

Course code	Course name	L-T-P-Credits	Year of Introduction
AE466	INDUSTRIAL ROBOTICS	3-0-0-3	2016
<b>Prerequisite : Nil</b>			
<b>Course Objective</b>			
<ul style="list-style-type: none"> <li>• To familiarise automation and brief history of robot and applications.</li> <li>• To study the kinematics of robots.</li> <li>• To give knowledge about robot end effectors and their design.</li> <li>• 4. To learn about Robot Programming methods &amp; Languages of robot.</li> </ul>			
<b>Syllabus</b>			
Automation and Robotics-configuration of robots-introduction to manipulator kinematics-Basic control system models-Robot actuation and feedback components- General considerations in robot material handling- Robot Programming and AI -Robot cell layouts - robot cycle time analysis			
<b>Expected outcome</b>			
The students will			
<ol style="list-style-type: none"> <li>i. be equipped with the automation and brief history of robot and applications.</li> <li>ii. be familiarized with the kinematic motions of robot.</li> <li>iii. have good knowledge about robot end effectors and their design concepts.</li> </ol>			
<b>Text Books</b>			
Richard D. Klafter, Thomas A. Chmielewski and Michael Negin, " <i>Robotic Engineering - An Integrated Approach</i> ", Prentice Hall India, 2002			
<b>Reference books:</b>			
<ol style="list-style-type: none"> <li>1. Deb S.R., "<i>Robotics Technology and Flexible Automation</i> ", Tata McGraw-Hill, Publishing Co., Ltd., 1994.</li> <li>2. K.S. Fu., R.C.Gonzalez, C.S.G.Lee, "<i>Robotics Control Sensing</i> ", Vision and Intelligence, McGraw Hill International Edition, 1987.</li> <li>3. Mikell P. Groover, Mitchell Weiss, "<i>Industrial Robotics, Technology, Programming and Applications</i> ", McGraw Hill International Editions, 1st Edition, 2000</li> </ol>			
<b>Course Plan</b>			
Module	Contents	Hours	Semester Exam Marks
<b>I</b>	Automation and Robotics, Robot anatomy, configuration of robots, joint notation schemes, work volume, introduction to manipulator kinematics, position representation, forward and reverse transformations of a 2- DOF arm, a 3- DOF arm in two dimension , a 4 – DOF arm in three dimension, homogeneous transformations in robot kinematics, D-H notations, solving kinematics equations, introduction to robot arm dynamics.	7	15%
<b>II</b>	Basic control system models, slew motion, joint – interpolated motion and straight line motion, controllers like on/off, proportional, integral, proportional plus integral, proportional plus derivative, proportional plus integral plus derivative.	7	15%

<b>FIRST INTERNAL EXAMINATION</b>			
<b>III</b>	Robot actuation and feedback components position and velocity sensors, actuators and power transmission devices, mechanical grippers , vacuum cups, magnetic grippers, pneumatic, electric , hydraulic and mechanical methods of power and control signals to end effectors.	7	15%
<b>IV</b>	General considerations in robot material handling, material transfer applications, pick and place operations, palletizing and related operations, machine loading and unloading, die casting, plastic molding, forging, machining operations, stamping press operations using robots.	7	15%
<b>SECOND INTERNAL EXAMINATION</b>			
<b>V</b>	Robot Programming and AI: Methods - Languages - Computer control and Robot Software -VAL Language – Trajectory Planning, Basic robot motions - Point to point control & continuous path control and interpolations AI – Basics – Goals-AI Techniques – AI & Robotics.	7	20%
<b>VI</b>	Robot cell layouts , multiple robots and machine interface, other considerations in work cell design, work cell control, interlocks, error detection and recovery, work cell controller, robot cycle time analysis.	7	20%
<b>END SEMESTER EXAMINATION</b>			

**QUESTION PAPER PATTERN:**

Maximum Marks:100

Exam Duration: 3 Hours

**Part A**

Answer any two out of three questions uniformly covering Modules 1 and 2 together. Each question carries 15 marks and may have not more than four sub divisions.

(15 x 2 = 30 marks)

**Part B**

Answer any two out of three questions uniformly covering Modules 3 and 4 together. Each question carries 15 marks and may have not more than four sub divisions.

(15 x 2 = 30 marks)

**Part C**

Answer any two out of three questions uniformly covering Modules 5 and 6 together. Each question carries 15 marks and may have not more than four sub divisions.

(20 x 2 = 40 marks)