GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL (CAD/CAM) (08)

ARTIFICIAL INTELLIGENCE
SUBJECT CODE: 2720819
SEMESTER: II

Type of course: Engineering Science

Prerequisite: Zeal to learn the subject

Rationale: The course intends to introduce concepts of artificial intelligence and its applications to mechanical engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks		Practical Marks				
L	T	P	C	ESE (E)	PA (M)	ESE (V)		PA (I)		
						ESE	OEP	PA	RP	
3	0	2#	4	70	30	20	10	10	10	150

Contents:

Sr. No	Topic	Lectures	Weightage %
1	**Introduction:** History, Definition of AI, Emulation of human cognitive process, knowledge search tradeoff, stored knowledge, semantic nets. An abstract view of modelling, elementary knowledge. Computational logic, analysis of compound statements using simple logic connectives, predicate logic, knowledge organization and manipulation, knowledge acquisition.	**06**	**10%**
2	**Programming:** Introduction to LISP, syntax and numerical function, LISP and PROLOG distinction, input output and local variables, Interaction and recursion, property list and arrays alternative languages, formalized symbolic logics- properties of WFRS, non-deductive inference methods. Inconsistencies and uncertainties: Truth maintenance systems, default reasoning and closed world assumption, Model and temporary logics.	**08**	**20%**
3	**Search Methods and Knowledge Representation:** Fuzzy logic: Concepts, Introduction to Fuzzy logic with examples, probabilistic reasoning, Bayesian probabilistic inference, Dempstor Shafer theory, possible world representation, Ad-Hoc methods. Search and control strategies: Concepts, search problems, uniformed or Blined search, Backward and forward chaining; Hybrid control structures; Meta rules decision lattices; Concurrency in control structures; AND-OR NOT lattices; Randomness in control structures; Grammars for interpreting languages; Rule based system implementation-backward chaining; Virtual facts and catching; Implementation, Input/output coding, Intermediate predicates,	**11**	**30%**

	Probability in rules, Independence assumption and/or combination, search-state operators, search as graphical traversal search strategies; Depth first and breadth first heuristics, cost and evaluation functions, Optimal path search.		
4	**Knowledge Organization and Communication in Expert System:** Matching techniques: Need for matching, matching problem, partial matching, Fuzzy matching, RETE matching algorithm. Knowledge organization-Indexing and retrieval techniques, integration of knowledge in memory organization systems, Perception, communication and Expert systems. Overview of Linguistics, Basic passim techniques, semantic analysis and representation structures, Natural language generation and system.	**09**	**15%**
5	**Pattern Recognition and Learning Techniques:** Pattern recognition system: Understanding speech recognition, Image transformation, low level processing, medium and high level processing, vision system architecture, Rule based system architecture, knowledge acquisition and validation, knowledge system building tools, use of AI and ES in manufacturing and design, types of learning- general learning model, performance measures, learning automate genetic algorithm, learning by induction - EX,ID3,INDUCE systems.	**11**	**25%**

References:

1. Artificial Intelligence- Modern approach, Russel (Stuart), Pearson
2. Introduction to Artificial intelligence and Expert systems, Dan W Patterson, PHI.
3. Introduction to Artificial intelligence, Eugene Charniak, Drew Mc Dermot, Addison Wesley Longman.
4. Artificial intelligence and the design of expert systems, George. F, William. A. S., The Benjamin Cummins Publishing Co., Inc
5. Artificial intelligence An Engineering Approach, Robert J Schalkoff, McGraw Hill.

Course Outcomes

After completing this course, students should be able to:

1. Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
2. Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
3. Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming).
4. Design and carry out an empirical evaluation of different algorithms on a problem formalization, and state the conclusions that the evaluation supports.

List of Experiments

1. Introduction to Programming.
2. Programming exercise for searching.
3. Programming exercise for decision making.
4. Programming exercise for search and control strategies.
5. Programming exercise for knowledge organization and communication.
6. Programming exercise for pattern recognition and use of AI for learning techniques.

Design based Problems (DP)/Open Ended Problem:

1. Cryptarithmetic Puzzle Problem
2. Finding optimum path using search technique

3. Write program for solving puzzles (i.e. Chess, Sudoku etc)

Major Equipment:

1. Computational facility.
2. PROLOG.
3. LISP.

List of Open Source Software/learning website:

1. PROLOG software.

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website