

CSC 555 - ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

CREDIT HOURS: 3
PREREQUISITES: Graduate Standing and Nine Advanced Hours of CSC
GRADE REMINDER: Must have a grade of C or better in each prerequisite course.

CATALOG DESCRIPTION

Use of computers in problem solving involving information representation, searching, theorem proving, and pattern matching with substitution. Methods for knowledge representation, searching, spatial, temporal and common sense reasoning, and logic and probabilistic inferencing. Applications in expert systems and robotics.

PURPOSE OF COURSE

To introduce basic concepts and techniques of artificial intelligence and provide insights into active research areas and current applications.

EDUCATIONAL OBJECTIVES

The goal of this course is to have students develop concepts and skills associated with problems that are classified as requiring intelligence for their solution. These problems require solution strategies that use searching, pattern matching, knowledge representation, machine learning, reasoning, uncertainty, and the ability to perform “common sense” processing. Evaluation will be based on successful completion of laboratory assignments, performance on homework, and analysis of exam responses.

Upon successful completion of the course, students should be able to:

1. Demonstrate knowledge of the issues, concerns, and problem in computationally solving problems that are usually solved by humans.
2. Demonstrate skills in problem analysis and solution design where searching, pattern matching, and substitution are the primary tools.
3. Apply analysis techniques to logic problems using propositional calculus and predicate calculus.
4. Describe artificial intelligence applications including, production systems, expert systems, robotics, natural language processing, and computer vision.
5. Demonstrate problem solving techniques to include spatial, temporal, qualitative, and common sense reasoning.
6. Program in symbolic manipulation languages including LISP and Prolog.
7. Discuss active research areas and examples.

CONTENT

Hours

Overview of Artificial Intelligence, History, Approaches, and Debates 3

Introduction to a symbolic manipulation language (LISP)	6
Production systems and pattern matching	2
Knowledge Representation and Issues	5
Notational systems	
Trees, graphs, hierarchies, propositional and predicate logics, frames, semantic networks, constraints, conceptual dependencies, database, knowledge discovery in databases (KDD)	
Search	5
State-space representations	
Depth-first, breadth-first, heuristic search	
Planning and game playing	
Genetic algorithms	
Logical Reasoning	5
Predicate Calculus resolution, completeness, and strategies	
Unification, Prolog, monotonic and non-monotonic reasoning	
Probabilistic Reasoning	5
Probabilistic inference networks	
Fuzzy inference rules, Bayesian rules, Dempster-Shafer Calculus	
Learning	3
Knowledge acquisition, classification rules, self directed systems	
Planning and Common Sense Reasoning	3
Robot actions, strips, triangle tables, case based reasoning, spatial and temporal formalisms.	
Neural networks	3
Principles, biological analogies	
Training (techniques and errors)	
Recognition	
Expert Systems	5
Organization, tools, limits, examples	
Exams	3
	TOTAL 45

REFERENCES

Bratko, I., Prolog, 2nd Ed., Addison-Wesley, 1990.

Charniak, E., and McDermott, D., Introduction to Artificial Intelligence, Addison-Wesley, 1987.

Dean, T., Allen, J., and Aloimonos, Y., Artificial Intelligence Theory and Practice, Benjamin/Cummings, 1995.

Giarratano, J., and Riley G., Expert Systems Principles and Programming, PWS-KENT, 1989.

Luger, G., and Stubblefield, W., Artificial Intelligence, 2nd Ed., Benjamin/Cummings, 1993.

Nilsson, N. J. Principles of Artificial Intelligence, Tioga, 1980.

Rich, E. and K. Knight Artificial Intelligence, 2nd Ed., McGraw-Hill, 1991.

Russell S., and Novig, P., Artificial Intelligence A Modern Approach, 1995.

Tanimoto, S. L. The Elements of Artificial Intelligence Using Common Lisp, 2nd Ed., W. H. Freeman, 1995.