# INDUSTRIAL ROBOTICS

**Subject Code: 13ME2114**                          **L    P    C**
                                                    **4    0    3**

**Pre requisites:** Automation in Manufacturing

**Course Educational Objectives:**
To impart knowledge on
1. robot configurations and components
2. sensors and actuators used in Robotics
3. programming techniques for industrial robots
4. kinematic and dynamic analysis for simple planar robots
5. robot cell design and applications

**Course Outcomes:**
The  student will be able to
1. identify  various robot configurations and components
2. select appropriate actuators and sensors for a robot based on specific application
3. carry out kinematic and dynamic analysis for simple serial kinematic chains
4. write a program for pick and place operations
5. design a cell for a small manufacturing unit

## UNIT–I
Introduction: Automation and robotics. robot anatomy, robot configuration motions, joint notation, work volume, robot drive systems, control systems and dynamic performance, precision of movement Control systems and components: Basic concepts and models, controllers, control system analysis, robot activation and feedback components, position sensors, velocity sensors, actuators, power transmission systems

## UNIT–II
Motion analysis and control: Manipulator kinematics, position representation forward transformation, homogenous transformations, manipulator path control robot dynamics, configuration of a robot controller

## UNIT–III

End effectors: Grippers-types, operation, mechanism, force analysis, tools as end effectors, considerations in gripper selection and design
**Sensors:** Desirable features, tactile, proximity and range sensors, uses of sensors in robotics

## UNIT–IV

Machine vision: Functions, sensing and digitizing-imaging, devices, lighting techniques, analog to digital signal conversion, image storage, image processing and analysis-image data reduction, segmentation, feature, extraction, object recognition, training the vision system, robotics applications
Robot programming and Languages: Lead through programming, robot programming as a path in space, motion interpolation, WAIT, SIGNAL and DELAY commands, branching capabilities and limitations. Textual robot languages, generations, robot language structures, elements in functions.

## UNIT-V

Robot cell design and control: Robot cell layouts-robot centered cell, inline robot cell, mobile robot cell, considerations in work design, work cell control, inter locks, errors detection, work cell controller
Robot applications**:** material transfer, machine loading/unloading, processing operations, assembly and inspections

## TEXT BOOK:

1. M.P Groover, M Weiss, R M gnagel and N G Ordrey, "*Industrial Robotics*", Tata McGraw-Hill, New Delhi, 2008.

## REFERENCES:

1. R.K. Mittal, I J Nagrath, " *Robotics and Control*", Tata McGraw Hill, 2003, 6th Reprint, 2007, New Delhi.
2. S. K. Saha, "*Introduction to Robotics*" , McGraw-Hill Education India, New Delhi, 2008.
3. Saeed B. Niku, "*Introduction to Robotics: Analysis, Systems, Application*" , Pearson education, 2011.