

Course Title and Code	CS432 - Artificial Intelligence
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I. **Course Identification and General Information:**

Course Title	Artificial Intelligence	Course Code	CS432	Pre-requisite	MATH 329
Department	Computer Science	Course Level	10	Credit Hours	3(2+1)

II. **Course Description/Topics:** The following course topics will be covered.

Artificial Intelligence - Introduction :

What is AI.
A brief history.
The state of the art.

Intelligent Agents:

Agents and environments.
Rationality.
PEAS (Performance measure, Environment, Actuators, Sensors).
Environment types Agent types.

Problem solving and search:

Problem-solving agents.
Problem types.
Problem formulation.
Example problems.
Basic search algorithms.

Informed search algorithms:

Best-first search.
A* search.
Heuristics

Local search algorithms :

Hill-climbing.
Simulated annealing.
Genetic algorithms.

Constraint Satisfaction Problems :

CSP examples.
Backtracking search for CSPs.
Problem structure and problem decomposition.
Local search for CSPs.

Game playing :

Games.
Perfect play :
minimax decisions.
 α - β pruning.
Resource limits and approximate evaluation.
Games of chance.
Games of imperfect information.

Planning :

Search vs. planning
STRIPS operators
Partial-order planning

First-order logic:

Why FOL.
Syntax and semantics of FOL.
Fun with sentences.
Wumpus world in FOL.

Uncertainty :

Probability .
Syntax and Semantics .
Inference .
Independence and Bayes' Rule.

Machine learning:

Classification by examples.
Decision trees induction.
Artificial Neural networks.
Naïve Bayes Classifier.
Unsupervised learning approach- clustering.

III. **Course Outcomes:** Summary of the main learning outcomes for students enrolled in the course.

- Describe the nature of AI using rational act and think concepts.
- Comparing and differentiate between the concepts of optimal reasoning/behavior and human-like reasoning/behavior.
- Describe a given problem domain using the characteristics of the environments in which a better intelligent agent design can be achieved.
- Comparisons between different search algorithms in terms of their efficiency, and the optimality.
- Experience with the concept of learning from the past to predict a better future.

IV. **Required Text:**

Artificial Intelligence: A Modern Approach(3rd Edition), Stuart Russell, and Peter Norvig.

V. **References:**

- Machine learning : A Probabilistic Perspective , Kevin P. Murphy