research papers in the technical journals of repute and more than 80 research papers in conference proceedings to his credit.



**Dr. D. K. Maiti** is a Professor in the Department of Aerospace Engineering at Indian Institute of Technology Kharagpur. Prior to joining IIT Kharagpur, he worked as a Scientist/Engineer at the Aeronautical Development Agency (ADA), Bangalore. His research interest is aeroelasticity, damage assessment of structures, and structural optimization. He has more than 40 international journal papers and more than 50 national and international conference papers to his credit.



**Dr. M. R. Sunny** joined the Department of Aerospace Engineering at Indian Institute of Technology Kharagpur as an Assistant Professor in the year 2014. Prior to that, he pursued his Doctoral and Postdoctoral research in the research group of Dr. Rakesh K. Kapania at Virginia Polytechnic Institute and State University. His areas of research include structural dynamics, fluid structure interaction, damage assessment of structures, finite element analysis.

## Course Co-ordinator

**Prof. Mohammed Rabius Sunny**  
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<http://www.cep.iitkgp.ac.in/iswt>



# Introduction to Nano Structured Polymeric Materials

## Overview

Nano patterned polymer films find wide applications in various areas of Science and Engineering. On one hand, such films act as functional coatings with custom tailored optical, chemical and wetting properties. On the other hand, ultra thin films tend to spontaneously rupture and dewet, resulting in meso scale patterns. With suitable templating strategies, instability and morphological evolution of an ultra thin film is considered as a viable alternative to top down lithography techniques. The final morphology depends on the competition and coupled effects of two different length scales: 1) the natural length scale of instability arising out of interfacial interaction and 2) the imposed length scale of the confining template.

This situation becomes more complex and physics more demanding when instead of a single homopolymer, either a polymer blend or a block co-polymer is used. Blends of two immiscible polymers exhibit phase segregation due to factors such as differential wettability, solubility, preferential surface enrichment and so on. On the other hand, block copolymers (BCP) offer an attractive alternative patterning technology since they can self-assemble on lengthscales from a few to hundreds of nanometers. Bulk self assembled morphologies include lamellae, hexagonally close packed cylinders, spheres, and gyroid networks.

This course is organized in two modules that should be taken together. The topics in Module A will expose the participants to the concept of soft lithography and spontaneous instability in an ultra thin polymer film. The condition under which the thermally excited capillary waves amplify and lead to rupture of a film will be discussed first, followed by morphological evolution during film rupture and dewetting. The discussion will also include strategies to organize the instability patterns by imposing lateral confinement. In the second module, how Reciprocal space techniques based on scattering with different probes such as light, x-rays and neutrons can be used in polymer thin films to determine and understand its internal structures will be discussed. The modules will also cover state of art concepts of nano particle induced stabilization and phase segregation of thin films.

### Modules

**A: Instability and Patterning of Polymer Thin Films** : June 8 – June 12, 2015

**B: Reciprocal space techniques** : June 15 – June 19, 2015

**Number of participants for the course will be limited to Twenty Five.**

### You Should Attend If...

- you are a researcher in the cutting edge field of nano technology, polymer science, micro and nano fluidics, chemical engineering, coating technology, Physics or Physical Chemistry

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$500**

**Industry/ Research Organizations: ₹ 30000**

**Academic Institutions: ₹ 10000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The above fee include 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.

## The Faculty



**Prof. Alamgir Karim** (PhD, Northwestern University) is the Associate Dean for Research, College of Polymer Science and Polymer Engineering and The Goodyear Tire and Rubber Company Professor, Department of Polymer Engineering. He is regarded as one of the top most polymer physicist in the world with more than 250 papers in top journals such as Physical Review Letters, Nature Materials, ACS Nano, Macromolecules, Soft Matter, Polymer etc.



**Prof. Ashutosh Sharma** (PhD, SUNY at Buffalo) is a Chair Professor in the Department of Chemical Engineering at IIT Kanpur. Presently, he is serving as the Secretary of the Department of Science & Technology, Government of India. He is an outstanding scientist in the area of Colloids, Interfaces and Soft Nano Fabrication with more than 300 papers in journals such as Science, PRL, Langmuir, Advanced Materials etc. He is associate editor of ACS Applied Materials & Interfaces. He has won several major awards such as S S Bhatnagar award, Infosys Prize etc. and fellow of all Indian and several international academies.



**Dr. Rabibrata Mukherjee** (PhD, IIT Kanpur) is an Associate Professor of the Department of Chemical Engineering and an Associated Faculty of the School of Nano Science & Nano Technology at the Indian Institute of Technology, Kharagpur. His research interest is thin film instability, dewetting and self organization, soft lithography, colloidal self assembly, coffee stain problem etc. He has several papers in top notch journals such as Nano Letters, ACS Nano, Macromolecules, Langmuir, ACS Applied Materials & Interfaces, ACS Macro Letters, Soft Matter etc.

## Course Co-ordinator

**Prof. Rabibrata Mukherjee**  
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<http://www.cep.iitkgp.ac.in/iswt>

# Supply Chain Network - Modeling and Analysis

## Overview

The competitive business environment is changing significantly due to globalization, shorter product life cycles, minimum cost and lead time, and new technologies. A market driven business must react quickly to changes in customer preferences, technology, and competition. It should reposition itself in its value chain or re-engineer in such a manner so that the flow of good, information and funds will facilitate its business processes. These options require the company to be able to manage explosive numbers and types of suppliers, manufacturing units, production and distribution location i.e. effective management of supply chain network (SCN). Industry can enhance service level, reduce supply chain cost and align supply chain strategies through efficient SCN management and stay competitive in current globalized environment.

Efficient SCN requires initiation of end-to-end supply chain integration including procurement, production, warehousing, inventory and transportation. Traditional supply chain management initiates end-to-end visibility and provides essential data for SCN improvement. However, the demand of ubiquitous globalization is to go beyond the traditional end-to-end integration to achieve utmost impact. Application of analysis in SCN can provide valuable insights for strengthening strategic decisions in SCN including supplier selection and evaluation of supplier performance for quality control, accurate forecasting of demand, monitoring supply and replenishment policies, cost effective planning of inventory management. SCN analysis can use historical data and with the help of mathematical modelling can optimize different SCN decisions.

Course curriculum is designed based on requirements of both industry and academia and consist of a perfect blend of both theoretical and practical approach.

<b>Modules</b>	<p><b>Supply Chain network-Modelling and Analysis:</b> June 15 – June 26, 2015</p> <p><b>Number of participants for the course will be limited to Fifty.</b></p>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ You are an Industrial engineer or research scientist working in the area of supply chain network and related field.</li> <li>▪ You are a supply chain professional seeking to learn tools and techniques, current advancement and future directions for SCN modeling and analysis.</li> <li>▪ You are a student or faculty from academic institution interested in learning how to do research and identify current research area on supply chain network.</li> </ul>
<b>Fees</b>	<p>The participation fees for taking the course is as follows:</p> <p><b>Participants from abroad : US \$500</b></p> <p><b>Industry/ Research Organizations : ₹ 30000</b></p> <p><b>Academic Institutions : ₹ 10000</b></p> <p><b>TEQIP-II approved Institutions : ₹ 2000</b> (To be refunded after completion of course)</p> <p>The above fee include 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.</p>

## The Faculty



**Prof. Suresh P. Sethi** is the Director of Center for Intelligent Supply Networks in Naveen Jindal School of Management at The University of Texas at Dallas. His research interest includes Supply Chain Management, Optimal Control Theory and Applications and Operations Research.



**Prof. M. K. Tiwari** is head of the department of Industrial and Systems Engineering, IIT Kharagpur. His research interest is Manufacturing Planning and Scheduling, Logistics and Supply Chain Analysis, Computational Intelligence in Manufacturing & Logistics and Optimization & Simulation.



**Prof. B. Mahanty** is Dean Planning & Coordination and Professor in the department of Industrial and Systems Engineering, IIT Kharagpur. His research interest is System Dynamics, Operations Research, Information Systems and Project Management.



**Dr. S. P. Sarmah** is Associate professor in the department of Industrial and Systems Engineering, IIT Kharagpur. His research interest is Supply chain management, Reverse logistics, Inventory and Operations Management.



**Dr. S. K. Kumar** is Assistant Professor in the department of Industrial and Systems Engineering, IIT Kharagpur. His research interest is Operations Research, Supply Chain and Logistics, Optimization and Game Theory.

## Course Co-ordinators

**Prof. M. K. Tiwari**  
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# Deep Foundations including Seismic and Offshore Applications

## Overview

Geotechnical practitioners always prefer to use spread footings (shallow foundation) wherever possible because they are simple to understand and inexpensive to build. However, because of wide variations in site conditions and loadings, often spread footings are not the best choice and the most common alternative to spread footings is deep foundations. Mankind has used pile foundations for more than 2000 years. Construction methods for pile foundations improved very fast during the industrial revolution, especially when steam/electrical power became available. However use of systematic analysis to design these foundations is comparatively new. Behaviour of pile foundations under varying loading and site conditions are quite complex and it is particularly so with the use of various new materials and methods.

In this course it is intended to cover details developments in analysis, design and testing of pile foundations. Various loading conditions to be considered in the analysis are: vertical compressive loading, uplift, lateral loading, seismic, wind, and wave loading. Course participant will learn the topics through lectures, tutorial, assignments and demonstration through freely available software. Also a few case studies will be included to stimulate the motivation in research in various areas of deep foundations.

### Modules

**Dates:** June 29 – July 10, 2015

**Number of participant is limited to Fifty.**

### You Should Attend If...

- Practicing civil engineer and research scientists associated with analysis, design and construction of pile foundation and are desirous to update their knowledge in deep foundations.
- A student or faculty from the academic institution for the understanding of current practices of pile foundations and furthering their knowledge in research in various areas of deep foundation.

