III B.TECH -II SEMESTER
ROBOTICS

Course Code: ME6T6FE2   **Credits: 3**
Lecture: 3 periods/week   **Internal assessment: 30 marks**
Tutorial: 1 period/week   **Semester end examination: 70 marks**

COURSE OBJECTIVES:
The objective of the course is to enable students to

- Understand robot configuration, structures, basic components, workspace and generations of robots.
- Get acquainted with performing spatial transformations and solve kinematics of the robot
- Get knowledge and analysis skills associated with trajectory planning
- Learn about various sensors, actuators, robot programming
- Understand the present & future applications of a robot

COURSE OUTCOMES:
Upon completion of this course the students will be able to:
- Demonstrate knowledge of industrial robots, characteristics
- Explain basic components of robot and end effectors
- Apply spatial transformation to obtain forward kinematics
- Obtain basic idea on working principle of various actuators and sensors.
- Program different robot operations and appreciate applications of robots in industry.

UNIT I
INTRODUCTION: Automation and Robotics– An over view of Robotics-historic back ground-types of robots – present and future applications
CLASSIFICATION OF ROBOTS: by coordinate system and control system. Performance characteristics-selection of robot-economic considerations

UNIT II
COMPONENTS OF THE INDUSTRIAL ROBOTS: Basic components of robot, common types of arms, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors.

UNIT III
MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation problems
TRANSFORMATIONS AND KINEMATICS: Objectives, homogenous coordinates, forward solution, Denavit Hartenberg (D-H) Notation, simple problems involving planar manipulators.

UNIT IV
ROBOT ACTUATORS: Pneumatic, Hydraulic actuators, electric & stepper motors.
ROBOT SENSORS: Feedback components: position sensors, potentiometers, resolvers, encoders, Velocity sensors **Proximity sensors:** Contact type, non-contact type – reflected light scanning laser sensors

UNIT V

ROBOT PROGRAMMING: programming methods, programming languages- levels of Robot programming and simple programs.

ROBOT APPLICATIONS: Material Transfer, Material handling, loading and unloading, Processing, spot and continuous arc welding & spray painting, Assembly and Inspection.

Learning Resources

Text Books:
1. Robotic Engineering by Richard D.Klafter, Prentice Hall
2. Industrial Robotics by Mikell P.Groover, McGraw-Hill Int. Edition
3. Robotics and Control / Mittal R K & Nagrath I J / TMH.

Reference Books:
1. Introduction to Robotics – John J. Craig, Addison Wesley
2. Robotics – K. S. Fu, Gonzalez & Hee
3. Introduction to Robotics – Saeed B.Niku, Prentice Hall

Web resources:
1. http://nptel.ac.in/downloads/112101098/