

**B.E Semester: 7 Automobile Engineering**  
**Subject Name: Robotics & Artificial Intelligence (MA703-N-B )**  
**[Dept. Elect.-3]**

**A. Course Objective:**

- To present a problem oriented in depth knowledge of Robotics & Artificial Intelligence.
- To address the underlying concepts and methods behind Robotics & Artificial Intelligence.

**B. Teaching / Examination Scheme:**

Teaching Scheme				Total Credit	Evaluation Scheme					Total
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
3	0	2	5	4	3	70	30	20	30	150

**C. Detailed Syllabus:**

Unit No.	Details
1	<b>Scope of AI:</b> Games theorem, natural language processing, vision and speech processing, robotics, expert systems, AI techniques- search knowledge, abstraction.
2	<b>Problem solving:</b> State space search; Production systems, search space control: depth first, breadth-first search, heuristic search - hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis
3	<b>Knowledge Representation:</b> Predicate Logic: unification, modus ponens, resolution, dependency directed backtracking. Rule based Systems: forward reasoning, conflict resolution, backward reasoning, use of no backtracks. Structured Knowledge Representation: semantic net slots, exceptions and default frames, conceptual dependency, scripts.
4	<b>Handling uncertainty and learning:</b> Non-monotonic reasoning, probabilistic reasoning, use of certainty factors, fuzzy logic, Concept of learning, learning automation, genetic algorithm, learning by inductions, neural network.
5	<b>Robotics:</b> Introduction, Advantages, Limitations and Laws of Robotics, Robot Classification, Components of Robots, Types of Robot Joints, Degree of Freedom, End Effectors of Robots, Types of End Effectors, Grippers, Actuators, Types of Sensors, Classifications, Non Servo Controlled Robots, Servo Controlled Robots, Basic Configuration of Robots, Method of Robot Programming, Direct and Inverse Kinematics: Co-ordinates Frames, Rotations, Homogeneous Coordinates.
6	<b>IOT (Internet of Things):</b> Introduction to IOT, Introduction to Arduino and Raspberry Pi, Integration of sensors and actuators with Arduino and Raspberry Pi, Industrial IOT: Case study in Agriculture, Healthcare and activity monitoring.

<b>Total hours (Theory):48</b>
<b>Total hours (Practical):32</b>
<b>Total hours:80</b>

#### D. Lesson Planning:

Sr. No.	Date/Week	Unit	Weight age	Topic No
1	1 <sup>st</sup> ,2 <sup>nd</sup> ,3 <sup>rd</sup>	Unit 1	20%	1,2
2	4 <sup>th</sup> .5 <sup>th</sup> ,6 <sup>th</sup>	Unit 2	20%	3
3	7 <sup>th</sup> , 8 <sup>th</sup> ,9 <sup>th</sup>	Unit 3	20%	4
4	10 <sup>th</sup> .11 <sup>th</sup> . 12 <sup>th</sup>	Unit 4	20%	5
5	13 <sup>th</sup> , 14 <sup>th</sup> ,15 <sup>th</sup> ,16 <sup>th</sup>	Unit 5	20%	6

#### E. Instructional Method & Pedagogy

1	At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2	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.
3	Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4	One/Two internal exams may be conducted and total/average/best of the same may be converted toequivalent of 30 marks as a part of internal theory evaluation.
5	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.
6	Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overallinternal evaluation.
7	The course includes a laboratory, where students have an opportunity to build an appreciation for theconcept being taught in lectures. Suggested list of experiment is given below

#### F. List of Practical:

1	Application of solid Modeling & Mechanism simulation using CAD software
2	Design of Robot cell using simulation software
3	To develop program for forward kinematics, inverse kinematics using various codes
4	Development of Composite Rotation Matrix
5	Develop and arm matrix for Adept-1 SCARA robot.
6	Inverse Kinematics for Adept-I SCARA Robot.
7	To develop the programs for (1) Water Jug Problem, (2) Knights Tour, (3) Crypto Arithmetic Problems & (4) Implementing Searching algorithm.

#### G. Students Learning Outcomes:

1	The student can identify different areas and applications of Robotics & Artificial Intelligence .
---	---

#### H. Text Books & Reference Books:

1	E. Rich and K. Knight, “Artificial intelligence”, MH, 2nd ed., 1992.
2	N.J. Nilsson, “Principles of AI”, Narosa Publ. House, 2000.

3	Robin R Murphy, Introduction to AI Robotics PHI Publication, 2000
4	D. W. Patterson, "Introduction to AI and Expert Systems", PHI, 1992.
5	R. J. Schalkoff, "Artificial Intelligence - an Engineering Approach", McGraw Hill Int. Ed., Singapore, 1992.
6	George Lugar, .AI-Structures and Strategies for and Strategies for Complex Problem solving, 4/e, 2002, Pearson Educations.
7	Programmable Automation Technologies - An Introduction to CNC, Robotics and PLCs by Kandray, Daniel E
8	Introduction to Robotics: Analysis, Control, Applications by Saeed B. Niku, Wiley Publication
9	The Internet of Things. Enabling Technologies, Platforms, and Use Cases by Pethuru Raj and Anupama C. Raman , CRC Press
10	Internet of Things: A Hands-On Approach by by Arsheep Bahga, University press