### Fees

The participation fees for the course are as follows:

**Participant from abroad: US \$ 500**

**Industry/research organisation: ₹ 30000**

**Academic Institution: ₹ 10000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The above fee includes all instructional materials, computer use for tutorials, 24 hr. free internet facility. The participants have to bear the food and lodging expenses during their stay. They will be provided accommodation on payment basis.

## The Faculty



**Prof. M. Hesham El Naggar**, Ph.D., P.Eng., M. CSCE, F. EIC, F. ASCE

Dr. El Naggar is a Professor and Associate Dean of Engineering at Western University, Canada. He is Associate Editor of the Canadian Geotechnical Journal. He received numerous awards including: Stermac, G.G. Meyerhof, Canadian Geotechnical Colloquium Speaker, Western Faculty Scholar, Outstanding Teaching, and Research Excellence Awards. He published 350 technical papers/book chapters on foundations and geotechnical earthquake engineering and consulted on major projects worldwide and has given more than hundred short courses on “Design of Machine Foundations”, “Foundation Design” and “Geotechnical Earthquake Engineering” to practicing engineers worldwide.



**Prof. Subhamoy Bhattacharya** currently Chair in Geomechanics and Programme Director for the MSc course in Advanced Geotechnical Engineering at the University of Surrey. He is also the Director of Undergraduate Studies in Civil Engineering and has an overall responsibility for quality management and enhancement of teaching and learning standards in the department. He previously held the position of Senior Lecturer at the University of Bristol, Departmental Lecturer in Engineering Science at University of Oxford, College Lecturer at Brasenose College and Lady Margaret Hall (University of Oxford), 21st Century Centre of Excellence Fellow at Tokyo Institute of Technology (Japan). Professor Bhattacharya earned his doctorate from University of Cambridge as a Jawaharlal Nehru Memorial Trust Cambridge Scholar investigating failure of pile foundations in seismically liquefiable soils. He spent many happy years working in civil and offshore engineering consultancies, including as staff engineer at Fugro Limited and Consulting Engineering Services (now Jacobs).



**D. K. Baidya**, Professor, Department of Civil Engineering Indian Institute of Technology Kharagpur. His research interests cover wide range of geotechnical engineering areas namely, shallow and deep foundations, machine foundations, geotechnical earthquake engineering and reliability in geotechnical engineering

## Course Co-ordinator

**Prof. D. K. Baidya**

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# Microfluidics and Nanotechnology for Healthcare Engineering

## Overview

The study of fluid flows in channels with characteristic length scales of the order of microns is termed as microfluidics. The technology of fluid engineering at micro and nano scales can be applied to medical diagnostics, drug delivery and healthcare applications. The low sample requirement not only gives the advantage of minimal invasive techniques but also reduces the expenses involved. Topics ranging from mimicking the biological functionalities on glass slide in a laboratory, use of a CD player as microscope, DNA analysis, portable and inexpensive diagnostic kits and other such interesting technologies would be unraveled in the course.

Beginning with a revision of the basic concepts of fluid mechanics the modifications that need to be introduced as the fluid flow scales move down to micron and sub-micron levels would be studied. The course aims to discuss the pressure driven, surface tension and capillarity and electrokinetic modes of flow actuations both at micro and nanoscales. A brief introduction to the tools of analysis for molecular flows would be given. With the understanding of these concepts, the course would proceed to discuss biomicrofluidics for healthcare engineering.

The second module would be more focused on the biomedical technologies. The topics covered would span the spectrum of compact disc-based fluidic platform and carbon MEMS, artificial muscle for responsive drug delivery and integrating fluidics with DNA arrays as well as researching label-free assays for the Molecular Diagnostics platform of the future.

Course participants will learn these topics through lectures and hands-on experiments. Also case studies and assignments will be shared to stimulate research motivation of participants.

### Modules

**A: Microfluidics and Nanofluidics-Introduction and applications in Healthcare** : June 29 – July 3, 2015

**B: BioMEMS and Nanotechnology** : July 6 – July 10, 2015

**Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

- you are interested in R&D activities interfacing engineering activities and medical applications.
- you are an undergraduate / graduate student in any branch of science/engineering with particular interest in microfluidics and nanotechnology.
- you are faculty member interested to work in the focused area of microfluidics / nanofluidics / biomicrofluidics.
- you are a prospective entrepreneur interested in innovations on medical diagnostics.

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$500**

**Industry/ Research Organizations: ₹ 30000**

**Academic Institutions: ₹ 10000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

**Registration fees will be reimbursed only to the faculty members and students of TEQIP-II funded institutes, after the participants completes the course.**

The above fee include 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.

## The Faculty



**Suman Chakraborty** is a professor in Mechanical Engineering Department of IIT Kharagpur. His research work is focusing on the transport over miniaturized scales, along with the agglomeration of the science of microfluidics with the complex biophysics of in-vitro and living systems. He is an author of more than 250 numbers of highly rated International Journal publications. He is the recipient of the Santi Swarup Bhatnagar Prize. He is also the youngest Fellow of the Indian National Academy of Engineering (FNAE), a Fellow of the National Academy of Science (FNASc), a Fellow of the American Society of Mechanical Engineers (FASME), along with other awards and recognitions.



Before joining University of California Irvine as the Chancellor's Professor in Mechanical and Aerospace Engineering (MEA), **Dr. Marc Madou** was the Vice President of Advanced Technology at Nanogen in San Diego, California. He specializes in the application of miniaturization technology to chemical and biological problems (BIO-MEMS). He authored several books including "Fundamentals of Microfabrication," an introduction to MEMS and NEMS, which has become known as the "bible" of micromachining, was published in July of 2011 (<http://fundamentalsofmicrofabrication.wordpress.com>). Dr. Madou was the founder of the SRI International's Microsensor Department, founder and President of Teknekron Sensor Development Corporation (TSDC), Visiting Miller Professor at UC Berkeley and Endowed Chair at the Ohio State University (Professor in Chemistry and Materials Science and Engineering). At UCI, Dr. Madou works on carbon-MEMS, a CD based fluidic platform, artificial muscle for responsive drug delivery and integrating fluidics with DNA arrays as well as researching label-free assays for the Molecular Diagnostics platform of the future. To find out more about those recent research projects, visit <http://mmadou.eng.uci.edu/>

## Course Co-ordinator

**Prof. Suman Chakraborty**

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# Corporate Governance

## Overview

Corporate governance, in essence, deals with accountability and transparency by those in control of corporations. It is a multifaceted area drawing on various academic disciplines such as law, economics, finance and organisation behaviour.

The globalisation of markets makes it important to have regard to governance developments in major economies. To that end, both local and international perspectives of corporate governance practices are offered in this course – with particular reference to the comparative position in India, Australia, England, South Africa and the United States. The course also offers comparative perspectives to the Anglo-American model by examining some of the Asian governance models.

Through the use of local and international case studies, this course aims to equip students with knowledge of the legal responsibility of company directors and officers and to understand the legal risks arising from occupying those corporate positions.

The course contains essential knowledge for all directors (whether executive or non-executive or chairperson) and company officers (including company secretary) to discharge their statutory and common law duties to the company. The course also emphasises principles and recommendations for best practices in corporate governance by adopting a global perspective.

### Modules

- A Concepts and Issues in Corporate Governance**
- B Corporate Governance in Listed Public Companies**
- C Duties (and Liabilities) of the Modern Director**
- D Australian and International Perspective**
- E Role of Gatekeepers (Regulators, auditors and lawyers)**

June 29 – July 12, 2015

**Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

- you are an advanced student in LL.B. program (preferable with Corporate Law Hons), LL.M. program (those who pursue Corporate Law Specialization), MBA, ICSI, ICAI etc.
- you are faculty of academic and professional institute.
- you are a corporate executive and Corporate Lawyer.
- you are an aspirant to be a Board Member.

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$200**

**Industry/ Research Organizations: ₹ 10000**

**Academic Institutions: ₹ 5000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The above fee includes all instructional materials, computer use for tutorials and assignments, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

## The Faculty



**Anil Hargovan** is the Associate Professor in the School of Taxation and Business Law, University of New South Wales, Sydney, Australia. His research interest includes Corporate Law and Governance & Insolvency Law.



**Indrajit Dube** is the Associate Professor in the Rajiv Gandhi School of Intellectual Property Law, Indian Institute of Technology Kharagpur, India. His research interest includes Corporate Law and Governance & Environmental Governance.

## Course Co-ordinator

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<http://www.cep.iitkgp.ac.in/iswt>

# Mapping Creativity

## Overview

Science, engineering and management emphasize only technical competence, whereas these disciplines are also about people's skills, ethical values and, above all, creativity. Like artists who are constantly reinventing themselves, scientists, engineers, managers, lawyers and entrepreneurs need to be inventive, come to terms with ground realities, have the vision to adapt to them, and be creative. In order to make engineers, scientists, lawyers, managers and entrepreneurs break free from their traditional mindsets and think different, the addition of a creative ingredient -- beyond the proverbial "lateral thinking" (a la Edward de Bono) -- in their lives can infinitely enhance the quality of science, engineering, management and legal disciplines. With an intention of introducing engineers, scientists, managers and lawyers to the other side of life -- the angst and tribulations, the sublime pleasures and contradictions of the creative realm--- by inviting artists from various fields to share their experiences in art and life, this course aims to enable participants to apply them to management and real world problem-solving.

Through rehearsing practical skills, participants gain an awareness of creativity, the creative process, creative problem-solving, and developing creative strategies in science, engineering, law and management within the framework of the contemporary, international and global communications and media context.

### Participants will have the opportunity to:

- Understand the creative process
- Map creativity through the unfolding of the creative process
- To apply the creative process in their own domains
- To find creative solutions to practical problems

### Goals

- The goals of this course are for participants to:
  - improve their ability to find creative solutions to problems in science, engineering, law and management
  - understand the creative process and map creativity
  - develop strategies to apply their understanding of creativity in their chosen field or profession

### Modules

**A: Defining Creativity and the Creative Process** : July 6 – July 10, 2015

**B: Mapping Creativity in Narrative, Visual and Performing Arts** : July 11 – July 14, 2015

**Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

- you are a scientist or engineer interested in developing 'lateral thinking' and 'creative problem-solving'
- you are a manager, lawyer or entrepreneur interested in adding a creative element to 'lateral thinking'
- you are a student or faculty from an academic institution interested in understanding the other side of life

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$500**

**Industry / Research Organizations : ₹ 10000**

**Academic Institutions : ₹ 5000**

**Students from other Academic Institutions : ₹ 2500**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

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.

