| Code | Subject | L | T | P | C |
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| PHD19009 | ADVANCED ROBOTICS & AI | 3 | 1 | - | 4 |

Course Objectives:
1. Acquire knowledge of Robotic and Artificial intelligence theories fundamentals; so they will be able to design program systems using approaches of these theories for solving various real-world problems.

2. Awake the importance of tolerance of imprecision and uncertainty for design of robust and low-cost intelligent machines.

Unit 1. CONTROL SYSTEMS AND COMPONENTS: Basic Control Systems Concepts and Models, Controllers, Control System Analysis, Robot Activation and Feedback Components, Power Transmission Systems, Robot Joint Control Design; ROBOT END EFFECTORS: Types, Mechanical Grippers and Other types, Tools as End Effectors, The Robot/End Effector Interface, Considerations in Gripper Selection and Design;

Unit 2. MACHINE VISION Introduction, The Sensing and Digitizing function, Image processing and Analysis, Training and Vision Systems, Robotic Applications; ROBOT PROGRAMMING: Programming methods, Robot program as a path in space, Motion Interpolation, WAIT, SIGNAL, DELAY Commands, Branching.

Unit 3. SOCIAL ISSUES and FUTURE OF ROBOTICS Social and Labor issues, Robotics Technology of the future; FUTURE APPLICATIONS: Characteristics of Future Robot Tasks, Future manufacturing Applications, Hazardous and Inaccessible Nonmanufacturing Environments

Unit 4. MACHINE LEARNING & ANN: Knowledge and Learning, Learning by Advise, Examples, Learning in problem Solving, Symbol Based Learning, Explanation Based Learning, Version Space, ID3 Decision Based Induction Algorithm, Unsupervised Learning, Reinforcement Learning, Supervised Learning: Perceptron Learning, Back propagation Learning, Competitive Learning, Hebbian Learning

Unit 5. EXPERTS SYSTEMS: Overview of an Expert System, Structure of an Expert Systems, Different Types of Expert Systems- Rule Based, Model Based, Case Based and Hybrid Expert Systems, Knowledge Acquisition and Validation Techniques, Black Board Architecture, Knowledge Building System Tools, Expert System Shells, Fuzzy Expert systems.

TEXT BOOK:

Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey Industrial Robotics: Technology, Programming, and Applications , 1st edition, McGraw-Hill International Edition, 1986

REFERENCE BOOK:

K.S.Fu, R.C Gonzalez, C.S.G.Lee, ROBOTICS, Control, Sensing, Vision and Intelligence, 1st edition, McGraw-Hill International Edition, 1987.