Chapter 1: Introduction. History of AI. Topics and types of application, different types of AI, inspiring disciplines.

Chapter 2. Intelligent Agents. Notion of agent and rationality. Rational vs human-like agents. Thinking vs acting. Different types of environments and their characteristics (PEAS). Characteristics of different types of agents. Rationality of agents in different environments.

Chapter 3: Solving problems by search: Representation of a problem and a solution, and the problem space. Problem solving through search. Tree versus graph search. Time and memory complexity, completeness and optimality of algorithms. Typical uninformed and informed search algorithms. Notion of heuristics and its role in search. Notions of admissibility and consistency, when and why they are important.

Chapter 4: Local search. Characteristics and representation of a state and problem space. Objective function and heuristic cost function. Typical algorithms such as simulating annealing, Hill-climbing, genetic algorithms.

Chapter 5: Adversarial search. Games and utility-based agents. Search when more than one agent actin the environment. Optimal decision. Heuristic evaluation function to estimate the value of a state. Minimax algorithm. How to limit search through pruning. Alpha-beta pruning.

Chapter 6: Constraint satisfaction problem. Representation of problem, constraint graphs. Inference in CSP. Node and arc consistency, and forward checking. Search in CSP, backtracts search. Search and inference combination. Heuristics for ordering variable assignment and value selection. Local search for CSP

Chapter 7: Logical Agents. Knowledge representation languages. Propositional logic, syntax and semantics. Representation of a problem using Propositional logic. Notions of model, validity, satisfiability, and entailment. Truth tables. Inference rules. Use of inference rules for theorem proving. Proof by resolution refutation. Conjuctive normal form. Horn Clauses. Backward and forward chaining. Planning using propositional logic

Chapter 8.: First order logic: Expressiveness of the language. Difference from propositional logic, quantification and variables.

Chapter 9: Inference in First order logic. Inference rules for quantifiers. Instantiation/elimination/propositionalisation of quantifiers. Skolemization and Standardization. Unification. Definite Clauses, and Forward and Backward chaining. Conjunctive normal form for FOL. Resolution Refutation in FLO.

Chapter 10: Classical planning. Planning in state-space vs plan-space. Heuristic in planning. Partial order vs total order planning. Mutex relations. Plan Graphs.

Chapter12: Knowledge representation. Ontologies, Category and objects. Hierarchical organisation of knowledge, inheritance-based inference. Semantic network, Frames, rule-based

Multi-agents and Game Theory: Utility-based agents. Notions of outcome and utility. Payoff matrix representation of states. One-shot games. Notions of Dominance, action profiles, dominant and dominated actions. Strategical behaviour, elimination of dominated actions. Applying these in different cardinal games, such as prisoners dilemma, stag hunt, etc. Notion of Nash equilibrium, pareto optimality and social welfare and their use for solving problems

Ethical aspects of AI: A short lecture touching EU and other regulations, common points of ethical concern of them. Bias, discrimination and unfairness related to machine learning for decision support systems. Mitigation of fairness and the ML pipeline. How to measure unfairness, possible metrics. Morality in ethics of philosophy, different perspectives, in particular deontological and consequentialist ones. Connection of these to AI methods. Moral machines.