

## PEI-311 ROBOTIC TECHNOLOGY

L	T	P	Cr
3	1	0	3.5

**Course Objectives:** To understand the concepts of Robotic technology, to enable selection, programming and design of robotic systems

**Fundamentals:** Historical information, robot components, Robot characteristics, Robot anatomy, Basic structure of robots, Resolution, Accuracy and repeatability

**Robot Kinematics:** Position Analysis forward and inverse kinematics of robots, Including frame representations, Transformations, position and orientation analysis and the Denavit–Hartenberg representation of robot kinematics, The manipulators, The wrist motion and grippers.

**Inverse Manipulator Kinematics:** Differential motions and velocity analysis of robots and frames.

**Robot Dynamic Analysis and Forces:** Analysis of robot dynamics and forces, Lagrangian mechanics is used as the primary method of analysis and development.

**Trajectory Planning:** Methods of path and trajectory planning, Both in joint–space and in Cartesian–space.

**Actuators and Sensors:** Actuators, including hydraulic devices, Electric motors such as DC servomotors and stepper motors, Pneumatic devices, as well as many other novel actuators, It also covers microprocessor control of these actuators, Mechatronics, Tactile sensors, Proximity and range sensors, Force and torque sensors, Uses of sensors in robotics.

**Robot Programming:** Robot languages, 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 and robotic applications.

**Fuzzy Logic Control:** Basic principles of fuzzy logic and its applications in microprocessor control and robotics.

**Minor Project:** Nil

**Course learning outcome (CLO):** After the completion of the course the students will be able to

1. Handle robot components and study its characteristics

Learn about robot kinematics.

Analyze the differential motions, inverse manipulator kinematics.

Perform robot dynamic analysis and trajectory planning.

Use actuators and sensors in robot.

Program systems for different applications.

**Recommended Books:**

1. *Gonzalez, R. C., Fu, K. S. and Lee, C.S.G., Robotics Control Sensing, Vision and Intelligence, McGraw Hill (1987).*
2. *Koren, Y., Robotics for Engineers, McGraw Hill (1985).*
3. *Niku, S.B., Introduction to Robotics, Analysis, Systems, Applications, Dorling Kingsley (2006).*
4. *Predko, M., Programming robot controllers, McGraw Hill (2002).*

**Evaluation Scheme:**

S.No	Evaluation Elements	Weightage (%)
1.	MST	30
	EST	45
	Sessionals (May include Assignments/ Projects/ Tutorials/ Quizes/ Lab Evaluations)	25