**Artificial Intelligence (Web Course)**

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**Detailed Syllabus :**

**Module 1:** Introduction to Artificial Intelligence

Lesson 1 Intro to AI: What is AI ? Examples of AI systems. Approaches to AI. Brief history of AI

Lesson 2 Intelligent Agent : stimulus-response agents. components of intelligence

**Module 2:** Problem Solving using Search - Single agent search

Lesson 3 Introduction to State Space Search Statement of Search problems: state space graphs. Searching explicit state spaces. Feature based state spaces. Problem types, examples (puzzle problem, n-queen, the road map, traveling salesman, etc.)

Lesson 4 Uninformed Search: Formulating the state space. Greedy search, breadth-first, depth-first, iterative deepening, bidirectional search

Lesson 5 Informed Search Strategies I - Using evaluation functions. A general graph-searching algorithm. Uniform cost search, A*, admissibility of A*

Lesson 6 Informed Search Strategies II - Iterative deepening A*, recursive best first search

**Module 3:** Problem Solving using Search -Two agent search

Lesson 7 Adversarial search: Two agent games. Minimax

Lesson 8 Two agent games : alpha beta pruning

**Module 4:** Constraint satisfaction problems

Lesson 9 Constraint satisfaction problems - I Definitions, examples, constraint-graph, backtracking, forward checking, constraint propagation (arc-consistency, path-consistency)

Lesson 10 Constraint satisfaction problems II dynamic ordering, incremental repair (min-conflicts heuristic), CSP and SAT, GSAT

**Module 5:** Knowledge Representation and Logic - Propositional Logic

Lesson 11 Propositional logic, syntax, semantics, semantic rules, terminology - validity, satisfiability. interpretation, entailment, proof systems

Lesson 12 Propositional Logic inference rules, natural deduction, propositional resolution

**Module 6:** Knowledge Representation and Logic - First Order Logic

Lesson 13 First Order Logic - I Motivation, Syntax, Interpretations, semantics of quantifiers

Lesson 14 First Order Logic - II Entailment in FOL, Interpretation

Lesson 15 Inference in FOL - I First Order resolution. Conversion to clausal form.

Lesson 16 Inference in FOL - II Unification. Most general unifier. Resolution with variables Proving validity

**Module 7:** Knowledge Representation and Logic - Rule based Systems

Lesson 17 Rule Based Systems - I Forward chaining. Backward chaining. Conflict resolution

Lesson 18 Rule Based Systems – II

**Module 8:** Other representation formalisms

Lesson 19 Semantic nets

Lesson 20 Frames - I

Lesson 21 Frames – II

**Module 9:** Planning - 4 lectures

Lesson 22 Logic based planning situation calculus, frame problem

Lesson 23 Planning systems : Describing states and goals. STRIPs. regression planning

Lesson 24 Planning algorithm - IL25. Planning algorithm – II

**Module 10:** Reasoning with uncertainty - Probabilistic reasoning

Lesson 26 Reasoning with uncertain information Review of Pobability Theory

Lesson 27 Probabilistic Inference

Lesson 28 Bayes Network

Lesson 29 A basic idea of inferencing with Bayes networks

**Module 11:** Reasoning with uncertainty - Fuzzy Reasoning

Lesson 30 Other paradigms of uncertain reasoning. Introduction to Fuzzy sets

Lesson 31 Fuzzy set representation. Fuzzy inferences

Lesson 32 Fuzzy reasoning – continued

**Module 12:** Machine Learning

Lesson 33 Learning : introduction

Lesson 34 Learning from Observations.

Lesson 35 Rule induction and Decision Tree - I

Lesson 36 Rule induction and Decision Trees - II

Lesson 37 Learning and Neural Networks - I

Lesson 38 Neural Networks - II

Lesson 39 Neural Networks – III

**Module 13:** Natural Language Processing

Lesson 40 Issues in NLP. Natural language understanding

Lesson 41 Parsing. Natural language generation