## The Faculty



**Rob Cover** is Discipline Chair of Media and Communication and Associate Professor in Social Sciences at The University of Western Australia. During 2006 and 2007 he served the Queensland state government as a senior communication strategist and communication consultant, and has written for a range of news, opinion and magazine publications. He was Writer-in-Residence at the Katharine Susannah Prichard Writers' Centre in Western Australia and has published short fiction. As an academic, Rob has published many academic refereed articles and chapters in journals. He is the recipient of Australian Research Council (ARC) grant funding and is working on a number of projects related to creative/interactive media, resilience, belonging, population and mobility. His previous books are *Queer Youth Suicide, Culture and Identity: Unliveable Lives?* (Ashgate 2012), *Vulnerability and Exposure: Footballer Identity, Masculinity and Ethics* (UWAP 2015), and *Digital Identities: Creating and Communicating the Online Self* (Elsevier, forthcoming 2015).



**Mahesh Dattani** is a playwright, stage director, screenwriter and film maker. His published works include *Final solutions* and *Other plays*, *Tara*, and more recently, *Me and My plays*. In 1998, Mahesh Dattani won the prestigious central Sahitya Akademi Award for his book *Final Solutions and Other Plays*. Today his plays, translated in Hindi, Gujarati and Kannada, are performed and produced in all the major cities of India as well outside, including London, Leicester, New York, Washington DC, Sydney, Colombo and Dubai. Most notably, his play *Dance Like a Man*, directed by Lillete Dubey, received 500 performances and continues to tour. His plays are on the syllabus of several Indian and

foreign universities and schools. His film *Mango Soufflé* (writer and director) was adjudged best motion picture at the Barcelona Film Festival 2003 and *Morning Raga* (writer and director) had its international premier at the Cairo Film Festival in December and he won the award for best artistic contribution. The script has been archived by The Academy of Motion Pictures, USA.



**Anjali Gera Roy** is a Professor in the Department of Humanities of Social Sciences at the Indian Institute of Technology Kharagpur, who works on fiction, film and performance traditions of India, folklore and communication. She is the author of *Cinema of Enchantment: Perso-Arabic Genealogies of the Hindi Masala Film* (Hyderabad: Orient Blackswan forthcoming 2015) and *Bhangra Moves: From Ludhiana to London and Beyond* (Aldershot: Ashgate 2010).

## Course Co-ordinator

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<http://www.cep.iitkgp.ac.in/iswt>

# Modeling River Catchment Interactions

## Overview

The course covers topics on data requirement, governing principles and processes for catchment and river flow modeling. Prediction and forecasting of low-flow and floods as well as regionalization as a way to deal with ungauged basins are also covered. The course also covers generation of meteorological scenarios for modeling river catchment interactions to quantify impact of climate and land-use change on future floods.

The course focuses on developing understanding of river catchment interactions to analyse the impact of changing climate and land-use on future floods, and to develop and implement adaptive water resources measures. The course will include lectures, tutorials to solve practical problems, and demonstration of river/catchment models. Participants will be exposed to recently developed techniques of flood modeling tools with climate and land-use change information.

<b>Modules</b>	<p><b>Dates:</b> June 1 – June 12, 2015</p> <p><b>Number of participants for the course will be limited to Fifty.</b></p>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ You are a practicing engineer, resources manager working for flood risk management, water resources assessment and management, and interested in understanding the catchment and river flow processes, climate and land-use change for flood risk management.</li> <li>▪ You are a student or faculty in an academic institution and interested in learning catchment flood modeling, climate and land-use change and their effect on flood hazards through advanced modeling tools and techniques.</li> </ul>
<b>Fees</b>	<p>The participation fees for taking the course is as follows:</p> <p><b>Participants from abroad: US \$500</b></p> <p><b>Industry/ Research/Academic Organizations: ₹ 10000</b></p> <p><b>Students from Academic Institutions (non- IIT KGP): ₹ 5000</b></p> <p><b>TEQIP-II Approved Institutions: ₹ 2000</b> (To be refunded after completion of course)</p> <p>The above fee includes all instructional materials, computer use for tutorials, and 24 hr free internet facility. The participants will be provided accommodation on payment basis.</p>

## The Faculty



**Prof. Axel Bronstert** is Professor and Chair for Hydrology and Climatology at the Institute of Earth and Environmental Science, University of Potsdam, Germany. His research areas comprise of Hydrological Processes Modeling, Flood modeling, and Flood Risk Management. He is in editorial board of many renowned water resources related international journals like Hydrology and Earth System Sciences, International Journal of Flood Risk Management, Hydrological Processes, and Journal of Hydrology.



**Prof. N. K. Goel** is Bharat Singh Chair Professor for Water Resources at the Department of Hydrology, Indian Institute of Technology (IIT) Roorkee. His teaching and research interest include Stochastic Hydrology, Extreme Value Estimation, Flood Estimation and Forecasting. Prof. Goel is Adjunct Professor at University of Waterloo, Canada. He received Khosla Research Prize and held Star Performer Status for more than six times in a row at IIT, Roorkee.



**Prof. R. Singh** is a Professor of Land & Water Resources Engineering at the Department of Agricultural and Food Engineering at IIT Kharagpur. His teaching and research areas comprise of hydrologic modeling and water resources management. His research has focused heavily on the development of hydrologic model, watershed management, and management of water resources.



**Prof. Chandranath Chatterjee** is a Professor of Land & Water Resources Engineering at the Department of Agricultural and Food Engineering at IIT Kharagpur. His research interests include flood modeling, hydrological modeling and application of Geo-informatics in surface water hydrology. He has received several awards including Humboldt Foundation award from Germany.



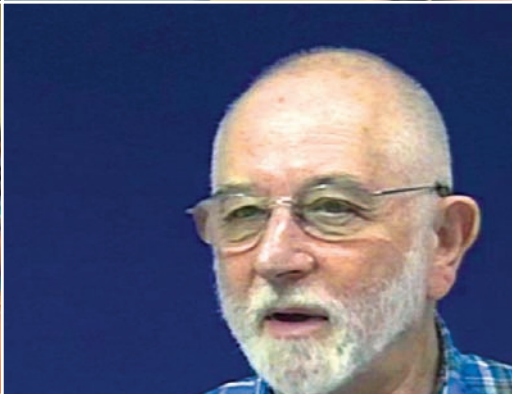
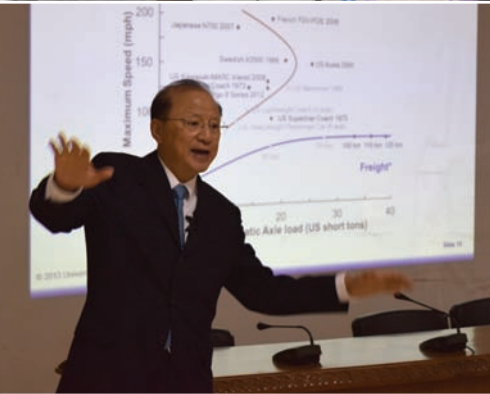
**Dr. Ashok Mishra** is an Associate Professor of Land & Water Resources Engineering at the Department of Agricultural and Food Engineering at IIT Kharagpur. His teaching and research areas comprise of hydrological modeling & watershed management, climate change analysis & its applications. His research has focused mainly on water resources assessment and developing climate change adaptation techniques.

## Course Co-ordinator

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<http://www.cep.iitkgp.ac.in/iswt>





# Orthopaedic Biomechanics: Implants and Biomaterials

## Overview

Biomechanics is a subject that seeks to understand the mechanics of living system; it is mechanics applied to biological system. Biomechanics helps us to understand the relationship between structure and function, predict changes due to alterations, and propose methods of artificial interventions. Thus diagnosis, surgery and prosthesis are closely associated with Biomechanics. A most vigorous development of Biomechanics is associated with Orthopaedics, because the most frequent users of the surgical theatres are patients with musculoskeletal problems. The Biomechanics of trauma, injury and rehabilitation is becoming increasingly important to modern society. Fundamental research has included not only surgery, prosthesis, implantable materials and artificial limbs, but also cellular and molecular aspects of healing in relation to stress and strain, and tissue engineering of cartilage, tendon and bone. Lectures will be delivered by internationally renowned faculties from abroad and India. This course will cover the fundamental aspects as well as state-of-the-art techniques of modelling and simulation and is intended towards engineers, scientists and clinicians.

### Modules

Clinical Problems in Orthopaedics, Musculoskeletal system, Basic concepts of Biomechanics, Gait Analysis & Joint Kinematics, Imaging Techniques & Biomechanical Analysis, Biomechanics of Total Joint Replacement – Hip, Knee, Shoulder, Elbow. Biomaterials and Biomaterial behavior, Basic Concepts of Implant Design, Failure Mechanisms and Current Concepts.

**Duration:** Ten working days; November 30 – December 11, 2015

**Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

This course is designed for M.Tech / PhD students of Mechanical, Civil, Biomedical Engineering and Medical students (with special interest), who are likely to be benefited by learning the fundamental aspects of modelling and simulation of musculoskeletal system. Faculty members and Research Associates are also welcome. This is an excellent opportunity for the participants to learn details of modelling and analysis of bone and implant, Biomaterials and Biomaterial behavior, in order to pursue advanced studies and research in areas related to Biomechanics and Biomaterials.

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$500**

**Industry/ Research Organizations: ₹ 30000**

**Academic Institutions: ₹ 10000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The above fee include 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.

## The Faculty



**Professor Nico Verdonchot** is in the faculty of the Radboud University Medical Center Nijmegen and the University of Twente both situated in The Netherlands. His research interests include computer modelling of failure processes of orthopaedic implants and musculoskeletal modeling of the lower limb.



