

**Course Syllabi: UEI512 Robotics and Related Instrumentation (L : T : P :: 3 : 1 : 0)**

1. **Course number and name:** UEI512; Robotics and Related Instrumentation
2. **Credits and contact hours:** Credits: 3.5; Hours: 4
3. **Text book, title, author, and year**
  - *Nikku, S.B., Introduction to Robotics, Prentice–Hall of India Private Limited (2002).*
  - *Schilling. R. J., Fundamentals of Robotics: Analysis and Control, Prentice–Hall of India Private Limited (2006).*
  - *Criag, J., Fundamentals of Robotics: Analysis and Control, Prentice–Hall of India Private Limited (2006).*
  - *Gonzalex, R. C. and Fu, K. S., Robotics Control Sensing, Vision and Intelligence, McGraw–Hill (2004).*
  - *Koren, Y., Robotics for Engineers, McGraw–Hill (1985).*
  - a. Other supplemental materials
    - Nil
4. **Specific course information**
  - a. Brief description of the content of the course (catalog description)

**Basic Concepts in Robotics:** Automation and robotics, Robot anatomy, Basic structure of robots, Resolution, Accuracy and repeatability

**Classification and Structure of Robotic System:** Point to point and continuous path systems. Control loops of robotic systems, The manipulators, The wrist motion and grippers.

**Drives and Control Systems:** Hydraulic systems, Dc servo motors, Basic control systems concepts and models, Control system analysis, Robot activation and feedback components, Positional and velocity sensors, actuators. Power transmission systems, Robot joint control design.

**Robot arm Kinematics and Dynamics:** The direct kinematics problem, The inverse kinematics solution, Lagrange-Euler formation, Generalized D'Alembert equations of motion, DenavitHartenberg convention and its applications.

**Sensors and Instrumentation in robotics:** Tactile sensors, proximity and range sensors, Force and torque sensors, Uses of sensors in robotics.

**Vision Systems:** Vision equipment, Image processing, Concept of low level and high level vision.

**Robot Programming :** Method of robots programming, Lead through programming methods, a robot programs as a path in space , Motion interpolation, WAIT, SIGNAL and DELAY commands, Branching capabilities and limitation of lead through methods.

**Robot Language:** The textual robot languages, Generations of robot programming languages, Robot language structure, Constants, Variables and other data objects, Motion commands, End effectors and sensor commands computations, Programmecontrol and subroutines, communication and data processing, Monitor mode commands, Introduction to Artificial Intelligence.
5. **Specific goals for the course**

After the completion of the course, the students will be able to:

  - Demonstrate the basic concepts of robotics, their classification and structure.

- Explain the type of the drive and control systems used in robotics.
- Describe the type of sensors and other instruments used in robotics.
- Perform the robot language programming.

**6. Brief list of topics to be covered**

- Basic Concepts in Robotics
- Classification and Structure of Robotic System
- Drive and control systems
- Sensors and Instrumentation in robotics
- Robot language programming