BIOHEAT TRANSFER

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Overview

This course is proposed to introduce fundamental knowledge of engineering and biology to participants who have a general interest in biomedical engineering. Understanding the mechanism of heat transfer in biological systems plays an important crucial role in many cutting edge biomedical applications such as microsurgery, hyperthermia treatment of tumor, vascular anastomosis, tissue welding/soldering, etc. The proposed course will introduce principles and applications of bioheat transfer. Topics include Energy conservation and metabolisms, three modes of heat transfer, Convection over body surface, Heat transfer to blood vessels, bioheat equations, and applications of bioheat equations in hyperthermia treatment of tumor, microfluidics to name a few.

The primary objective of the course is to introduce transport phenomena involving mass, momentum and energy transport to address complex biological processes. The idea of developing a general framework towards the development of a CFD solver to address many biological processes involving mass, momentum and heat transport will be the key focus of this proposed course. This course has significant relevance to a wide community involving engineers, doctors, academicians and researchers working in the area of biomedical sciences.

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. The course module can be broadly classified into three groups as given in the table.

Modules	**A: CFD Modeling of Heat, Mass and Momentum Transport in Biological Systems** **B: Anatomy of Human Vasculature System** **C: Medical Diagnostics** **Number of participants for the course will be limited to fifty.**	**June 06-17, 2015**
Who Should Attend…	• **Senior undergraduate students/graduate students pursuing MBBS/M. Tech/MS and Ph. D. Programme in the Medical Science, Mechanical, Chemical and Biomedical engineering** • **Proposed course has been designed to update knowledge and improve understandings of the faculty members in new IITs, IISERs, NISER and other academic institutions in the country about the best practices and recent advances in the field;** ▪ **Practicing engineers and scientists working in Medical instruments, as well as, in government research organizations will also be benefited.**	
Fees	The participation fees for taking the course is as follows: **Participants from abroad : US $250** **Industry/ Research Organizations: ₹ 8,000** **Academic Institutions: Faculty - ₹ 4,000 and Students - ₹ 2,000** The above fee include working lunch, all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges and 24 hr free internet facility. Limited accommodation may be provided to participants (on payment basis) in student's hostel subject to availability.	

The Faculty

Professor Sunil Kumar is a Professor of Mechanical Engineering. He was the Dean of Engineering for NYU Abu Dhabi and the Associate Provost for Abu Dhabi Engineering at NYU Polytechnic School of Engineering. Prior to assuming this role he was Graduate Dean and former Head of the Department of Mechanical, Aerospace, and Manufacturing Engineering. He has also taught at the University of California, Berkeley; was a scientist at the Lawrence Berkeley Laboratories; and a visiting scientist at NASA's Ames Research Center in California. His research interests include medical diagnostics and light propagation in living tissues.

Professor Suman Chakraborty is a Professor of Mechanical Engineering at Indian Institute of Technology Kharagpur. He was awarded the Shanti Swarup Bhatnagar Prize for science and technology, the highest science award in India, for the year 2013 in engineering science category. His areas of research are microfluidics and nanofluidics, interfacial phenomena and phase change, and computational fluid dynamics.

Professor (Dr.) Dillip Kumar Parida is Professor and Head, Department of Radiation Oncology, All India Institute of Medical Sciences (AIIMS), Bhubaneswar. Professor (Dr.) Parida holds a MD from SCB Medical College, Cuttack and MBBS from MKCG Medical College, Berhampur. His research interest is in Radiation Cell Biology, Cancer genetics, Palliative Radiotherapy, etc. to name a few.

Professor Swarup K. Mahapatra is Professor and Head, School of Mechanical Sciences, IIT Bhubaneswar. He holds a Ph.D. in Mechanical Engineering from Jadavpur University and M.Tech in Mechanical Engineering from IIT Roorkee. His research interests lies in Thermal Radiation Modelling, Conjugate Heat and Mass Transfer, Bio-Heat Transfer, Complex Fluid Flow and Flow in Porous Medium.

Dr. Prasenjit Rath is Assistant Professor of Mechanical Engineering in the School of Mechanical Sciences, IIT Bhubaneswar. He holds a Ph. D. in Mechanical Engineering from Nanyang Technological University, Singapore and M.Tech in Mechanical Engineering with specialization in Thermal and Fluids Engineering from IIT Guwahati. His key research areas are developing numerical methods for moving

Course Co-ordinators

Prof. Swarup K. Mahapatra
Dr. Prasenjit Rath
Phone: +91-674-2306-272/273
E-mail: swarup@iitbbs.ac.in
prath@iitbbs.ac.in

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http://www.gian.iitkgp.ac.in/GREGN

boundary problems of Stefan type where the moving boundary is priory unknown.