**Dr. Debasis Chakravarty** is a renowned Orthopaedic Surgeon working in Fortis Hospitals, Kolkata. He has practiced extensively in India and abroad. Dr. Chakravarty specializes in Joint Replacement and Trauma Surgery. He has expertise in Primary and Revision arthroplasty of hip, knee, elbow and shoulder joints. He is an ex revision arthroplasty fellow of Helios Endo-Klinik in Hamburg and AO Fellow in Trauma at BG Unfallklinik, Ludwigshafen, Germany.



**Professor Amit Roy Chowdhury** is a faculty in the Department of Aerospace Engineering and Applied Mechanics of Indian Institute of Engineering Science and Technology Shibpur. His research areas include Implant Biomechanics, Biomaterials and Finite Element Analysis. He was a visiting faculty to the State University of New York (SUNY).



**Dr. Santanu Dhara** is currently working as an Associate Professor in the School of Medical Science and Technology, Indian Institute of Technology Kharagpur. He has established Biomaterials and Tissue Engineering Laboratory in the School with the vision of product development research based on fundamental understanding of cell-material interaction. Amongst different biomaterial aspects, BMTE group is working for the development of customized implants through various top down and bottom up fabrication strategies.



**Professor Sanjay Gupta** is presently working in the Department of Mechanical Engineering, Indian Institute of Technology Kharagpur. He has developed Biomechanics laboratory in the department and has successfully collaborated with University of Southampton, United Kingdom. His primary research areas are bone and joint mechanics, pre-clinical analysis of implant design and tissue engineering. Currently, he is also the Faculty Co-ordinator, International Relations at IIT Kharagpur.

## Course Co-ordinators

**Prof. Sanjay Gupta**

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**Prof. Santanu Dhara**

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# Thin Film Technology for Waste Heat Recovery

## Overview

The shortage of energy resources is the main problem of recent times. More than half of the energy consumed worldwide is wasted as heat. The recovery of small fraction of this waste heat can change the global energy scenario. Thus thermoelectricity has become significant in the field of waste heat recovery. It is also advantageous for localized cooling of microelectronic systems for its ability to maintain its efficiency in small scale dimension. However, the major problem associated with thermoelectricity is the low efficiency of commercially available materials. Recent progress in thermoelectric research has enabled researchers to develop new materials with enhanced thermoelectric efficiency.

This course is organized in two modules that should be taken together. The topics in Module A will be based on thin film technology where the topics such as general aspects and history of vacuum science and technology, basic concepts, physico-chemical phenomena in vacuum, physics and principle of pumping, measurements, and thin film deposition for thermoelectric materials will be covered. Module B will deal with the thermoelectric effect and will cover its introduction, different materials with particular emphasis on nanostructure systems and characterizations.

Course participants will learn these topics through lectures and interaction.

<b>Modules</b>	<p><b>A: Thin Film Technology</b> : December 5 – December 8, 2015</p> <p><b>B: Thermoelectric Effect</b> : December 9 – December 14, 2015</p> <p><b>Number of participants for the course will be limited to Fifty.</b></p>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ you are an engineer or research scientist interested in developing modules for waste heat recovery using the principle of thermoelectric effect.</li> <li>▪ you are a material scientist interested to know about the various aspects materials and their structures including thin film materials for the application of waste heat recovery.</li> <li>▪ you are a student or faculty from academic institution interested in learning techniques of waste heat recovery by using thermoelectric effects, the materials used and their characterizations.</li> </ul>
<b>Fees</b>	<p>The participation fees for taking the course is as follows:</p> <p><b>Participants from abroad : US \$400</b></p> <p><b>Industry/ Research Organizations: ₹ 15000</b></p> <p><b>Academic Institutions: ₹ 5000</b></p> <p><b>TEQIP-II approved Institutions : ₹ 2000</b> (To be refunded after completion of course)</p> <p>The above fee include all instructional materials, computer use for tutorials and assignments, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.</p>

## The Faculty



**Prof. Per Eklund** is in the faculty of Linköping University, Sweden. His research interests include novel thin-film materials for energy applications, nitride-based nanostructured thin films for thermoelectrics and epitaxial and nanostructured thermoelectric thin films.



**Prof. Pallab Banerji** is a Professor of Indian Institute of Technology, Kharagpur. His research interest is thermoelectric and photovoltaic effects in materials, and metalorganic chemical vapour deposition of III-V semiconductors.

## Course Co-ordinator

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<http://www.cep.iitkgp.ac.in/iswt>

# Ergonomics & Human Factors Engineering

## Overview

Ergonomics and Human Factors Engineering (HFE), a multi-disciplinary subject, is concerned with re-engineering of a process, a product, or a workspace for efficient and safe working. As technology becomes more complex and work systems operate under severe constraints, good ergonomic design becomes increasingly important and imperative. In this context, 'technology push' in the modern era is considered to be the main factor influencing the direction and growth of ergonomics. Several industries and organizations in recent years apply the ergonomic concepts in the design of their products and processes, work environment, and human-machine interfaces. In India, China and many others developed and developing countries, the industries have been experiencing stiff competition, particularly with the onset of globalization process and liberalization of their economy; and a very few organizations have been able to utilize the concepts and principles of ergonomics in their work systems to their advantage primarily because of (i) lack of knowledge or absence of trained personnel, in the field of ergonomics and human factors engineering and (ii) excessive emphasis on solution of work system-related problems through the use of newer 'technology', imported or otherwise.

IIT Kharagpur, being an internationally recognized technical institution of India with its Department of Industrial and Systems Engineering having a number of experts with proven knowledge, expertise, and research capabilities in the broad field of ergonomics, plans to offer a 2-week duration Industrial Summer/Winter Term (ISWT) on Ergonomics & Human Factors Engineering to provide both industry professionals and students/researchers with valuable insights into several pertinent issues of Ergonomics & Human Factors Engineering.

Internationally acclaimed academics, researchers and practitioners with proven knowledge, experience, and demonstrable ability in teaching, consultancy, research, and training in the field of Ergonomics & Human Factors Engineering will deliver lectures and discuss cases in the course. The course will be planned and offered as per the norms set by IIT Kharagpur for ISWT subject. Course participants will learn select topics in ergonomics and human factors engineering through lectures and hands-on exercises/experiments. Also case studies and assignments will be shared to stimulate research motivation of participants.

### Modules

- A: Introduction to Ergonomics & HFE** : December 7 – December 8, 2015  
**B: Human Body Centred Ergonomics** : December 9 – December 14, 2015  
**C: Human Factors for Human Performance & Systems Design** : December 15 – December 17, 2015  
**Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

- Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories.
- Students at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad: US \$500**

**Industry/ Research Organizations: ₹ 30000**

**Academic Institutions: ₹ 10000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hour free internet facility. The participants will be provided with accommodation on payment basis.

## The Faculty



**Prof. Pradip K. Ray** is presently a Professor in the Department of Industrial and Systems Engineering, Indian Institute of Technology (IIT), Kharagpur, India. He served as the Head of the Department during September, 2006 to August, 2009. Professor Ray has about more than thirty three years of diversified experience-eight years as Senior Industrial Engineer/Manager at General Electric Company of India in Calcutta and more than twenty four years of teaching and research experience at IIT, Kharagpur. He has also served as Associate Professor at Eastern Mediterranean University, Cyprus (two years) and as Visiting Faculty at University of South Pacific, Fiji Islands. He has published one text book titled 'Product and Process Design for Quality, Economy and Reliability', four book chapters, and around 120 papers in international and national journals of repute and conferences in the areas of productivity measurement and evaluation, quality design and control, TQM, process optimization, ergonomics/human factors engineering, safety engineering and management and other related topics. He has supervised 16 PhD scholars in his research areas till date. Professor Ray is a certified Lead Assessor for ISO-9001 registration, and actively involved in a number of industrial consulting and research projects (23 such projects till date) in his interest areas. He is a member of several professional bodies, such as INFORMS and IIMM, and a Fellow of World Academy of Productivity Sciences and a Fellow of Institution of Engineers (India).



**Prof. Chia-Fen Chi (Christine)** is presently a Distinguished Professor at the Department of Industrial Management at National Taiwan University of Science & Technology, Taipei, Taiwan. She served as chair of the Industrial Management Department, Associate Dean and Dean of International Affairs. Since Feb 2013, she has

been appointed as Director of centre for teaching and learning at her university. Prof Christine obtained her B.S (Industrial Engineering) from Tunghai University, Taiwan, with M.S in Industrial Engineering and PhD in Human Factors from State University of New York at Buffalo, USA. She has published a large number of papers in reputed international journals on several aspects of Human Factors and Ergonomics and has been editorial board member in several international journals in her research interest notably International Journal of Industrial Ergonomics, Journal of Service Science & Management, Journal of Occupational Safety & Health etc. She had been Visiting Professor at Iowa State University, USA and attended the Postgraduate Seminars and Training Programs at Harvard Business School. She has handled a large number of research and consulting projects and delivered invited lectures in several countries, institutions and conferences. Her research areas include accident analysis and prevention, aging and disabled workers, job analysis and job accommodation etc.

## Course Co-ordinator

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# Hydrodynamics of Riverbed Erosion and Scour at Structures

## Overview

The phenomenon of lowering the riverbed level due to sediment removal is called riverbed erosion. The sediment removal also takes place locally at a structure with the formation of a local scour hole. This course will provide a comprehensive understanding on riverbed erosion, scour within channel contractions, scour downstream of structures, scour below horizontal pipelines, scour at bridge piers and abutments. Further, the scour countermeasures are of paramount importance. This issue will also be covered. The purpose of the present course is to describe the analytical derivations, empirical/semiempirical formulations and mathematical modelling of the problems related to riverbed erosion and local scour at structures. This course will present a good overview of the fundamentals as well as latest developments of the subject. The lectures will be delivered by the international and national faculties having enormous expertise in the field of riverbed erosion and scour. Therefore, students/participants can learn various aspects of the subject from the world renowned experts of the subject.

