

1. AI

L-T-P-C: 3-1-0-4

Artificial Intelligence Course Description:

A course for introducing the basic principles, techniques, and applications of Artificial Intelligence.

Course Objective:

At the end of this class, we expect the students to be able to Identify, apply and solve problems using the AI tools and techniques that were introduced as part of this course. In addition, we want to introduce the students to interesting sub-fields of artificial intelligence, to enable them to pursue areas that they find interesting.

Prerequisites:

1. Intro to C programming
2. Overview of Computers
3. Data Structures and Algorithms
4. Advanced Data Structures and Algorithms

Note: The course number and name might vary based on the semester/year.

Syllabus:

Core Topics:

1. Introduction (AIMA Chapters 1-2)
 - a. Definition and history of AI
 - b. Introduction to Intelligent agents
2. Problem solving (AIMA Chapters 3)
 - a. Solving problems by searching
 - i. Uninformed searches
 - ii. Informed (heuristic) searches
3. Beyond classical search (AIMA Chapters 4-6)
 - a. Local Search
 - b. Adversarial search
 - c. Constraint satisfaction problems
4. Knowledge representation (AIMA Chapters 7-8)
 - a. Representing knowledge
 - b. Propositional logic
 - c. First-order predicate logic
5. Reasoning fundamentals (AIMA Chapter 9 & RETE)
 - a. Automated deduction
 - i. forward chaining
 - ii. backward chaining
 - b. reasoning techniques
 - i. Resolution (PL and FOL)
 - ii. RETE for forward chaining
6. Planning (AIMA Chapter 10,11)

- a. Planning via searching: state space or graph search
- b. Classical planning approaches

Additional Topics:

- 7. Uncertain knowledge and reasoning (AIMA Chapters 13, 14)
 - a. Basic probability and Bayes rule
 - b. Bayesian networks: representation and inference

Invited Lectures:

- 8. Introduction to important Sub-fields of Artificial Intelligence
 - a. Introduction to Machine learning
 - b. Introduction to Natural Language Processing
 - c. Introduction to Computer Vision
 - d. Introduction to Robotics

Tentative Teaching Plan:

Before Mid: Module 1 to 3

Before End Sem: Module 4 to 6

Note 1: We will follow the AIMA 3rd edition book very closely. Till Module 6 we have around 11 chapters, which is plenty of material to cover. Depending upon availability of time, we will cover module 7- extended topics.

Note 2: Module 8 is a series of guest lectures from experts in different subfields of AI. The guests could be industry experts or faculty (both internal or external). If we can't find guests, we will organize online lecture materials (NPTEL, etc.) and conduct discussion sessions to introduce the topics to the student.

Assessment:

- 1. Exams (70%)
 - a. Mid Sem (30%)
 - b. End Sem (40%) [*Semi-Comprehensive*]
- 2. Assignments (30%)
 - a. Assignment-1 (15%)
 - b. Assignment-2 (15%)

Notes on exams: The Mid-sem questions will involve problem solving exercises, theoretical definitions, algorithms, etc. We will test the students on the topics covered. End-sem is like mid-sem, but it will have an additional comprehensive section. This section will be used to test the students on all topics in AI course. But, most of the questions in the comprehensive section will be of objective type (MCQ or Fill-in-blank). All exams are closed book exams.

Notes on Assignments: Most or all assignments would involve programming and/or application of AI tool(s) to solve a problem. The students are expected to work on the problems on their own and not as a group.

Text Book:

- *Artificial Intelligence: A Modern Approach. Third Edition. – Stuart Russell and Peter Norvig (AIMA)*

References:

- *Building Problem Solvers – K.D.Forbus and J.D.Kleer*
- *Knowledge Representation and Reasoning– R. Brachman & H. Levesque*
- *Artificial Intelligence. Third Edition – Patrick Winston*

Course Webpage: TBD

Industry Relevance:

AI is applied to revolutionize many industries

Source: <https://www.forbes.com/sites/forbestechcouncil/2019/01/16/13-industries-soon-to-be-revolutionized-by-artificial-intelligence>