RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Computer Science & Information Technology, VIII-Semester

Open Elective CSIT-803 (D) ROBOTICS

Objective:
To understand the basic concepts associated with the design and Functioning and applications of Robots. To study about the drives and sensors used in Robots. To learn about analyzing robot kinematics and robot programming

Course Outcomes: After the completion of this course, the students will be able to:
1. Learn about knowledge for the design of robotics.
2 Learn about force and torque sensing
3. Understand different sensors and vision of machine
4. Understand robot kinematics and robot programming
5. Apply basics on an application of Robots

Unit-I
Fundamentals of Robot: Robot – Definition – Robot Anatomy – Co-ordinate Systems, Work Envelope, types and classification – Specifications – Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and Functions – Need for Robots – Different Applications

Unit-II
Robot Drive Systems and End Effectors : Pneumatic Drives , Hydraulic Drives, Mechanical Drives, Electrical Drives, D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of Drives End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

Unit-III
Sensors and Machine Vision: Requirements of a sensor, Principles and Applications of the following types of sensors– Position of sensors (Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, Pneumatic Position Sensors), Range Sensors (Triangulation Principle, Structured, Lighting Approach, Time of Flight Range Finders, Laser Range Meters), Proximity Sensors (Inductive, Hall Effect, Capacitive, Ultrasonic and Optical Proximity Sensors),Touch Sensors, (Binary Sensors, Analogue Sensors), Wrist Sensors, Compliance Sensors, Slip Sensors. Camera, Frame Grabber, Sensing and Digitizing Image Data – Signal Conversion, Image Storage, Lighting Techniques. Image Processing and Analysis –Data Reduction: Edge detection, Feature Extraction and Object Recognition -Algorithms. Applications– Inspection, Identification, Visual Serving and Navigation.

Unit-IV

Robot Kinematics and Robot Programming: Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2Dimensional), Four Degrees of Freedom (In 3 Dimensional) – Deviations and Problems. Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End effecter commands, and Simple programs

Unit-V

Implementation and Robot Economics: RGV, AGV; Implementation of Robots in Industries – Various Steps; Safety Considerations for Robot Operations; Economic Analysis of Robots – Pay back Method, EUAC Method, Rate of Return Method.

Recommonded Books:

1. M.P.Groover, "Industrial Robotics – Technology, Programming and Applications", McGraw- Hill, 2001.
2. Saha S. , Introduction to Robotics , TMH.
3. Ghoshal Ashitava, Robotics, Fundamental Concepts and Analysis, Oxford.
4. Yu Kozyhev, Industrial Robots Handbook, MIR Publications.