## Syllabus

Sediment dynamics, river processes, scour within channel contraction, scour at grade control structures, scour at sills, scour downstream of sluice opening, scour at bridge piers and abutments, scour countermeasures, dynamic similitude for fluvial systems, immobile bed model and mobile bed model.

### Modules

**Duration of the Course :** December 7 – December 18, 2015

**Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

- This course is designed for BTech (third and fourth years) / MTech / MSc / PhD students of Civil Engineering, Water Resources Engineering, Geology and Geophysics, Agricultural Engineering, Ocean Engineering and Naval Architecture who will be benefited in learning the experimental, analytical and computational aspects of erosion of riverbeds and scour at structures.
- This course will also provide an excellent opportunity to the professionals/engineers to comprehensively learn the erosion and scour processes including scour countermeasures to pursue with the field applications more effectively.

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$500**

**Industry / Research Organizations: ₹ 20000**

**Academic Institutions: ₹ 5000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, and 24 hours free internet facility. The participants will be provided accommodation on payment basis.

## The Faculty



**Prof. Roberto Gaudio** is currently a Professor, Dipartimento di Ingegneria Civile, Università della Calabria, Rende, Italy, where he teaches river hydraulics, hydraulic modelling etc. His general areas of research interests encompass analytical hydrodynamics, sediment transport, scour, open-channel flows and coherent motion of turbulence.



**Prof. Bruce Melville** is a Professor of Civil and Environmental Engineering, The University of Auckland, New Zealand. He is an Associate Editor of the Journal of Hydraulic Engineering (ASCE). He is an active researcher with an international reputation in the field of fluvial sediment transport and scour. He (with Dr. Stephen Coleman as a coauthor) is the author of a book titled "Bridge Scour" published by Water Resources Publications.



**Prof. T. Gangadharaiah** has retired from the Department of Civil Engineering, Indian Institute of Technology Kanpur in 2003. He is presently working as an Emeritus Professor of Civil Engineering, Siddaganga Institute of Technology, Tumkur, Karnataka. His research interests are hydrodynamics, sediment transport and scour.



**Prof. Subhasish Dey** is a Professor and Head of the Department of Civil Engineering, Indian Institute of Technology Kharagpur. He is an Associate Editor of the Journal of Hydraulic Engineering (ASCE), Journal of Hydraulic Research (IAHR), Sedimentology, Acta Geophysica, International Journal of Sediment Research and Journal of Hydro-Environment Research. His research interests include analytical hydrodynamics, turbulence, sediment transport and scour. He is the author of a book titled "Fluvial Hydrodynamics" published by Springer-Verlag.

## Course Co-ordinator

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# Separation of Fine and Ultra-Fine Particulates in Fluid Medium: Fundamentals and Applications in Mineral and Coal Processing

## Overview

Processing of Mineral and Coal has gained considerable significance in recent years because of the increasing need to treat more and more inferior grade of raw material. Inferior grade necessitates fine crushing and fine to very fine grinding. Typical examples are 0.7-1.0% Copper ore ground to -60 micron; -100 micron iron ore fines and slimes, low volatile coking coal requiring "pre-cleaning" crushing definitely to -13mm and possibly to -6mm. Processing equipment mostly involve particle motion through water and separation between particles of differing size and density takes place as a result of the interplay of body forces (gravitation or centrifugal), drag forces and particle inertia. Equipment design and performance, therefore, rely heavily on the dynamics of particles in flowing fluid which is very often turbulent. Efficiencies of the processing equipment drop significantly with decrease in particle size as the differences in relative settling velocities between the particles to be separated in water becomes minimal and the rheological behavior of the fluid medium also changes. Therefore, an urgent need has arisen to understand the fine and ultra-fine particulate separation behavior in a dynamic fluid medium from a fundamental view point to improve the knowledge in separation characteristics of the particulate matter, to better design the equipment and to improve the operational performance of the existing equipment.

### The course will have following two modules:

1. Fundamental: Definition of fine and ultra-fine particulates; Particle size, density and their distribution; Important unit operations in mineral and coal processing; Governing laws of fluid motion; Movement of solids in fluids; Suspension rheology; CFD – basics; Mass balances; Separation curves.
2. Industrial Applications: Slurry flow in grinding mills; Particulate separation in classifiers, centrifugal separators and enhanced gravity concentrators; Examples on CFD applications; Optimization of closed circuit grinding operations; Performance improvement of separation equipment; Equipment design and selection - the role of fluid mechanics; Flow sheet development for particulate processing – examples from iron ore slimes and coal fines processing.

Participants will learn these topics through lectures and tutorials. Case studies and assignments will be shared to stimulate research motivation of participants.

### Modules

**Fundamentals:** December 7 – December 12, 2015

**Industrial Applications:** December 14 – December 18, 2015

**Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

- Those involved in equipment design and selection and in plant design in the area of processing of particulate matter including coal and mineral
- Those involved in technical sales of processing and handling equipment
- Those who operate particulate matter processing plants including coal and mineral
- Teachers, students and researchers in the area of processing of particulate matter including coal and mineral

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$500**

**Industry/ Research Organizations: ₹ 30000**

**Academic Institutions: ₹ 10000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The 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.

## The Faculty



**Éric Climent** received his PhD in fluids mechanics in 1996. He was lecturer at the University of Strasbourg (1997–2001). He then moved to Brown University (U.S.A.) as a visiting professor in applied mathematics. He returned to Toulouse in 2003 to work in the chemical engineering laboratory. Since 2008, he has been a member of the Fluids Mechanics Institute, developing his expertise on the modelling and simulation of disperse two-phase flows (suspension flow, solid/liquid separation, bubbles, and drops in turbulent flows). He is now Director of IMFT, France and the head of a Master program devoted to Fluids Engineering for Industrial Processes.

numbers of highly rated International Journal publications. He is the recipient of the Santi Swarup Bhatnagar Prize. He is also the youngest Fellow of the Indian National Academy of Engineering (FNAE), a Fellow of the National Academy of Science (FNASc), a Fellow of the American Society of Mechanical Engineers (FASME), along with other awards and recognitions.



**Arun Kumar Majumder** is an Associate Professor in Mining Engineering Department of IIT Kharagpur. His research interests are in the areas of coal and mineral processing, fine particulate processing and solid-fluid interactions.



**Sumantra Bhattacharya** is currently Tata Steel Chair Professor in the Department of Fuel and Mineral Engineering of Indian School of Mines Dhanbad. He is a member of the editorial board of International Journal of Coal Preparation and Utilization and is at present working on the effect of feed characteristics on the performance of coal cleaning units.



**Kaushik Sengupta** is a mechanical engineering graduate from Jadavpur University in the year 1984. Presently a fellow of the institution of engineers India. Currently working as Vice-president and H.O.D design and engineering for Tega industries Ltd. Possessing thirty years of experience in the fields of mineral processing and bulk material handling; starting from design & selection of equipment/review of application engineering/ analysis of plant operation & process controls.



**Suman Chakraborty** is a Professor in Mechanical Engineering Department of IIT Kharagpur. His research work is focusing on the transport over miniaturized scales, along with the agglomeration of the science of microfluidics with the complex biophysics of in-vitro and living systems. He is an author of more than 250

## Course Co-ordinator

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# Video Based Scene Understanding

## Overview

Computer vision is a field that includes methods for acquiring, processing, analyzing, and understanding images and, in general, high-dimensional data from the real world in order to produce numerical or symbolic information, e.g., in the forms of decisions. A theme in the development of this field has been to duplicate the abilities of human vision by electronically perceiving and understanding an image. This image understanding can be seen as the disentangling of symbolic information from image data using models constructed with the aid of geometry, physics, statistics, and learning theory. Computer vision has also been described as the enterprise of automating and integrating a wide range of processes and representations for vision perception.

As a scientific discipline, computer vision is concerned with the theory behind artificial systems that extract information from images. The image data can take many forms, such as video sequences, views from multiple cameras, or multi-dimensional data from a medical scanner. Video sequence only provides the opportunity to observe an object in more details but also shows the interaction of objects over time. As a technological discipline, scene understanding seeks to apply its theories and models to the construction of machine vision systems. Sub-domains of scene understanding include event detection, video tracking, object recognition, object pose estimation, learning, indexing, motion estimation, and image restoration.

Course participants will learn these topics through lectures and hands-on experiments. Also case studies and assignments will be shared to stimulate research motivation of participants.

### Modules

**Video Based Scene Understanding** : December 7 – December 18, 2015  
**Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

- you are an electronics engineer or research scientist interested in video and images understanding for various applications.
- you are information scientist/engineer interested to learn application of video and images in your profession.
- you are a student or faculty from academic institution interested in learning how to do research on video based scene understanding or want to work with video based understanding

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$500**

**Industry/ Research Organizations : ₹ 30000**

**Academic Institutions : ₹ 15000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The above fee include 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.

## The Faculty



**Prof. Amit K. Roy Chowdhury** is Professor of Electrical and Computer Engineering and Cooperating Faculty, Computer Science and Engg. of University of California, Riverside, California, USA. His research interests include computer vision/image processing, pattern recognition, Biometrics, especially face and soft biometrics, Vision sensor networks and statistical signal processing.



**Dr. Sudipta Mukhopadhyay** is Associate Professor, Electronics & Electrical Communication Engineering of IIT Kharagpur, India. His research interests include Medical Image and Signal Processing, Content based Medical Image Retrieval, Continuous Authentication and Video Processing.



**Prof. Prabir Kumar Biswas** is Professor and HOD of Electronics & Electrical Communication Engineering, IIT Kharagpur, India. His research interests include Image Processing, Computer Vision, Automated Visual Inspection, Multimedia Network, Pattern Recognition, Sensor Network

## Course Co-ordinator

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# Logic and Applications of Logic

## Overview

As the essential foundation for rational investigation, logic is a part of every systematic field of inquiry. Its versatility is evinced in its vast and varied applications in digital electronics, computer and manufacturing technologies, and also for deliberating in law, public policy and business strategy. In view of the above, it is a value-addition to one's skill-base to be exposed to this all-important subject and its recent applications

The course is envisaged in two modules that should be taken together. In module I, the topics covered will provide the participants a close overview of the fundamentals of classical logic with some applications. Module II will be on many-valued logics and various applications.

