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| **INTRODUCTION TO ARTIFICIAL INTELLIGENCE &**  **MACHINE LEARNING** | | | | | | | |
| **Semester** | **V** | **Course Code** | | **CEAM-02** | **Credits** | | **4** |
| **Scheme of Instruction Hours/ Week** | | **L** | **T** | **P** | **TOTAL** | | |
| **3** | **0** | **2** | **42 Hrs/Sem** | | |
| **Scheme of Examination TOTAL = 150 marks** | | **TH** | **IA** | **TW** | **P** | **O** | |
| **100** | **25** | **0** | **0** | **25** | |

**Prerequisites:**

* Students are expected to be familiar with basics of mathematics.
* Ability to program in Python.

**Course Objectives:** The subject aims to introduce and equip students with knowledge on:

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| 1 | The course is designed to present an overview of the principles and practices of AI to address real-world problems and to develop a basic understanding of problem solving, knowledge representation, reasoning and learning methods of AI. |
| 2 | To introduces the concept of learning from data and develop a strong foundation for understanding important Machine Learning algorithms and their applications. |

**Course Outcomes:** At the end of course, students will be able to:

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| CO1 | Understand problem solving through search techniques and classify various types of learning. |
| CO2 | Discuss various knowledge representation methods for AI problems. |
| CO3 | Illustrate and apply learning techniques for real-time problems. |
| CO4 | Formulate solutions to various machine learning tasks. |

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| **UNIT -1** | |  |
| **Introduction to Artificial Intelligence:** Overview, Turing test, Applications. CH 1  **Problem Solving by Search:** Importance of search in AI, Defining the Problem, State space search, Problem Solving Approach to Typical AI problems, Problem characteristics, production system characteristics, BFS and DFS. . CH 2  **Predicate Logic:** Representing Knowledge as Rules, Representing simple facts in logic,  Computable functions and predicates, Unification and resolution. CH5,6 | | 12 Hrs |
| **UNIT -2** | |  |
| **Knowledge Representation:** Representation and Mapping, Approaches to knowledge Representation. CH4  **Weak slot and filter structure:** Semantic nets, partitioned semantic nets, Frames. CH9 | | 10 Hrs |
| **Strong Slot and Filter Structures:** Conceptual dependency, Scripts. CH10  **Game Playing:** Overview, Mini-Max Search Procedure, Adding alpha-beta cut offs, Additional refinements. CH12 | |  |
| **UNIT -3** | | |
| **Machine Learning:** Introduction, Designing a learning System, Issues in machine learning. (Full topic)  **Concept Learning**: Introduction, General to specific ordering of hypothesis, Finding a maximally specific hypothesis, Version Spaces, candidate elimination algorithms. (Till 2.5)  **Decision tree Learning**: Introduction, Appropriate problems for decision tree learning, Basic Decision Tree Learning Algorithm, Issues in decision tree learning. (3.1-3.4, 3.7)  **Bayesian Learning**: Introduction, Bayes theorem, Naive Bayes Classifier, K-Nearest neighbor classifier. (6.1-6.3, 6.9, 8.1,8.2) | | 10 Hrs |
| **UNIT -4** | | |
| **Clustering:** Introduction, k-Means Clustering, Expectation-Maximization Algorithm, Hierarchical Clustering. (7.1, 7.3, 7.4, 7.8)  **Linear Discrimination**: Introduction, Generalizing the Linear Model, Geometry of the Linear Discriminant, Gradient Descent, Logistic Discrimination. (10.1, 10.2, 10.3, 10.6, 10.7)  **Reinforcement Learning**: Introduction, Elements of Reinforcement Learning, Model Based Learning, Temporal Difference Learning. (19.1-19.5) | | 10Hrs |
| **TEXTBOOKS** | | |
| 1 | Elaine Rich and Kevin Knight, Artificial Intelligence, 2nd edition, McGraw Hill. | |
| 2 | Tom M Mitchell, Machine Learning, Indian edition, McGraw Hill. | |
| 3 | Ethem Alpaydin, Introduction to Machine Learning, 2ndEdition, The MIT Press. | |
| **REFERENCES** | | |
| 1 | Struart Russell and Peter Norvig, Artificial Intelligence, a Modern Approach, 3rd edition, Prentice Hall. | |
| 2 | Shaishalev-Shwartz and Shai Ben-David, Understanding Machine Learning (FromTheory to Algorithms), First Edition, Cambridge University Press. | |

**List of Experiments**

**(Minimum 08 Experiments to be performed from the following list in Python)**

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| **Sr. No.** | **Experiment** |
| 1 | Implementation of Breadth first search using list or queue. |
| 2 | Implementation of depth first search using list or stack. |
| 3 | Implementation of 2-gallon and 3-gallon water jug problem based on production rules. |
| 4 | Implementation of Tower of Hanoi puzzle using recursion. |
| 5 | Implementation of 8-puzzle Problem. |
| 6 | Implementation of game tree using min-max algorithm. |
| 7 | Implementation of decision tree for a given dataset. |
| 8 | Implementation of Naive Bayes Classifier. |
| 9 | Implementation of K-nearest neighbor hood classifier for the given dataset. |
| 10 | Implementation of K-means clustering algorithm. |
| 11 | Implementation of Hierarchical clustering algorithm. |
| 12 | Implementation of a problem using reinforcement learning. |