

GUJARAT TECHNOLOGICAL UNIVERSITY
B.E. SEMESTER : VII
MANUFACTURING ENGINEERING

Subject Name: Industrial Robotics

Subject Code:173402

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam(E)	University Exam(P)	Mid Sem Exam(Theory) (M)	Practical (Internal)
4	0	2	6	70	30	30	20

Sr No	Course Contents
1	FUNDAMENTALS OF ROBOT Robot – Definition – Robot anatomy – Co-ordinate systems, work envelope, types and classification – Specifications – Pitch, yaw, roll, joint notations, speed of motion and pay load – Robot parts and their functions – Need for robots – Different applications.
2	ROBOT DRIVE SYSTEMS Pneumatic drives – Hydraulic drives – Mechanical drives – Electrical drives – D.C. servo motors, stepper motor and A.C. servo motors – Salient features, applications and comparison of all these drives.
3	END EFFECTORS End effectors – Grippers: Mechanical grippers, pneumatic and hydraulic grippers, magnetic grippers, vacuum grippers, RCC grippers – Two fingered and three fingered grippers – Internal grippers and external grippers – Selection and design considerations.
4	SENSORS 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, Analog sensors) – Wrist Sensors – Compliance Sensors – Slip Sensors.
5	MACHINE VISION Camera, frame grabber, sensing and digitizing image data – Signal conversion – Image Storage – Lighting techniques – Image processing and analysis – Data reduction – Segmentation – Feature extraction – Object recognition – Other algorithms – Applications – Inspection, identification, visual serving and navigation.
6	ROBOT KINEMATICS Forward kinematics – Inverse kinematics – Differences: Forward kinematics and Reverse kinematics of manipulators with two and three degrees of freedom (In 2 dimensional), four degrees of freedom (In 3 dimensional) – Deviations and problems
7	ROBOT PROGRAMMING Teach pendant programming – Lead through programming – Robot programming languages – VAL programming – Motion commands – Sensor commands – End

	effector commands – Simple programs.
8	IMPLEMENTATION AND RGV – AGV – Implementation of robots in industries – Various steps - Safety considerations for robot operations.
9	ROBOT ECONOMICS Economic analysis of robots – Pay back method, EUAC method and Rate of return method.

TEXT BOOK

1. Groover, M.P., “Industrial Robotics – Technology, Programming and Applications”, McGraw-Hill, 2001.

REFERENCES

1. Fu.K.S., Gonzalz.R.C., and Lee C.S.G., “Robotics Control, Sensing, Vision and Intelligence”, McGraw-Hill Book Co., 1987.
2. Yoram Koren, “Robotics for Engineers”, McGraw-Hill Book Co., 1992.
3. Janakiraman.P.A., “Robotics and Image Processing”, Tata McGraw-Hill, 1995.