### Topics for Module-I

- Propositional Calculus
- Aristotelian Logic
- First Order Predicate Logic
- Fuzzy Set, Type-1 and Type-2 Fuzzy Logic for uncertainty management
- Neuro-Fuzzy Systems: Fuzzy Logic and its application Machine Learning domain (Neural Network)

### Topics for Module-II

- Algebraic logic, data mining, and applications
- Many valued logics and applications

<b>Modules</b>	<p><b>The Fundamentals in Logic &amp; some applications:</b> December 7 – December 11, 2015</p> <p><b>Advanced Logic and Applications:</b> December 14 – December 18, 2015</p> <p><b>Number of participants for the course will be limited to Forty.</b></p>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ You are a Faculty or a student of duly authorized TEQIP II funded institutions</li> <li>▪ Or you are a working professional from R&amp;D organizations</li> <li>▪ Or you are a working professional from industry</li> <li>▪ Or you are a faculty or a student from academic institutions, other than TEQIP II funded institutions, who is interested in logic and its applications in various fields.</li> <li>▪ Or you are a student of IIT Kharagpur</li> </ul>
<b>Fees for participants</b>	<p><b>Students from abroad : US \$500</b></p> <p><b>From Industry / Research Organizations: ₹ 20000</b></p> <p><b>From other than TEQIP II Academic Institutions: ₹ 10000</b></p> <p><b>From TEQIP II Academic Institutions: ₹ 2000 (Refundable)</b></p> <p>The above fee includes all instructional materials, materials needed for tutorials and assignments, classroom facilities, 24 hr free internet facility. Accommodation can be arranged for the participants on payment basis.</p>

## The Faculty



**Prof. Esko Tapani Turunen** is Professor of Applied Mathematics, and Head of the Department of Mathematics, Tampere University of Technology, Finland. His research interests include Many-valued logic, Fuzzy Set theory, Fuzzy Logic, and their applications, Data mining.



**Prof. Jaya Sil** is Professor of Computer Science, Department of Computer Science and Technology, Indian Institute of Engineering Science and Technology (IEST) Shibpur. Her research interests include image processing, pattern recognition, multi-agent systems, bioinformatics.



**Prof. Chhanda Chakraborti** is a Professor of Philosophy, in Department of Humanities and Social Sciences, Indian Institute of Technology Kharagpur. Her research interests include Formal and Informal Logic, Philosophical Logic.

## Course Co-ordinator

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# Probabilistic Safety Assessment

## Overview

Probabilistic risk/safety assessment (PRA/PSA) is a systematic and comprehensive methodology to evaluate risks associated with a complex engineered technological entity (such as airliners, chemical plants, offshore platforms or nuclear power plants).

### PSA usually answers three basic questions:

- What can go wrong with the studied technological entity, or what are the initiators or initiating events (undesirable starting events) that lead to adverse consequence(s)?
- What and how severe are the potential detriments, or the adverse consequences that the technological entity may be eventually subjected to as a result of the occurrence of initiator(s)?
- How likely to occur are these undesirable consequences, or what are their probabilities or frequencies?

Successful implementation of PSA model in a technological entity helps to foresee adverse consequences, evaluate them and manage them effectively. It plays an important role in presenting the risk to regulators/government/public for review and taking appropriate decisions.

This course is divided in two modules: A) Basics of PSA Modeling and B) Advance PSA Modeling & Analysis. The basic module covers the basics PSA modeling approach and underlying techniques/tools such as hazard analysis, fault tree, event tree, human reliability, uncertainty propagation, sensitivity analysis etc. The advance module covers recent developments in overall PSA modeling approach and underlying techniques such as use of software reliability approaches, dynamic fault trees, dynamic event trees, advance human reliability analysis approaches, risk informed decision making techniques & regulation etc.

This course intends to provide education, knowledge and training on applying PSA model to technological entities. On successful completion, the participants are expected to gain understanding on evaluating safety risks and identify appropriate design, operations, maintenance, training and management actions for addressing these risks.

### Modules

**A: Basics of PSA Modeling** : December 7 – December 11, 2015  
**B: Advance PSA Modeling & Analysis** : December 14 – December 18, 2015  
**Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

- You are an engineer and working on evaluation of hazards and risks of your system/plant.
- You are a research scientist interested PSA Modeling aspects of engineering entities.
- You are a student or faculty from academic institution interested in learning how to perform reliability and risk modeling of engineering systems.

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad** : US \$500 per module & US \$800 for both modules (A&B)  
**Industry/ Research Organizations**: ₹ 25,000 per module and ₹ 40,000 for both modules  
**Academic Institutions**: ₹ 15000 for single module and ₹ 25000 for both modules  
**TEQIP-II approved Institutions** : ₹ 2000 (To be refunded after completion of course)

The above fee include 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



**Dr. Carol Smidts** is currently Full Professor in the Department of Mechanical and Aerospace Engineering and the Director for the Center of Excellence in Instrumentation, Control and Safety at the Ohio State University, USA. Her current research interests are in software measurement, software reliability prediction, impact of software risk on the probabilistic risk assessment framework, and science-based human reliability analysis verification and validation.



**Dr. Durga Rao Karanki** is currently working as a Scientist at Paul Scherrer Institute (Swiss Federal ETH Domain), Switzerland. His current research focuses on integrated deterministic and probabilistic safety analysis (Dynamic PSA) using Dynamic Event Tree (DET) methodology and uncertainty propagation in DETs.



**Smt. Rajee Guptan** is currently heading the Probabilistic Safety Assessment section of Reactor Safety and Analysis Directorate, Nuclear Power Corporation Ltd, Mumbai. Her primary responsibilities include Probabilistic Safety Assessment and implementation of its recommendations for Indian Nuclear Reactors; finalizing specification for PSA performance of bought out reactors; reviewing draft safety guides of IAEA and AERB; providing training to generate PSA manpower at operating stations.



**Prof. Neeraj Kumar Goyal** is currently serving as Assistant Professor at Reliability Engineering Centre, Indian Institute of Technology Kharagpur, India. His research interests include Probabilistic Risk Assessment, Software Reliability and System Reliability Modeling.



**Dr. V.N.A. Naikan** is currently Professor and Head of the Reliability Engineering Centre at the Indian Institute of Technology Kharagpur, India. His research interests include Reliability and Quality Engineering, Condition Monitoring and System Simulation.



**Dr. S. K. Chaturvedi** is currently working as Associate Professor at Reliability Engineering Centre, Indian Institute of Technology, Kharagpur (WB) India. He has research interest in the area of reliability modeling and analysis, network reliability, life-data analysis, maintenance and optimization.

## Course Co-ordinators

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# Planning and Management of Cultural Heritage Sites

## Overview

Heritage sites are invaluable resources for understanding and experiencing cultural significance of any place. Preservation of tangible and intangible heritage resources needs understanding of the context as well as scientific approach to unravel the significance and subsequent mapping of multilayered information. Moreover, to integrate cultural resources for creating development opportunities for a place and community, properly laid out planning policies, development guidelines, effective management strategies, and impact assessment are needed. This course aims to develop theoretical knowledge together with analytical and practical skills for the implementation of strategies for conservation in heritage sites and precincts.

The course is organized through lectures that will cover history of architectural conservation, various charters, norms and conventions relating to heritage conservation, including UNESCO World Heritage Convention, methodologies for planned interventions, and various international and national case studies (e.g. the conservation and management of the World Heritage site of Persepolis, Iran, World Heritage city of Split, Croatia, and Hampi, India). The topics will expose the participants to the entire gamut of necessary activities: mapping of heritage sites through scientific tools and techniques (GIS, satellite imagery), planning for interventions, protection measures, and management of Cultural Heritage sites. Lectures will also cover some other aspects like interpretation and presentation of heritage sites, management of tourism in protected sites, heritage impact assessment, and designing tool kits for effective implementation.

Theoretical inputs will be supplemented with site visits to cultural heritage sites, and sharing of practical exercises.

<b>Modules</b>	<p><b>Dates:</b> December 7 – December 18, 2015</p> <p><b>Number of participants for the course will be limited to Fifty.</b></p>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ you are an architect/ urban designer/ archeologist/ urban planner/ art historian interested in planning and management of cultural sites.</li> <li>▪ you are an administrator or entrepreneur interested to learn about planning and management of cultural sites .</li> <li>▪ you are a student or member of faculty at an academic institution pursuing research related to cultural heritage sites .</li> </ul>
<b>Fees</b>	<p>The participation fees for taking the course is as follows:</p> <p><b>Participants from abroad : US \$500</b></p> <p><b>Industry / research organizations in India : ₹ 20,000</b></p> <p><b>Academic institutions in India : ₹ 10,000</b></p> <p><b>TEQIP-II approved Institutions : ₹ 2000</b> (To be refunded after completion of course)</p> <p>The above fee includes charges for all instructional materials, computer use for tutorials and assignments, laboratory usage, and 24 hour free internet facility. The participants will be provided with accommodation on payment of separate charges, as may be applicable.</p>

## The Faculty



**Dr. Jukka Jokilehto** retired as Deputy Director General of ICCROM and is now Extraordinary Professor at the University of Nova Gorica, Slovenia. He was World Heritage Advisor from 2000 to 2006, and now acts as an international consultant, collaborating with UNESCO, ICCROM and ICOMOS, as well as various national authorities. He is author of the definitive *A History of Architectural Conservation*, published in 1999.



