

750751, Artificial Intelligence

3 hours per week, 3 credit hours, prerequisite: **none**

Teaching Method: 37 hours Lectures (2-3 hours per week) + 8 hours Laboratory (1 per 2 weeks)

Aims: The aim of this module is to introduce students to some of the basic ideas and concepts which

underlie the development of artificially intelligent machine systems and to teach a programming language suited to the implementation of such systems, so that they are brought to a level from which

they are able to pursue research in artificial intelligence.

Learning Outcomes:

On completion of this module, the student should:

- Have knowledge and understanding of knowledge-based system concepts.
- Have deeper knowledge and understanding of design philosophy behind rule-based systems.
- Be able to design and implement simple rule-based systems.
- Be able to consider the set of methods be needed to develop an intelligent system and have an appreciation of their advantages and limitations.
- Be able to use a set of tools to analyze intelligent tasks and be able to implement Prolog programs to solve them.

Textbooks and Supporting Materials:

- 1- P. H. Winston, Artificial Intelligence, 4th ed., Addison-Wesley,
- 2- L. Sterling, E. Shapiro, the Art of Prolog, MIT Press,
- 3- I. Bratko, Prolog Programming for Artificial Intelligence, 3rd ed. Addison-Wesley,

Synopsis:

- 1- Historical Overview: Definition of artificial intelligence (AI); Application areas; General problem solving versus specific knowledge; Complexity.
- 2- Heuristic Search: Uninformed versus informed search strategies; Formal properties of A*; Minimax

game search; alpha-beta pruning.

3- Logic and Resolution: Knowledge representation; Propositional and predicate calculus; Inference rules; Clause form; Resolution strategies; Prolog and logic programming.

4- Uncertainty Reasoning: Probabilistic reasoning and Bayes theorem; Belief networks; Dempster-Shafer theory; Fuzzy logic.

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5- Theory of Logic Programs: comparison with other paradigms; universal and existential quantification; facts; queries; logical variables; recursion; rules; Horn clauses; structured data.

6- Basic Prolog: execution model; declarative and procedural meaning; backtracking; arithmetic; list representation; negation as failure and difficulties; simple examples.

7- Prolog Programming and Techniques: input/output; meta-logical and extra-logical predicates; set predicates; cuts; program development and style; correctness and completeness; tracing and debugging.

8- Applications: Heuristic search and problem-solving strategies; game search; non-deterministic programming.

Assessment: Two 1-hour midterm exams (20% each); Assignments (10%); 2-hours Final Exam (50%)