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| **Course Title/ Code** | **Artificial Intelligence (CSH205B) T & P** |
| **Course Type:** | **Core (Departmental)** |
| **Course Nature:** | **Hard** |
| **L-T-P-O Structure** | **(3-1-2-0)** |
| **Objectives** | The student will be able to solve computationally complex problems using artificial intelligence techniques. |

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| **Syllabus** | **Sections** | **Weightage** |
| A | 25% |
| B | 25% |
| C | 25% |
| D | 25% |
| **TOTAL** | **100%** |

Students would be able to

**CO1.** Understand AI problems and their solutions.

**CO2.** Learn and apply searching algorithms.

**CO3.** Learn and apply techniques of representing knowledge.

**CO4.** Understand and learn reasoning and its types.

**CO5.** Understand and learn planning and its representation.

**CO6.** Understand and learn methods of learning.

CO7**.** Relate the above to applications and current trends in AI.

# Section-A

**Intelligent agents and AI Problems:** Introduction to AI, Foundation and History of AI, Turing Test, Intelligent Agents: Architectures, Types: reactive, deliberative, goal-driven, utility-driven, and learning agents, Applications and Current Trends of AI.

Problem Representation in AI, State Space Representation and Problem Reduction, Production Systems: Inference Engine, Working Memory, Knowledgebase and Control Strategy using Water Jug Problem and n-Queens Problem.

**Section-B**

**Search Strategies and Knowledge Representation:** Search Strategies: Uninformed Search Strategies, Informed Search strategies (Heuristic Search): Generate and Test, Hill Climbing, Best First Search, A\*algorithm, AO\*Algorithm, Constraint Satisfaction, Means End Analysis.

Game Playing: Minmax Strategy, Alpha-beta Pruning.

Introduction to Knowledge, Types of Knowledge, Issues in Knowledge Representation, Approaches to Knowledge Representation: Logic, Semantic Nets, Partitioned Semantic Nets, Frames and its types, Conceptual Dependency.

# Section-C

**Reasoning, Planning and Learning:** Logical agents: Propositional logic, Inferences, First-order Predicate Logic, Inferences in First-order Predicate Logic, Forward Chaining, Backward chaining, Unification, Resolution.

Reasoning under Uncertainty: Monotonic and Non-Monotonic Reasoning, Statistical Reasoning: Review of probability: Axioms of probability, Probabilistic inference, Probabilistic Reasoning(Bayes Theorem), Bayesian Networks, Inferences in Bayesian networks, Temporal and Spatial Reasoning, Dempster-Shafer Theory, Fuzzy Reasoning, Hidden Markov models. Planning with state-space search, partial-order planning, planning graphs.

Learning from observation, Inductive learning, Deductive learning, Decision trees, Explanation based  
learning, Statistical Learning methods, Machine Learning and its types: Supervised, Unsupervised and Reinforcement Learning, Natural Language Understanding, Overview of Natural Language Understanding and Deep Learning.

# Section-D

**Advanced Topics and Applications of AI:** Expert Systems: Architecture, Characteristics, Types, Advantages and Drawbacks, Knowledge Acquisition Principles, Study of MYCIN and DENDRAL, Overview of Knowledge Discovery from Databases, Web Intelligence, Robotics.

Semantic Webs, Natural Language Processing, Neural Networks, Genetic Algorithms, Big Data, Speech Processing.

**LIST OF EXPERIMENTS:**

1. Study of PROLOG.
2. Implementation of facts and rules with family tree.
3. Representing and solving AI problem by performing exercises on lists using PROLOG.
4. Representing and solving AI problem by performing exercises on Arithmetic and Relational operations using PROLOG.
5. Representing and solving AI problem by performing exercises on Strings using standard String Predicates in PROLOG.
6. Representing and solving AI/Gaming problem using searching algorithm in PROLOG.
7. Representing and solving AI problem by using sorting techniques in PROLOG.
8. Write a program to solve the problem of Tower of Hanoi.
9. Write a program to implement Water Jug problem.
10. Write a program to solve 8 queens problem.
11. Solve traveling salesman problem.
12. Solve monkey banana problem
13. Solve the classical Missionary Cannibals problem of AI.
14. Write a program to implement an Expert System.

**Text Books:**

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar B. Nair, Third Edition, TMH.
2. S. Russel and P. Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education.

**Reference Books:**

1. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem  
   solving”, Pearson Education.
2. J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers, 1998
3. Simon Haykin, “Neural Networks”, Pearson Education, Second Edition.