**Dr. Shikha Jain** is Chairperson of DRONAH Foundation, founding trustee of the Indian Heritage Cities Network Foundation, panel member of PRASADA, Society of South Asian Studies, UK, and visiting faculty in the Department of Urban Planning, School of Planning and Architecture, New Delhi. She is a senior consultant to the Ministry of Culture, Govt. of India, and, since 2012, Member Secretary, Advisory Committee on World Heritage Matters.



**Dr. Mehr-Azar Soheil** is an Iranian architect specializing in architectural conservation. She collaborated in several urban conservation and management projects, including the Comprehensive Management Plan for Bam and its Cultural Landscape (Iran), and the Urban Conservation Master Plan for the Historic Walled City of Baku (Azerbaijan). Furthermore, she has collaborated for the preparation of various World Heritage nominations, particularly in Iran.



**Dr. Sanghamitra Basu** is an Associate Professor of Indian Institute of Technology, Kharagpur. She is actively involved in teaching, consultancy, and research in the field of heritage mapping, documentation, conservation planning, and management. She has been involved with INTACH, and COMOS, India. During 2011-2014, she served as a Member of the National Monuments Authority, Ministry of Culture, Govt. of India.

## Course Co-ordinator

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<http://www.cep.iitkgp.ac.in/iswt>

# Smartgrid Operation with Renewables

## Overview

Electricity generation from renewable sources will need to increase significantly to achieve the goal of Sustainable Energy for all. Fortunately, there is growing evidence in many countries that high levels of renewable energy penetration in the grid are technically and economically feasible, particularly as solar and wind technologies increasingly reach grid parity in economic terms. However, continuous and expanded growth of the share of renewables in centralized and decentralized grids requires an effective new approach to grid management, making full use of “Smart Grid” and “Smart Grid Technology”. Existing grid systems already incorporate elements of smart functionality, but this is mostly used to balance supply and demand.

Smart grids incorporate information and communication technology into every aspect of electricity generation, delivery and consumption in order to minimize environmental impact, enhance markets, improve reliability and service, and reduce costs and improve efficiency. These technologies can be implemented at every level, from generation technologies to consumer appliances. As a result, smart grid can play a crucial role in the transition to a sustainable energy future in several ways: facilitating smooth integration of high shares of variable renewables; supporting the decentralized production of power; creating new business models through enhanced information flows, consumer engagement and improved system control; and providing flexibility on the demand side.

Internationally acclaimed academics, researchers and practitioners with proven knowledge, experience, and demonstrable ability in teaching, consultancy, research, and training will deliver lectures and discuss cases in the course.

### Modules

**Week 1:** December 7 – December 11, 2015

**Week 2:** December 14 – December 18, 2015

**Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

- Executives, Engineers and Researchers from manufacturing, service and government organizations including R&D laboratories.
- Faculty from reputed academic and technical institutions.
- Students from IIT Kharagpur (BTech / MSc / MS / MTech / PhD)

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$500**

**Industry/ Research Organizations: ₹ 30000**

**Academic Institutions: ₹ 10000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The above fee includes all instructional materials, computer use for tutorials, 24 hr. free internet facility. The participants have to bear the food and lodging expenses during their stay. They will be provided accommodation on payment basis.

## The Faculty



**Prof. Tapan Kumar Saha** has been with the University of Queensland, Australia since 1996, where he has been a Professor of Electrical Engineering.



**Mr. Sushil Kumar Soonee** is steering the Power System Operation of the pan-India grid as the Chief Executive Officer of POSOCO which is a wholly owned subsidiary of Power Grid Corporation of India Limited.



**Prof. A. K. Sinha** is a Professor in the Department of Electrical Engineering. Currently he is also the Head of School of Energy Science and Engineering.



**Prof. A. K. Pradhan** is a Professor at the Department of Electrical Engineering, IIT Kharagpur.



**Prof. Prabodh Bajpai** is an Associate Professor of Electrical Engineering at the Indian Institute of Technology.

## Course Co-ordinator

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<http://www.cep.iitkgp.ac.in/iswt>

# Special Topics in Robotics

**(A) Autonomous and Field Robotics**

**(B) Medical Robotics, and (C) Micro-Nano-robotic manipulation**

## Overview

Rapid advancement in electronics and computation capabilities has opened up new applications and capabilities in robotics that has created a significant impact on human life. Three distinct areas with specific requirements of specialist knowledge in the domain as well as robotics can be identified for which a focussed pedagogy is needed. The course therefore offers exposure to three emerging fields in form of modules: 1. Autonomous and field robotics, 2. Robotics for medicine and healthcare and 3. Micro and nano robotic manipulation.

- Long range motion of robotic systems like humanoids or vehicles be it on ground, in water requires a considerable capability motion planning and also of autonomy in operations and control. Depending on area of application the type of sensing and information inputs are often associated with considerable uncertainties. Design, control and motion planning of such systems requires a thorough exposure to some advanced topics as applications in robotics.
- Robotics has emerged a serious assistive technology in medicine and health care through in surgery and rehabilitation and assistive devices. While surgical robotics has led to reduced post-operative recovery costs and increased successes of speedy recovery, assistive and rehabilitation robotics has made great inroads to improve quality of living for people with disabilities.
- Targeted motion and force planning through manipulation in micro spaces is gaining considerable attention in applications in medicine as well as material sciences. Manipulation at molecular level and in structures that are observable under microscopes is becoming relevant for new material development and also in medical sciences like in targeted drug delivery through micro fluidic channels or by electro-magnetic excitations.

### Modules

**A: Fundamentals of Robotics, Field Robotics** : December 7 – December 21, 2015 (all modules)

**B & C: Topics in Topics in Medicine and Healthcare, Micro Robotics**

**A workshop on related aspects of design, manufacturing and integration of such robot will also be held along with this course. Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

- you are mechanical, electrical, electronics engineer, computer scientist or research scientist interested in robotics in any of the applications in Medicine, Field Robotics or Micro Robotics.
- you are a practicing engineer in industries working in the robotics / related areas.
- you are a student or faculty from academic institution interested in advanced application topics in robotics.

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$500**

**Industry / Research Organizations : ₹ 30000**

**Academic Institutions : ₹ 10000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The above fee include 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.

## The Faculty



**Yves Bellouard** is an Associate Professor in Microengineering and Richemont chair in Micromanufacturing at the Ecole Polytechnique Fédérale de Lausanne (EPFL), STI, IMT-Neuchâtel (Microcity), Switzerland. He will cover topics related to microrobotics and the design of microrobots as well as related micromanufacturing issues.



**G. K. Ananthasuresh** is a Professor of Mechanical Engineering at the Indian Institute of Science, Bengaluru. His research interests include compliant mechanisms, kinematics, design optimization, MEMS, and micromanipulation of biological cells. He will cover topics in compliant robotics.



**Chacko Jacob** is a Professor of Material Science, Indian Institute of Technology Kharagpur. His research has been focused on wide band gap semiconductors and the controlled growth of self-assembled nanostructures in these and related materials. He will cover topics in use of SEMs and FIB tools for micro- and nano- systems development.



**Manjunatha M** is an Associate Professor at the School of Medical Science and Technology, Indian Institute of Technology, Kharagpur. His research interests span bio instrumentation, biosensors, bio-robotics and neuro-rehabilitation. He will cover topics on control of prosthetic devices using EEG and surface EMG signals.



**Vishwanath Nagarajan** is an Assistant Professor of Ocean Engineering and Naval Architecture, Indian Institute of Technology, Kharagpur. His research interests are in the area of ship dynamics, propulsion, maneuvering and marine design. He will be covering topics related to underwater robots.



**C. S. Kumar** is a Professor of Mechanical Engineering, Indian Institute of Technology Kharagpur. His research interest is in Robotics and more recently in field robotics and in micro- and nano-manipulations. **D. K. Pratihari** is a Professor of Mechanical Engineering,

Indian Institute of Technology, Kharagpur. His research interest is in Robotics and soft computing applications.

Additional faculty from IIT Kharagpur and elsewhere are expected to cover specialist topic areas in the modules as well as the workshop. Please check the course website to stay up to date on current faculty list.

## Course Co-ordinators

**Prof. C. S. Kumar**

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**Prof. D. K. Pratihari**

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<http://www.cep.iitkgp.ac.in/iswt>

# Blasting Technology, Rock Fragmentation and Mine Productivity

## Overview

Fragmentation by blasting represents the first and the most crucial stage in the size reduction process in all mining and excavation operations. The range of application covers a very wide range of activities, i.e. quarrying, construction, open-cast and underground operations, and demolition. However, controlling the results of blasts and accurate prediction of fragment size reduction remains an extremely challenging task, as several interacting processes are involved, from physics of detonation to quantification of the underlying geological and geotechnical factors. Not all of these aspects are sufficiently quantified to yield prescribed results, especially where large-scale operations involving up to a million ton of broken rock are involved.

This course is aimed at elucidating the principles of detonation behavior of commercial explosives, blast design, transfer of explosive energy to the surrounding rock mass, and the ensuing fracture, fragmentation and movement of the target rock. The topics to be covered include, rock mass characterization, principles of explosives formulation, commercial explosives and initiators, blast design principles in both open-cast and underground operations, and as they relate to overall productivity. Advanced blast monitoring and post-blast assessment techniques will also be outlined.

Although an advanced level course aimed at the post-graduate level in science and engineering, it is designed with practicing mining and geological/geotechnical engineers, and production managers in mind, with the objective of upgrading their skills. Ample opportunity will also be provided for interactive sessions to discuss selected case histories brought forward by the participants.

### Modules

**Blasting Technology, Rock Fragmentation, and Productivity:** December 8 – December 19, 2015

**Number of participants for the course will be limited to Fifty.**

### You Should Attend If...

- you are a mining/geological/geophysical/geotechnical engineer/geologist/geophysicist in charge of or planning to move into blasting operations, or upgrading your skills and knowledge base in blasting technology and research
- you are a research scientist/engineer involved in explosives systems design and development in the commercial fields, or defense-related areas.
- you are a Manager of Drill-Blast-Load Operations, or Crushing and Grinding Operations, or Productivity Improvements at an operating mine or quarry
- you are a student or faculty from an academic institution and interested in learning more about this inter-disciplinary subject and seeking novel research avenues and opportunities.

