Devi Ahilya University, Indore, India Institute of Engineering & Technology				**IV Year B.E. (Mechanical Engg.) (Partl Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
MEP7E3 ROBOTICS	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	2	**1**	**1**	**2**	**1**	**1**	**4**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

1. The main objective of the subject to introduce the students about the new and advanced methods to implement on design of Industrial robot.
2. Objective of the subject to introduce the students about the new and advanced methods to implement on Industry Automation.
3. Students will demonstrate an understanding of how to program robots and computers that control manufacturing automation.

Pre requisite(s): Theory of Machine, Dynamics of Machine.

COURSE CONTENTS

UNIT-I

Introduction: Automation and Robotics, CAD/CAM and Robotics, An over view of Robotics, Present and future applications, Classification by coordinate system and control system.

UNIT-II

Components of the Industrial Robotics: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom, Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT-III

Robot Arm Kinematics: Direct and inverse kinematics, Rotation matrices, Composite rotation matrices, Euler angle representation , Homogenous transformation, Denavit Hattenberg representation and various arm configuration.

UNIT-IV

Robot Arm Dynamics: Lagrange – Euler formulation, joint velocities, Kinetic energy, Potential energy and motion equations, Generalised D'Alembert equations of motion.

UNIT-V

Application of Robotics: Robot Application in Manufacturing: Material Transfer, Material handling, loading and unloading- Processing, Spot and continuous arc welding & spray painting, Assembly and Inspection.

Learning Outcomes:

1. Familiar with the history, concept development and key components of robotics technologies.
2. Familiar with various robot sensors and their perception principles that enable a robot to analyse their environment, reason and take appropriate actions toward the given goal.
3. Understand, analyse and solve problems in spatial coordinate representation and spatial transformation, robot locomotion design, kinematics, motion control.

BOOKS RECOMMENDED:

[1] Fu K. S., *Robotics (Control, Sensing, Vision and Intelligence)*, McGraw-Hill, 4e, 2003.
[2] Schilling R.J., *Fundamental of Robotics*, Prentice Hall, 1990.
[3] Wesley, Sryda E., *Industrial Robots: Computer interfacing and Control*, Prentice Hall, 1985.
[4] Groover M.P., *Industrial Robotics Technology Programming and Applications*, McGraw-Hill, 1986.
[5] Asada and Slotine, *Robot Analysis and Control*, John Wiley and Sons, 1986.

LIST OF PRACTICAL ASSIGNMENTS

1. Assignment on introduction to robot configuration.
2. Demonstration of robot with 2 DOF, 3 DOF, 4 DOF etc.
3. Two assignments on programming the robot for applications.
4. Two assignments on programming the robot for applications in VAL II.
5. Two programming exercises for robots.
6. Two case studies of applications in industry.
7. Exercise on robotic simulation software.
