GUJARAT TECHNOLOGICAL UNIVERSITY

Biomedical Engineering

B. E. SEMESTER: VII

Subject Name: **Robotics And Artificial Intelligence**
Subject Code: **170306**

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

Sr. No	Course Content	Total Hrs.
1.	**Introduction** Automation and Robots, Classification, Application, Specification, Notations.	6
2.	**Intelligent Robotics:** Automation and Robots, Robot Classification, Robot Specifications, Sensory perception, Robot control and Intelligence.	4
3.	**Direct Kinematics:** Coordinate Frames, Rotations, Homogeneous Coordinates, The arm Equation, (DK analysis of - 2 Axis and 3 Axis Planar robot, Four axis SCARA Robot, Five axis Articulated robot).	12
4.	**Inverse Kinematics:** General Properties of Solutions, Tool Configuration, (IK analysis of - 2 Axis and 3 Axis Planar robot, Four axis SCARA Robot, Five axis Articulated robot).	10
5.	**Workspace Analysis and Trajectory Planning:** Workspace analysis, Work envelope of 4-axis SCARA Robot, Work envelope of 5-axis articulated Robot, Workspace Fixtures, The pick-and-place operation, Continuous-Path Motion, Interpolated Motion, Straight-Line Motion.	8
6.	**Basic Concepts of Artificial Intelligence:** Intelligence, Problem representation in Artificial Intelligence, Problem-solution Techniques used in Artificial Intelligence.	4
7.	**Elements of Knowledge Representation:** Logic, Production Systems, Semantic Networks, Expert Systems.	6
8.	**Task Planning:** Task-Level Programming, Uncertainty, Configuration Space, Gross-Motion Planning, Grasp Planning, Fine-Motion Planning, Task Planning Problem.	4
9.	**Applications in Biomedical Engineering** Application in rehabilitation, Clinical and Surgery	6

Text Books:

1. Staughard, *Robotics and AI*, Prentice Hall of India.
2. Robert Schilling, *Fundamentals of Robotics-Analysis and control*, Prentice Hall of India.

Reference Books:

1. Fu,Gonzales and Lee, Robotics, McGraw Hill
2. J.J,Craig,Introduction to Robotics, Pearson Education
3. Grover, Wiess, Nagel, Oderey, .Industrial Robotics, McGraw Hill.
4. Walfram Stdder, Robotics and Mechatronics.
5. Niku, Introduction to Robotics, Pearson Education.
6. Klafter, Chmielewski, Negin, Robot Engineering, Prentice Hall of India.
7. Mittal, Nagrath, Robotics and Control, Tata McGraw Hill publications.