

# GUJARAT TECHNOLOGICAL UNIVERSITY

## B.E. SEMESTER : VIII

### MECHATRONICS ENGINEERING

Subject Name: **AUTOMATED MANUFACTURING II**

Sr. No.	Course Contents	Total Hrs
1.	<b>FUNDAMENTALS OF ROBOTICS:</b> Introduction, Fundamentals of robot technology - anatomy, work volume, drives system, types of end effector, robot sensor. Robot and its peripherals; Basic control systems, Controllers & sensors.	6
2.	<b>KINEMATICS OF ROBOTIC MANUPULATORS:</b> Introduction to manipulator kinematics, homogeneous transformations and robot kinematics, Denavit-Hartenberg (D-H) representation, concept of forward and inverse kinematics. Robot programming & languages, Trajectory planning of robot motion.	8
3.	<b>APPLICATION ENGINEERING FOR MANUFACTURING:</b> Robot cell design, Robot cell layout, multiple robots & machine interference, work cell control, robot cycle time analysis; Economic analysis for robotics, Material transfer, Machine loading / unloading; Process applications, Robot implementation & integration into manufacturing.	4
4.	<b>ROBOT VISION SYSTEM:</b> Vision sensors and their operation, image acquisition and processing, object recognition and interpretation.	3
5.	<b>COMPUTER INTEGRATED MANUFACTURING AND AUTOMATION:</b> Elements of CIM, Different modules and information flow, Design aspects of CIM, CIM planning & implementation process, requirements of CIM, Computerized production activities, Computerized integrated quality concept, Inventory management, shop floor control, Production costing. Computerized maintenance management, MRP-I & II, Information system, JIT manufacturing.	6
6.	<b>FLEXIBILITY IN MANUFACTURING:</b> Definition & concept, flexible automation & productivity, components of FMS, Different types of FMS, Design problem of FMS, Technology required for FMS system. Robots - their function & programming in FMS.	4
7.	<b>GROUP TECHNOLOGY:</b> Part family, Part classification and coding, production flow analysis – OPITZ classification system, cellular manufacturing, quantitative analysis in cellular manufacturing.	6

#### List of Experiments:

1. Review of RCS – 6, SCORBOT ER – V plus and Virtual Reality Software.
2. Programming for part handling using SCORBOT (on Scorbase Pro and ACL).
3. Programming for snake configuration using RCS – 6.
4. Programming on Virtual Reality – Room No. 1, 2.
5. Programming to generate a cube of given dimensions in space using SCORBOT (on Scorbase Pro and ACL – Absolute and Incremental programming). Spray painting application.
6. Programming for Golfer Configuration using RCS – 6.
7. Programming on Virtual Reality – Room No. 3, 4.
8. Programming for decision making between two and three objects using SCORBOT (on Scorbase Pro and ACL).
9. Programming for Drawbot configuration using RCS – 6.
10. Robot kinematic programming using MATLAB.
11. Programming to test the input and output function using SCORBOT (on Scorbase Pro and ACL) and programming for parabolic trajectory using ACL language on SCORBOT.

**Text Books:**

1. M. P. Groover, Mitchell Weiss, Roger N. Nogel, Nicholas G. Odrey  
Industrial Robotics: Technology Programming & Applications  
McGraw Hill International
2. M. P. Groover  
Automation, Production Systems and Computer Integrated Manufacturing  
Prentice Hall of India

**Reference Books:**

1. Mohsen Shahinpoo  
A Robot Engineering Textbook  
Harper & Row Publishers
2. Saeed B. Niku  
Introduction to Robotics: Analysis, Systems, Applications  
PHI publishers
3. S. R. Deb  
Robotics Technology & Flexible Automation  
Tata McGraw Hill
4. R.K. Mittal, I.J. Nagrath  
Robotics and Control  
Tata McGraw-Hill