### Fees

The participation fees for taking the course is as follows:

**Participants from abroad : US \$500**

**Industry/ Research Organizations: ₹ 30000**

**Academic Institutions: ₹ 10000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The above fee include all instructional materials, computer use for tutorials and assignments, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

## The Faculty



**Professor Bibhu Mohanty**, Professor Emeritus, Lassonde Institute of Mining, University of Toronto, Toronto, Canada. Professor Mohanty has over 40 years of R&D experience in both Academic and Industrial environment, dealing with Blasting Technology. Currently he leads the team at the Lassonde Institute of Mining, University of Toronto, Canada on advanced blasting research, and fragmentation of rock under both explosive and high-velocity impact loads. His expertise encompasses the broad fields of explosives and blasting technology, fracture dynamics of rock, and explosion hazards and blast-resistant structures. Prior to taking up a Research Canada Industrial Research Chair Professorship at the University of Toronto on Rock Dynamics and Fragmentation, he led the Blasting Physics Research Group at ICI Explosives – North America (and later, Orica Explosives - North America). He holds degrees from the Indian Institute of Technology (Kharagpur), and the University of Toronto, Canada, and is a Registered Professional Engineer.



**Dr. Ajay K Jha**, Sr. Manager, CMPDI, Ranchi. Dr. Jha graduated from ISM, Dhanbad, with distinction in mining engineering. He obtained his Ph.D. from IIT-Kharagpur, and his MBA from BIT-Mesra with specialization in Marketing and Financial Management, and FCC (Coal). He has worked with CMPDI (HQ) for the last 24 years, and is currently responsible for providing technical services to all operating mines of CIL, and also offers niche blasting services to Reliance Coal Mine, NLC, SCCL, DFPCL, SAIL, NPTC, and other private mines.



**Professor Debasis Deb**, Ph.D., Department of Mining Engineering, IIT, Kharagpur. Professor Deb works in the area of rock mechanics, numerical modelling and ground control. He has developed numerical techniques for the analysis of rock fragmentation.

## Course Co-ordinator

**Prof. Debasis Deb**

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<http://www.cep.iitkgp.ac.in/iswt>

# Nanobiotechnology: A Discipline at a Crossroads

## Overview

Nanobiotechnology is a relatively young discipline whose purpose is the juxtaposition of nanoscience and biotechnologies. Naturally, it is a science at a crossroads, bridging some of the most exciting and prospective scientific disciplines. It feeds on the creative input of physicists, chemists, biologists, materials scientists, medical practitioners, pharmacologists, and engineers from different milieus, ranging from the mechanical to the electrical to the biomedical, requiring more multidisciplinary openness than perhaps any scientific discipline before or after. Like all things young, it is a source of perpetual excitement and wonder. In this summer course, students will become acquainted with the roots and the prospective paths branching out of a figurative tree that this field of science represents. Occasionally we will talk about the political and economic climate in which it thrives, but most of the time we will sit in its shade and savor its fruits. Still, as with all the freshly planted trees, many years are needed before the first fruits come to view. So may it be with attendees of this course, should they only be inspired to professionally pursue the wondrous path of nanobiotechnology. To freely share this inspiration, like water of life, is the first and the foremost aim of this course.

### Modules

The course will be organized in two modules

#### In module A the following topics will be covered:

Introduction to nanobiotechnology  
Materials in nanobiotechnology  
Synthesis and characterization of advanced nanostructured biomaterials  
Biomaterial / tissue interactions  
Bone mineral in hard tissue engineering and drug delivery  
Biodegradable polymers in nanobiotechnology  
Tissue engineering and nanomedicine  
Translational research and ethics in nanobiotechnology

#### In Module B the topics included are as follows:

Biomaterial- tissue interaction (Imaging techniques: Confocal Microscopy)  
Nano-bio interaction in microfluidic channels/drug screening  
Plasma Technology for synthesis of Nanomaterials

**Period :** December 14 – December 28, 2015

### You Should Attend If...

Research Scientist and engineers and technologist working in the area of Bio Engineering and / or Materials Science / Nano Science, Chemical Engineering, Chemistry, Biomedical Engineering.

### Fees

The participation fees for taking the course is as follows:

**Industry / Research Organizations: ₹ 20,000**

**Academic Institutions: ₹ 10,000**

**TEQIP-II approved Institutions : ₹ 2000** (To be refunded after completion of course)

The above fee includes all instructional materials for this course. The participants will be provided with accommodation on Payment Basis.

## The Faculty



**Prof. Vuk Uskokovic** is in the faculty of University of Illinois Chicago, USA in the Department of Bioengineering. His Research interest includes Biomaterials, Tissue Engineering, Nanobiotechnology and Nanomedicine.



**Prof. Lopamudra Giri** is in the faculty of Indian Institute of Technology Hyderabad, Department of Chemical Engineering. Her Research interest includes Synthesis of Nanomaterials, In vitro and In vivo studies of Cell interaction with Nanoparticles, Confocal imaging studies etc.



**Prof. Sudarsan Neogi**, is Professor, Department of Chemical Engineering, Indian Institute of Technology Kharagpur. His research interest includes Advanced Material Processing using RF Plasma technology, Plasma Induced Chemical Vapor Deposition, Adhesives Development and Wastewater engineering.

## Course Co-ordinator

**Prof. Sudarsan Neogi**

Professor

Department of Chemical Engineering  
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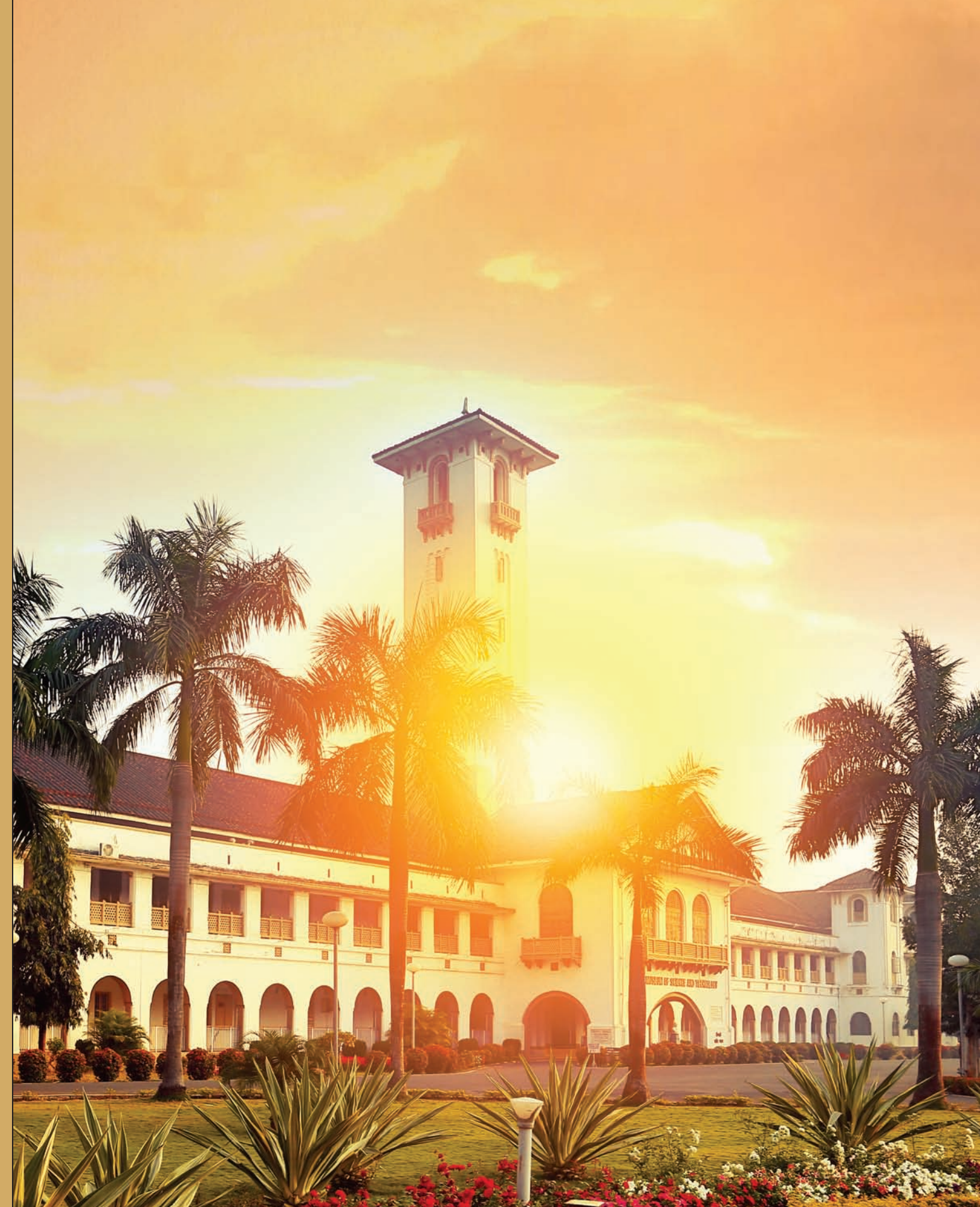
<http://www.cep.iitkgp.ac.in/iswt>

## Registration Process

Registration for ISWT courses is not automatic because of the constraints on maximum number of participants allowed to register for a course. In order to register for one or multiple non-overlapping courses, you have to apply online using the following steps:

1. **Create login and password at [www.cep.iitkgp.ac.in/iswt](http://www.cep.iitkgp.ac.in/iswt)**
2. **Login and complete the registration form.**
3. **Select courses**
4. **Confirm your application and payment information.**
5. **Pay ₹ 500/- (non-refundable) through online payment gateway.**

The course coordinators of the selected courses will go through your application and confirm your selection as a participant one month before the starting date of the courses. Once you are selected you will be informed and requested to pay the full fees through online payment gateway service.





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