CS 860 Artificial Intelligence (3-0)

Textbook: [AIMA] *Artificial Intelligence: A Modern Approach (2nd Edition)*, by Stuart Russel and Peter Norvig, Prentice Hall, 2002

ISBN-10: 0137903952, ISBN-13: 978-0137903955

Reference Books:

• Artificial Intelligence Structures and Strategies for Complex Problem Solving by George

F Lugar, Addison Wesley, 4th Ed 2002

• Artificial Intelligence: A New Synthesis by Nils Nilsson, Morgan   Kaufman, 1997.

Objective:

The primary objective of this course is to provide an introduction to the basic principles and applications of Artificial Intelligence. Programming assignments are used to help clarify basic concepts. The emphasis of the course is on teaching the fundamentals, and not on providing a mastery of specific commercially available software tools or programming environments. In short, this is course is about the design and implementation of intelligent agents---software or hardware entities that perform useful tasks with some degree of autonomy.

Course Outcome:

Upon successful completion of the course, students will have an understanding of the basic areas of artificial intelligence including problem-solving, knowledge representation, reasoning, decision making, planning, perception and action, and learning. Students will also be able to design and implement key components of intelligent agents of moderate complexity in C and/or Lisp or Prolog and evaluate their performance. Graduate students

are expected to develop familiarity with current research problems, research methods, and the research literature in AI.

Course Outline:

Artificial Intelligence (AI) seeks to understand the mechanisms underlying thought and intelligent behavior, and their embodiment in machines. This course approaches AI by using Intelligent Agents as an integrating perspective on the key topics in intelligent behavior.

Topics	Allocated Periods
Introduction to AI Definitions (Acting Humanly, Cognitive, "laws of Thought", Rational agent approaches Historical perspective Physical symbol system hypothesis **Intelligent agents** Agents and Environment The concept of rationality Performance measures Omniscience, learning and autonomy Nature of environments, Task environments and their Properties **The Structure of agents** Simple Reflex agent Model based agent Goal Based agents Utility based agents Learning agents **Problem solving by searches**	45

Problem solving agents

Problem formulating

Measuring performance

Search Strategies

Uninformed Searches

Breadth first

Depth first

Depth limited

Iterative deepening depth-first

Bidirectional

Comparison of Uninformed problem solving methods

Informed searches

Greedy best-first

A* Heuristic Functions (learning, devising) Local search algorithms Hill climbing Simulating annealing Local beam Genetic algorithms **Constraints Satisfaction problems** Basics of CSP Structure of problems Backtracking, Forward chaining Variable and value ordering Intelligent backtracking Local searches for CSPs **Adversarial Searches** Games Optimal decisions Mini-max algorithm Alpha-Beta pruning **Logical agents** Knowledge-based agents Propositional logic (syntax, semantics) Conjunctive/disjunctive Normal form, Horn clauses	

Reasoning in Propositional logic	
Resolution	
Forward and backward chaining	
Reasoning algorithms	
First-Order Logic (syntax, semantics)	
Inference in FOL	
Conjunctive Normal form	
Unification and lifting, forward and backward chaining, resolution	
Comparison of two representational languages	
Machine Learning	
Introduction ,induction, Types of machine learning	
Nearest Neighbors	
Decision Trees	
Neural Networks	
Learning Conjunctions	
Linear and non Linear saparability	
Evaluating learning algorithms	
Natural language Understanding	
Levels of language analysis	
Types of grammar	
Parsing(Top-down, bottom-up) natural language applications.	