

REFERENCES:

1. Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, New Delhi, Latest Edition 1998.
2. EDII "A Hand Book for New Entrepreneurs, Entrepreneurship Development Institute of India, Ahmadabad, LATEST EDITION.
3. Prasama Chandra, Projects – Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw-Hill, Latest Edition.

IV Year II Semester					
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MT 424 ROBOTICS CONTROL & DESIGN (ELECTIVE - V)					

Course Description & Objectives:

This course exposes students to robot anatomy, design & synthesis of manipulator mechanisms, end effectors, trajectory planning and machine vision.

Course Outcomes:

By studying this course, students will be

1. *familiar with the history, concept development and key components of robotics technologies.*
2. *understand basic mathematic manipulations of spatial coordinate representation and transformation.*
3. *understand and able to solve basic robot forward and inverse kinematics problems.*
4. *understand and able to solve basic robotic dynamics, path planning and control problems.*
5. *able to undertake practical robotics experiments that demonstrate the above skills.*

UNIT I: Introduction:

Brief History, Types of robots, uses of robots, Present status and future trends in robotics, Overview of robot subsystems, Issues in designing and controlling robots: resolution, repeatability and accuracy, transmission, Robot configurations and concept of workspace, and Mechanisms

UNIT II: Grippers and Sensors:

Robot Anatomy, End effectors and actuators, Different types of grippers, vacuum and other methods of gripping, Pneumatic, hydraulic and electric

actuators, Sensors and controllers, Internal and external sensors, position, velocity and acceleration sensors, proximity sensors, force sensors, laser range finder, camera, Micro-controllers, DSP, centralized controllers, real time operating systems.

UNIT III: Robot Analysis:

Task specification, Point to point and continuous motion specifications for typical applications, joint interpolation, task space interpolation, executing user specified tasks, Robot analysis, position and orientation of rigid bodies, spatial mechanism description, Denavit-Hartenberg notation, homogenous transformation, Forward and inverse position analysis, velocity mapping, static force analysis, singularities, acceleration mapping.

UNIT – IV Control Systems:

Robot control, Independent joint control, PD and PID feedback, actuator models, nonlinearity of manipulator models, issues in nonlinear control, force feedback, hybrid control, Motion Planning, Obstacle avoidance, configuration space, road map methods, graph search algorithms, potential field methods.

UNIT V: Applications:

Robot vision, Camera model and perspective transformation, image processing fundamentals for robotic applications, image acquisition and preprocessing, Segmentation and region characterization, object recognition by image matching and based on features, Problem of bin-picking, Futuristic topics in Robotics

TEXT BOOKS:

1. Groover M P, "Industrial Robotics", Pearson Publications.
2. Mittal R K & Nagrath I J, "Robotics and Control", Tata McGraw Hill Publications.

REFERENCES:

1. Fu K S, "Robotics", McGraw Hill Publications
2. P. Coiffet and M. Chaironze, "An Introduction to Robot Technology", Kogam Page Ltd. London,1983.
3. Richard D. Klafter, "Robotic Engineering", Prentice Hall India Limited.
4. John J Craig, "Introduction to Robotics", Pearson Education publications.
5. Mark W. Spong and M. Vidyasagar, "Robot Dynamics & Control", John Wiley & Sons (ASIA) Pvt. Ltd.6.<http://ocw.mit.edu/courses/mechanical-engineering/2-12-introduction-to-robotics-fall.-2005/>
7. <http://www.roboticscourseware.org/courses.html>