GUJARAT TECHNOLOGICAL UNIVERSITY

SUBJECT: Artificial Intelligence For Robotics

SUBJECT CODE: 2174101

B.E. 7th Semester

Type of course: Professional Core Course

Prerequisite: Application of AI Robot, Ethics of Artificial Intelligence.

Rationale: With the usage of Internet and World Wide Web increasing day by day, the field of AI and its techniques are being used in many areas which directly affect human life. Various techniques for encoding knowledge in computer systems such as Predicate Logic, Production rules, Semantic networks find application in real world problems. The fields of AI such as Game Playing, Natural Language Processing, and Connectionist Models are also important. Student should know some programming language for AI.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	1	0	4	70	20	10	30	0	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Introduction :** History, state of the art, Need for AI in Robotics. Thinking and acting humanly, intelligent agents, structure of agents. PROBLEM SOLVING: Solving problems by searching – Informed search and exploration–Constraint satisfaction problems–Adversarial search, knowledge and reasoning–knowledge representation – first order logic.	13	25%
2	**Planning :** Planning with forward and backward State space search – Partial order planning – Planning graphs– Planning with propositional logic – Planning and acting in real world.	8	20%
3	**Reasoning:-** Uncertainty Probabilistic reasoning–Filtering and prediction–Hidden Markov models–Kalman filters– Dynamic Bayesian Networks, Speech recognition, making decisions.	8	20%
4	**Learning:-** Forms of learning – Knowledge in learning – Statistical learning methods –reinforcement learning, communication, perceiving and acting, Probabilistic language processing, perception.	8	20%

5	**AI in Robotics:-** Robotic perception, localization, mapping- configuring space, planning uncertain movements, dynamics and control of movement, Ethics and risks of artificial intelligence in robotics	8	15%

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
26%	**26%**	**20%**	**20%**	**8%**	**-**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A modern approch", Pearson Education, India2003.
2. Negnevitsky, M, "Artificial Intelligence: A guide to Intelligent Systems",. Harlow: Addison-Wesley, 2002.
3. David Jefferis, "Artificial Intelligence: Robotics and Machine Evolution", Crabtree Publishing Company, 1992.

Course Outcomes:

After learning the course the students should be able to

1. Identify problems that are amenable to solution by AI methods.
2. Identify appropriate AI methods to solve a given problem.
3. Formalise a given problem in the language/framework of different AI methods.
4. Implement basic AI algorithms.
5. Design and carry out an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports.

Open Ended Problems:

1. Describe major subfields and paradigms of AI.
2. What are the major challenges in the field of AI?
3. How AI can be used to develop a better search Engine?

Active Learning Assignments: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.