

## UEI847: ROBOTICS AND AUTOMATION

L T P Cr

3 1 0 3.5

**Course Objectives:** To introduce the concepts of Robotic system, its components and instrumentation and control related to robotics.

**Basic Concepts in Robotics:** Automation and robotics, Robot anatomy, Basic structure of robots, Resolution, Accuracy and repeatability, and Classification and Structure of robots, Point to point and continuous path systems.

**Robotic System and Control Systems:** Components of robotic system, Hydraulic systems, d.c. 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 arm Kinematics and Dynamics:** Robot joints, The direct kinematics problem, The inverse kinematics solution, Lagrange-Euler formation, Generalized D'Alembert equations of motion, Denavit-Hartenberg 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 equipment, Image processing, Concept of low level and high level vision.

**Computer based Robotics:** Method of robots programming, GUI based robotic arm control, Interfacing with computer, communication and data processing, Introduction to Artificial Intelligence.

### Course Learning Outcomes (CLO):

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

1. explain the fundamentals of robotics and its components
2. illustrate the Kinematics and Dynamics of robotics
3. elucidate the need and implementation of related Instrumentation & control in robotics
4. illustrate the movement of robotic joints with computers/microcontrollers.
5. Explain sensors and instrumentation in robotics

### Text Books:

1. Nikku, S.B., *Introduction to Robotics*, Prentice-Hall of India Private Limited (2002).
2. Schilling. R. J., *Fundamentals of Robotics: Analysis and Control*, Prentice-Hall of India Private Limited (2006).

### Reference Books:

1. Cragg, J., *Fundamentals of Robotics: Analysis and Control*, Prentice-Hall of India Private Limited (2006).
2. Gonzalez, R. C. and Fu, K. S., *Robotics Control Sensing, Vision and Intelligence*, McGraw-Hill (2004).  
Koren, Y., *Robotics for Engineers*, McGraw-Hill (1985).

### Evaluation Scheme:

S.NO.	Evaluation Elements	Weightage (%)
1	MST	30
2	EST	45
3	Sessional (May include Assignments//Quizzes/Lab Evaluations)	25