Kadi Sarva Vishwavidyalaya

Gandhinagar-382015

B.E Semester: 8
Electronics & Communication Engineering
Subject Name: Robotics Engineering
Subject Code : EC-802 –C (E P II)

A. Course Objective:

The educational objectives of this course are

- To present a problem oriented introductory knowledge of Robotics Engineering.

- To address the underlying concepts and methods behind Robotics Engineering.

B. Teaching / Examination Scheme

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
EC- 802- C	Robotics Engineering	4	0	2	6	5	3	70	30	20	30	150

C. Syllabus

1 INTRODUCTION
Basic concept, Robot anatomy, Manipulators, Kinematics : Forward and Inverse kinematics, Precision movement, Robot specifications and work volume, Types of robot drives, Basic robot motions, Basic robot motions, Point to point control, Continuous path control

2 END EFFECTORS
End effectors, Classification, Mechanical, Magnetic, Vacuum and adhesive griper, Gripper force analysis and design, Robot control, Unit control system concept, Servo and non servo control of robot joints, adaptive and optimal control

3 SENSORS
Sensor devices, Types of sensors - Contact, Position and Displacement sensors, Force and Torque sensors, Proximity and Range sensors, Acoustic sensors, Robot vision systems, Sensing and digitizing, Image processing and analysis

4 ROBOT PROGRAMMING
Robot language classification, Programming methods, Off and on line programming, Lead through method, VAL systems and language, Simple program

5 INDUSTRIAL APP LICATIONS

Applications of robots, Material handling, Machine loading and unloading, Assembly, Inspection, Welding, Spray painting, Mobile robot, Micro robots, Recent development in robotics, Safety considerations

D. **Lesson Planning**

Sr. No.	No. of Hrs.	% Weight-age in Exam	Topic
1	11	**17**	**INTRODUCTION** Basic concept, Robot anatomy, Manipulators, Kinematics : Forward and Inverse kinematics, Precision movement, Robot specifications and work volume, Types of robot drives, Basic robot motions, Basic robot motions, Point to point control, Continuous path control
2	14	**24**	**END EFFECTORS** End effectors, Classification, Mechanical, Magnetic, Vacuum and adhesive griper, Gripper force analysis and design, Robot control, Unit control system concept, Servo and non servo control of robot joints, adaptive and optimal control
3	11	**16**	**SENSORS** Sensor devices, Types of sensors - Contact, Position and Displacement sensors, Force and Torque sensors, Proximity and Range sensors, Acoustic sensors, Robot vision systems, Sensing and digitizing, Image processing and analysis
4	15	**25**	**ROBOT PROGRAMMING** Robot language classification, Programming methods, Off and on line programming, Lead through method, VAL systems and language, Simple program
5	09	**18**	**INDUSTRIAL APP LICATIONS** Applications of robots, Material handling, Machine loading and unloading, Assembly, Inspection, Welding, Spray painting, Mobile robot, Micro robots, Recent development in robotics, Safety considerations
TOTAL	60	**100**	

E. **Instructional Method & Pedagogy**

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed

- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weight age should be given to all topics while teaching and conduction of all examinations.

- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.

- One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.

- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.

- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

- Experiments shall be performed in the laboratory related to course contents.

Suggested list of Experiments

Sr. No	Name Of Experiment
1	Wire up a PLC for the given lamp circuit.
2	Design a Ladder logic for the given lamp circuit.
3	Design and implement ladder logic for the forward and reverse control of a hydraulic cylinder.
4	Design a ladder diagram for performing the given arithmetic operations.
5	Design a ladder diagram for performing the given application using counters.
6	Design a ladder diagram for performing the given application using Timers.
7	Interfacing PLC to HMI- text display. 8. Programming a graphical HMI.
8	Networking PLCs- drives and a host computer.
9	Troubleshooting PLCs.

F. **Students Learning Outcomes**

On successful completion of the course The student can learn
- Basics of robots
- Control system and end factors
- Sensor Technology
- Industrial applications of robot

G. **Recommended Study Materials**

Text/ Reference Books:

1.Deb S. R., Robotics Technology flexible automation, TMH Publishing company Ltd., 1994
2.Mikell P. Groover, Industrial Robotics Technology, Programming and Applications, TMH Publications
3.Robotic Technology (Vol. I-V) Phillipe Collet Prentice Hall
4.An Introduction to Robot Technology Coiffet and Chirooza Kogan Page
5.Robotics for Engineers Y. Koren McGraw Hill
6.Robotics K.S. Fu, R.C. Gonzalez & CSG Lee McGraw Hill International
7. Robotics J.J. Craig Addison-Wesley
8.Industrial Robots Groover, Mitchell Weiss, Nagel Octrey McGraw Hill
9.Robots & Manufacturing Automation Asfahl Wiley Eastern