

# Robotics and Machine Intelligence

B.E. Sem. VIII [INFT]

(Elective – II)

## EVALUATION SYSTEM

	Time	Marks
<b>Theory Exam</b>	3 Hrs.	100
<b>Practical Exam</b>	–	–
<b>Oral Exam</b>	–	25
<b>Term Work</b>	–	25

## SYLLABUS

- 1. Robotic Manipulation** : Automation and Robots, Classification, Application, Specification Notations.
- 2. Direct and Inverse Kinematics** : Co-ordinate frames, Rotations, Link Co-ordination Arm Equation, (Two axis, Three axis, Four-axis robot SCARA, Five-axis only Rhino XR-3 Robot). General properties of solutions Tool configuration Two axis, Three axis planar articulated, Four axis SCARA, Five axis robots only Rhino XR-3 Robot.
- 3. Workspace Analysis and Trajectory Planning** : Introduction to Workspace Analysis and Trajectory Planning, Work Envelop and examples, Pick and place operations, Continuous path motion, Interpolated motion, Straight-line motion.
- 4. Machine Intelligence** : Object Detection using Adaboost, Object Recognition using Moments, Template Matching using correlation principle & Principal Component Analysis ( PCA), Object Tracking using Discrete Wavelet Transform, Segmentation, Region Labeling, Shrink and Swell operators, Perspective Transformation, Stereo Vision, Depth Measurement with Vision Systems, Real Time Video Processing.
- 5. Embedded Systems and Real-time Operating System** : Introduction to Embedded systems, Embedded Micro Controller cores (ARM, RISC, CISC, SOC), Embedded Memories, Architecture of Embedded Systems, Real-Time Operating Systems, Required RTOS services/capabilities (in contrast with traditional OS)..RT Linux, Programming languages for Embedded Systems.
- 6. Robotics Convergence Technology** : Telematic camera Robotic System, Non-Imaging Sensors, Artificial intelligence for robotics, Knowledge representation, planning, and task scheduling. Sound and touch sensing, People sensing, Autonomous mobile robot, humanoid robots and simulated humans, human-robot interaction.
- 7. Applications of Robotics** : Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading Processing - spot and continuous arc welding & spray painting – Assembly Inspection, Selected Embedded System-based Applications: Database Applications (smart cards), Process-Control (Fuzzy logic), Robot application in Medical, Industrial Automation, Security

**Reference Books :**

1. Fundamentals of Robotics-Analysis and control, (*Robert Shilling*) Prentice Hall of India
2. Gonzales and Lee, Robotics, (*Fu*) McGraw Hill
3. Introduction to Robotics, (*J.J, Craig*) Pearson Education
4. Process Control Instrumentation Technology, (*Curtis D. Johnson*) PHI Publication, Eighth Edition
5. An Embedded Software Primer – (*David E. Simon*) – Pearson Education
6. Embedded Microcomputer Systems (*Jonathan W. Valvano*)– Thomson
7. Embedded Realtime Systems Programming- (*Sriram V Iyer, Pankaj Gupta*) - Tata McGraw Hill
8. Staughard, (*Robotics and AI*) Prentice Hall of India
9. “Industrial Robotics”, (*Grover, Wiess, Nagel, Oderey*) McGraw Hill
10. Introduction to Robotics, (*Niku*) Pearson Education
11. Robot Engineering, (*Klafter, Chmielewski, Negin*) Prentice Hall of India
12. Robotics and Control, (*Mittal, Nagrath*) Tata McGraw Hill publications
13. Programmable Controllers , (*George L Balten Jr.*) Tata McGraw Hill publications
14. Embedded Linux – (*Hollabaugh*) Pearson Education
15. Robotics (*Fu K S*) McGraw Hill.
16. Robotic Engineering (*Richard D. Klafter*) Prentice Ha
17. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science.

