



BIOMEMS AND MICROFLUIDICS

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INTENDED AUDIENCE :

This course would be relevant for mechanical engineering manufacturing science/ fluidic streams graduate students and some senior undergraduate students. The interdisciplinary nature of the course would also be able to attract students from various disciplines like biosciences/ bioengineering, chemical engineering and environmental engineering. (Refer to participating faculty list). A considerable portion of the material will also be directly taught from review articles and publications. The highly interdisciplinary nature and research focus of this course may eventually be able attract some undergraduate students into graduate programs.

PREREQUISITES: Chemistry and basic fluid mechanics

COURSE OUTLINE :

During the last several decades, micro-system research mainly addressed electromechanical systems and in recent years, the focus has shifted to Bio-Microelectromechanical Systems (BioMEMS). This shift is driven primarily by the potential applications of the micro-systems to chemistry, biology and medicine. In fact, a combination of BioMEMS and microsystems has made possible the realization of physical systems at scales and dimensions similar to biological entities such as bacterial and mammalian cells, viruses, spores, etc., and this has resulted in the development of a variety of diagnostic and therapeutic applications, intelligent biochips and sensors.

ABOUT INSTRUCTOR :

Prof. Shantanu Bhattacharya is currently as Associate Professor at the Department of Mechanical Engineering at the Indian Institute of technology Kanpur. Prior to joining the department he has been associated at a senior management level at Suzuki Motors and has over 6 years of experience in various production capacities and positions. Prof. Bhattacharya currently takes care of the 4-I laboratory at IIT Kanpur as its coordinator and has also been associated with the TA202 laboratory as coordinator between 2012-2015. Both these laboratories are very high end in terms of offering manufacturing training programs

COURSE PLAN :

Week 1: Introduction of BioMEMS and Microfluidics

Week 2: Sensing technologies

Week 3: Basic electrochemistry

Week 4: Fundamentals of microfluidics

Week 5: Applications of microfluidics

Week 6: Introduction to Cell biology, DNA & Proteins for diagnostics

Week 7: Introduction to Polymerase chain reaction (PCR)

Week 8: Microelectronic-fabrication processes