

IV Year B.Tech. Mechanical Engg. I-Semester

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ME423 ROBOTICS

Course Description & Objective:

The objective of this course is to establish an understanding of Robot anatomy, design and synthesis of manipulator mechanism, kinematics, end effector, trajectory planning, machine vision, real world interface and problem associated with their design.

Course Outcomes:

1. Gives an idea to be familiar with the automation and brief history of robot and construction of a manipulator.
2. To give the student familiarities with the kinematics of robots and basics of robot control systems.
3. To give knowledge about robot end effectors, their design and their pros and cons.
4. To give knowledge about various Sensors, their applications in robots and a brief understanding of robot vision.
5. To give a wide knowledge about the various real world and industrial application or robot in the current days.

UNIT - I Introduction:

Definition of automation-programmable automation - flexible automation - Definition of a Robot - Basic Concepts - Robot configurations - characteristics of robots – accuracy and repeatability-load carrying capacity - Actuators - Basic robot motions - Point to point control - Continuous path control.

UNIT - II Kinematics of Robot:

Basic control system concepts – control system analysis – robot actuation and feed back, Manipulators – direct and inverse kinematics – the Denavit-Hartenberg Transformation Method – Coordinate transformation.

UNIT - III Classification of Robot End Effectors:

End effectors. Types of Robot end effectors – Grippers, tools as end effectors – End effectors interfacing. Automated Manufacturing Work Cell – Concepts and Design.

UNIT - IV Sensor & Machine Vision:

Range sensing - Proximity sensing - Touch sensing - Force and Torque sensing. Introduction to Machine vision - Sensing and digitizing - Image processing and analysis. Encoders - tachometers.

UNIT - V Robot Application:

Application and characteristics of robots in machining - Welding - Assembly - Material handling - Loading and unloading – spray painting - inspection – forging - medical surgery - CIM.

TEXT BOOKS :

1. Spong M. and Vidyasagar M., "Robot Dynamics and Control", 2nd ed., John Wiley & Sons, 2008.
2. Mikell P. Groover, Mitchell Weiss, "Industrial Robotics, Technology, Programming and Applications", 2nd ed., Mc.Graw Hill International, 2008.

REFERENCE BOOKS :

1. K.S. Fu., R.C.Gonzalez and C.S.G.Lee, "Robotics Control sensing, Vision and Intelligence", 1st ed., McGraw Hill International, 2nd reprint 2008.
2. R.K. Mittal & I.J.Nagrath, "Robotics and Control", 2nd ed., Tata McGraw Hill, 6th reprint 2007.
3. Saeed B.Niku, "Introduction to Robotics Analysis, Systems, Applications", 2nd ed., PHI Learning Publication, 2009.
4. S.K. Saha, "Introduction to Robotics", 2nd ed., Tata McGraw Hill, 2009.