



**MHRD**

Department of Higher Education  
Ministry of Human Resource Development  
Government of India

## Course Contents

Introduction to Mobile Robots

Kinematics of Mobile Robots

Wheeled Mobile Robots

Locomotion

Dynamics of Mobile Robots

Dynamic Modelling and Simulation

Sensing and Perception of Mobile Robots

Autonomy of Mobile Robots

Motion Control of Mobile Robots

Conventional Control Schemes

Intelligent Control Schemes

Introduction to Mobile Manipulators

Dynamics and Control of Underwater Robots

Applications and Limitations of Mobile Robots

Hands on Sessions with Real-time Robots

Tutorial Sessions on ROS and Matlab

## Important Dates

Submission of registration form along with a demand draft or a crossed cheque : February 20, 2018

Acceptance Notification (by mail) : February 23, 2018

Participants have to submit filled-in registration form along with duly attested by Head of the Institution. The same along with demand draft or cheque should be send through post or courier to the course coordinator.

## Course Overview

**A**utonomous mobile robots are rapidly evolving from factory wagons and conveyer based carts, which are physically bound to their work-cells, to increasingly complex machines capable of performing challenging tasks in our daily environment. The objective of this course is to provide the basic concepts and algorithms required to develop mobile robots that act autonomously in complex environments. This course covers the fundamentals of Autonomous Mobile Robotics, including modelling, perception and control for autonomous operation.

## Course Objectives

**T**he course addresses participants of faculty members, industrial professionals and PhD scholars as well as faculty members who want to get more familiar with the mobile robots and their motion control schemes along with applications.

The objectives of the course are:

- This course provides an introduction to mobile robotic systems and motion control methods with such systems from a computational and real-time perspective.
- It provides a deep knowledge of the kinematics, dynamics and control of mobile robots.
- It provides an easy understanding of various algorithmic approaches towards designing intelligent and autonomous mobile robotic systems.
- It gives a platform to learn a variety of mobile robotic systems and applications.
- Additionally, it provides a way to learn the basics elements related to mechanical and electrical systems of mobile robots, including sensors, locomotion and manipulation hardware.

At the end of the course:

- The participants are capable to model and analyze various mobile robots and mobile manipulators.
- Further, they are able to design their own motion control schemes for the mobile robots.

Five Days Course on

# Autonomous Mobile Robots

For College Teachers and Research Beginners

**6<sup>th</sup> to 10<sup>th</sup> March 2018**



Discipline of Mechanical Engineering  
Indian Institute of Technology Indore  
Indore, Madhya Pradesh, India

## Resource Persons



**Prof. Laxmidhar Behera** completed his PhD in Electrical engineering from Indian Institute of Technology Delhi in the year 1996. His area of specialisation was 'Neural Controllers For Robot Manipulators'. Also he was awarded Post Doctoral fellowship at German

National Center for Information Technology, GMD, Germany. His area of work includes very effective and fascinating topics like Intelligent Systems and Control, Cognitive Robotics, Nano-robotics, Vision based Control, Soft Computing, Information Retrieval in music and language, Semantic Information Processing, Physics of Complex Systems, Cyber Physical Systems, Formation Control of UAVs, Brain-Computer Interface (BCI), Sanskrit Computational Linguistics. He wrote a book 'Intelligent Systems and Control: Principles and Applications' which is used a text book in IIT Kharagpur and Penn state university, USA. Currently he is Professor and heading the 'Intelligent system Laboratory' at Indian Institute of Technology Kanpur.



**Prof. T Asokan** has completed his Ph.D in Mechanical Engineering from the Indian Institute of Technology Madras, in the year 2000. His area of specialization was electro hydraulic controls for robotic applications. He then spent six years as a researcher at the Robotics Research Center,

Nanyang Technological University, Singapore working in the area of mechatronic systems and robotics. Prior to that, he spent 3 years in DRDO as a Scientist. He was awarded the Stanford-India biodesign fellowship by the Stanford University, USA in 2009 and has completed a post doctoral fellowship in medical device development at the Stanford University. He is a member of the Bureau of Indian Standards (BIS) and the Indian representative in the Joint Working Group (JWG9) of the International Standards Organisation's (ISO) sectional Committee on Robots and Robotic Devices. His areas of teaching and research are Robotics, Product design, and Engineering System design. Currently he is Professor at Department of Engineering Design at Indian Institute of Technology Madras.

## Course Coordinator



**Santhakumar Mohan** has completed his PhD in Robotics and Control at the Indian Institute of Technology Madras, Chennai in 2010. From June 2010 to March 2011, he worked as an assistant professor in the Department of Mechanical Engineering at National Institute of Technology

Calicut (NITC), Kerala (India). He then worked as a postdoctoral fellow at Korean Advanced Institute of Science and Technology (KAIST), Daejeon (Republic of Korea). In 2012, he joined the faculty of the Mechanical Engineering at Indian Institute of Technology Indore. Currently, he is associate professor at Mechanical Engineering and the head, Centre for Robotics and Control, IIT Indore. He is holding visiting faculty positions at IISc Bangalore, India, RWTH Aachen, Germany and ECN, France.

His active research areas include underwater vehicle control, underwater manipulator design and control, assistive and rehabilitation robots, design and control of mobile manipulators and parallel robotic platforms. He has received the outstanding young Scientist for the year 2014 from Korea Robotics Society and Alexander von Humboldt Fellowship (2016–2017). He has published more than 100 articles in various journals and conference proceedings. He has 3 Indian patents in parallel robots and lower limb rehabilitation mechanisms.

## Who can attend?

- Faculty members working in AICTE recognized Engineering Colleges, Universities and Polytechnics.
- Professionals from Industries and Research and Development Organisations.
- Research Scholars pursuing their doctoral thesis in the area of Robotics.

## Travel Information

Indore is located in the Central part of India. It is well-connected by rail, road and air. The nearest railway station is Indore Junction and the nearest Airport is Devi Ahilyabai Holkar Airport, Indore. For any travel related queries, please contact the course coordinator.

## Selection Norms

- Selection will be based on Discipline, Research interest and Professional experience.
- Priority will be given for young faculty members working in mechanical, electrical and allied disciplines.
- Number of seats are limited to 30 Faculty members, 10 Research scholars and 10 Industrial/R&D professionals.
- The course coordinator's decision will be final in selection.

## Accommodation

Free accommodation (on shared basis) and food will be provided to the selected outstation academic participants. Others have to arrange their own accommodation.

**No TA/DA will be paid to the participants.**

## Registration Fees

There is no registration fee for faculty members working in AICTE recognized engineering colleges, polytechnics and universities. Similarly, research scholars (only PhD scholars) are exempted from the registration fee. However, the candidate has to submit a Demand Draft or Cheque for an amount of Rs. 1,000/- as a deposit which will be returned to him/her on the day of registration. Industrial and R&D professionals have to submit a Demand Draft or Cheque for an amount of Rs. 10,000/- towards course fee. The crossed Demand Draft or Cheque should be drawn in favour of "The Registrar, IIT Indore", Payable at Indore.

## Contact Details

For any information regarding eligibility, fee payment, travel, accommodation, etc., please contact the course coordinator via email or phone.

## Dr. Santhakumar Mohan

Associate Professor

Discipline of Mechanical Engineering

Indian Institute of Technology Indore

#1B-301B, POD Building, Simrol Campus

Indore, Madhya Pradesh, INDIA - 453552

Email: [santhakumar@iiti.ac.in](mailto:santhakumar@iiti.ac.in)

<http://people.iiti.ac.in/~santhakumar/>