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 capabilites 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: A. Autonomous and field robotics, B. Robotics for medicine and healthcare and C. Micro and nano robotic manipulation.

A. 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.
B. 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.
C. 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 though micro fluidic channels or by electro-magnetic excitations.

Modules	**A: Fundamentals of Robotics, Field Robotics : Dec 7 - Dec 21 (all modules)** **B & C: Topics inin 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 50.**
Expected Attendees…	▪ 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.

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	▪ 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** 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 a Associate Professor in Microengineering and Richemont chair in Micromanufacturing at the EcolePolytechniqueFédérale 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 bandgap 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 anAssociate Professor at the School ofMedical Science and Technology, Indian Institute of Technology, Kharagpur. His research interests span bioinstrumentation, biosensors, bio-robotics and neuro-rehabilitation. He will cover topics on control of prosthetic devices using EEG and surface EMG signals.

 **VishwanathNagarajan**is anAssistant 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.Pratihar** is a Professor of Mechanical Engineering, Indian Institute of Technology, Kharagpur. His research interest is in Robotics and soft computing applications.

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