

Introduction to Robotics

Course objectives:

This course will take you through various topics in robotics to arouse interest in the subject.

1. Introduction to the manipulator and mobile robot kinematics
2. Introduction to robotics and automation
3. Learning robotics through experimentation

Course modules:

1. Kinematics of robots (~4 lec.)
 - a. Spatial descriptions and transformations
 - b. Two DOF planar manipulator kinematics
 - c. Kinematics of wrist decoupled spatial manipulators
 - d. Kinematics of differential wheeled mobile robot
2. Sensing and Control (~4 lec.)
 - a. Range, proximity, and force sensing
 - b. Robotic vision and image processing
 - c. Programming microcontrollers: Arduino (open-source electronics platform)
3. Applications (~4 lec.) Experiments on
 - a. Forward and inverse kinematics of a 2 DOF planar arm
 - b. Kinematics of a 3 DOF spatial arm
 - c. Differential wheeled mobile robot
4. Bonus module (based on available time and student interest, 2 extra lectures)
 - a. Theory and application of a wheeled self-balancing robot

Exams:

We will conduct simple 1-hour exams after every module.

Books:

- Introduction to Robotics by JJ Craig,
- Robotics: Control, Sensing, Vision and Intelligence by Fu, K. S., Gonzalez, R., & Lee, C. G
- Other references:
 - Robotics: Fundamental Concepts and Analysis by Ashitava Ghosal
 - Introduction to Robotics by S.K.Saha
- Online courses
 - https://onlinecourses.nptel.ac.in/noc21_me32/preview by Prof Ashish Dutta
 - https://onlinecourses.nptel.ac.in/noc21_me37/preview by Prof Ashitava Ghosal

Prerequisites:

- Basic engineering mathematics
- Basic mechanical and electrical engineering

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Timing for discussion over a call: T-Th-S after 5:00 p.m.