



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code: 3725415

Semester – II

Subject Name: Artificial Intelligence

Type of course: Program Elective III

Prerequisite: Data Structures, Mathematics

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 C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr.	Topics	Teaching Hours	Module Weightage
1	Introduction to AI: The AI Problems, The Underlying Assumption, AI Techniques, AI Model, Criteria For Success, Examples & Applications.	2	4 %
2	Problems, State Space Search & Heuristic Search Techniques : Defining The Problems As A State Space Search, Production Systems, Production Characteristics, Production System Characteristics, And Issues In The Design Of Search Programs, Additional Problems. Generate-And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis	5	10 %
3	Knowledge Representation and Predicate Logic: Representations And Mappings, Approaches To Knowledge Representation, Representing Instance And its Relationships, Computable Functions And Predicates, Using Predicate Logic Representation Simple Facts In Logic, Resolution.	7	13 %
4	Representing Knowledge Using Rules : Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning	4	8 %

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Sr.	Topics	Teaching Hours	Module Weightage
5	Symbolic Reasoning Under Uncertainty: Introduction To Non monotonic Reasoning, Logics For Non- monotonic Reasoning.	4	8 %
6	Statistical Reasoning: Probability And Bays' Theorem, Certainty Factors And Rule-Base Systems, Bayesian Networks, DempsterShafer Theory, Fuzzy Logic.	3	5 %
7	Weak Slot / Strong Slot and-Filler Structures: Semantic Nets, Frames, Conceptual Dependency, Scripts, CYC	6	10 %
8	Game Playing: Overview, And Example Domain, Overview, MiniMax, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components Of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques.	6	12 %
9	Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Semantic Analysis, Discourse And Pragmatic Processing, Spell Checking	7	12 %
10	Connectionist Models Introduction: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI And Symbolic AI	4	6 %
11	Introduction to Prolog : Introduction To Prolog: Syntax and Numeric Function, Basic List Manipulation Functions In Prolog, Functions, Predicates and Conditional, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays, Miscellaneous Topics, LISP and Other AI Programming Languages.	8	12 %

Reference Books:

1. Artificial Intelligence, Elaine Rich And Kevin Knight, Tata Mcgraw-Hill
2. Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, PHI
3. Introduction to Prolog Programming, Carl Townsend
4. PROLOG Programming For Artificial Intelligence, Ivan Bratko
5. Programming with PROLOG, Klocksins and Mellish



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Course Outcomes: After learning this course on AI the post graduate students should be able to

Sr. No.	CO statement	Marks % weightage
CO-1	Design and Implement various search methods	30%
CO-2	Understand and Analyse the various knowledge representation methods.	30%
CO-3	Understand and implement various Game Playing Techniques.	20%
CO-4	Use Prolog Programming language using predicate logic.	20%

List of Experiments:

Sr. No.	Practical Title
1	Write a program to implement Tic-Tac-Toe game problem
2	Write a program to implement BFS (for 8 puzzle problem or Water Jug problem or any AI search problem)
3	Write a program to implement DFS (for 8 puzzle problem or Water Jug problem or any AI search problem)
4	Write a program to implement Single Player Game (Using Heuristic Function)
5	Write a program to Implement A* Algorithm.
6	Write a program to solve N-Queens problem using Prolog.
7	Write a program to solve 8 puzzle problem using Prolog.
8	Write a program to solve travelling salesman problem using Prolog.
9	Convert following Prolog predicates into Semantic Net cat(tom). cat(cat1). mat(mat1). sat_on(cat1,mat1). bird(bird1). caught(tom,bird1). like(X,cream) :- cat(X).



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**Sr.
No. Practical Title**

mammal(X) :- cat(X).
has(X,fur) :- mammal(X).
animal(X) :- mammal(X).
animal(X) :- bird(X).
owns(john,tom).
is_coloured(tom,ginger).

Write the Conceptual Dependency for following statements

- 10 (a) John gives Mary a book
 (b) John gave Mary the book yesterday

Soft Ware: Prolog Language

List of Open Source Software/learning website:

<http://www.journals.elsevier.com/artificial-intelligence/>

<https://www.technologyreview.com/s/534871/our-fear-of-artificial-intelligence/>

<http://www.sanfoundry.com/artificial-intelligence-mcqs-inductive-logic-unification-lifting-1/>