

**ME-404A****ROBOTICS  
( OPEN ELECTIVE )****L T P C  
4 - - 3****COURSE OBJECTIVES:**

1. To provide an introduction to Robotics and Automation including robot classification, design and selection, analysis and applications in industry.
2. To provide information on various types of end effectors, their design, interfacing and selection.
3. To provide the details of operations for a variety of sensory devices that are used on robot , the meaning of sensing, classification of sensor, that measure position, velocity & acceleration of robot joint.
4. To familiarize the basic concepts of transformations performed by robot.
5. To perform kinematics and to gain knowledge on programming of robots.

**COURSE OUTCOMES:****After successful completion of the course, the students are able to**

1. understand basic components of robotics, classification of robots and their applications.
2. know on types of robot grippers, their usage and design considerations.
3. understand about various types of sensory devices their working and applications.
4. apply basic transformations related to the movement of manipulator.
5. design a robot mechanism to meet kinematics requirements and to write simple programs.

**UNIT I***Text Book - 1 (12)*

**Basics of Robot :** Introduction to Robotics, major component of a robot, robotic like devices, classification of robots - Classification by coordinate system and by control method, Specifications of robots, fixed versus flexible automation.

**Applications of robot :** Economic analysis, Robot applications in Material Handling, Processing and assembly.

**UNIT II***Text Book - 1 (12)*

**Robot End Effectors :** Introduction, end effectors, interfacing, types of end effectors, grippers and tools.

**Selection :** Selection and Design Considerations of End effectors, Remote Centre Compliance device.

**UNIT III***Text Book - 1 (12)*

**Robotic Sensory Devices : Position Sensors :** Objective, Non-optical position sensors - potentiometers, synchros, inductocyn, optical position sensors - opto interrupters, optical encoders (absolute & incremental).

**Proximity Sensors :** Contact type, non-contact type - inductive, capacitive proximity sensors, optical proximity sensor, and scanning laser proximity sensor.

**UNIT IV***Text Book - 1 (12)*

**Touch and Slip Sensors :** Proximity rod & photo detector tactile sensor, slip sensors - Forced oscillation slip sensor, interrupted type slip sensors.

**Transformations :** Objectives, homogenous coordinates, basic transformation operations, fixed angle representation, Euler angle representation.

**UNIT V***Text Book - 2 (12)*

**Forward Kinematics :** Forward solution - Denavit Hartenberg procedure. Simple problems involving 2 and 3 DOF manipulators, SCARA manipulator.

**Robot Programming :** Robot programming Languages - VAL Programming - Motion Commands, Sensor Commands, End effector commands, and Simple programs.

**LEARNING RESOURCES:**

**TEXT BOOK(s):**

1. Robotic Engineering by Richard D.Klafter, Prentice-Hall of India Pvt Ltd, 2010.
2. Robotics and Control, R.K. Mittal and I.J. Nagarath, TMH, 2005.

**REFERENCE BOOK(s):**

1. Introduction to Robotics: Mechanics And Control, John J.Craig 3rd Edition, Pearson, 2008.
2. Robotics: Control, Sensing, Vision, and Intelligence, K. S. Fu, R. C. Gonzales, and C. S. G. Lee, Tata McGraw-Hill, NY, 2008.
3. Introduction to Robotics: Analysis, Systems, Applications, Saeed B. Niku, Prentice Hall, NJ, 2010.

**WEB RESOURCES:**

1. <http://nptel.iitm.ac.in/courses.php?branch=Mechanical>
2. <http://academicearth.org/courses/introduction-to-robotics> Video references:-