CSPC3003 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (3-0-0)

Course Objectives:

- To learn the concepts of Artificial Intelligence
- To learn the methods of solving problems using Artificial Intelligence
- To introduce the concepts of Expert Systems and machine learning

Module-I: (10 hours)

Introduction To AI –The Foundations of Artificial Intelligence; Agents and Environments, Intelligent Agent , Good Behaviour-The Concept of Rationality, the Nature of Environments, Structure of Agents.

Problem-solving and searching in AI- Iterative search, Uninformed search (Breadth-first search, Depth-first search, Uniform cost search), Informed (Heuristic) Search Strategies (Greedy best-first search, A* Search), Constraint Satisfaction Problem (CSP).

Module-II: (10 hours)

Adversarial search – Games, The Mini-Max algorithm, Alpha-Beta Pruning.

Knowledge Representations & Reasoning– logical agents, Knowledge-Based Agents, Logic, Reasoning Patterns in Propositional Logic & First-Order Logic, Resolution Using Propositional logic & First-Order Logic. Unification and Lifting, Forward Chaining, Backward Chaining,

Module-III: (08 hours)

Uncertainty – Reasoning with uncertainty (Probabilistic Reasoning) Bayes' rule, Bayesian Network Representation, Markov Models, Independence and Inference.

Expert Systems: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition

Module-IV: (06 hours)

Learning methods – Statistical Learning, Rote Learning, Learning by Taking Advice, Learning in Problem-solving, Learning from Examples: Induction, Explanation-based Learning.

Module-V: (08 hours)

Machine learning: Supervised learning, Unsupervised learning, Reinforcement learning

Machine Learning Paradigms- Regression (Linear, Logistic), Classification (decision trees, KNN, support vector machine, Naïve Bayes Classifier), Model Evaluation Metrics: Overfitting and underfitting, Clustering, Dimensionality Reduction, Neural Network basics, Ensemble learning.)

Course Outcomes

- Ability to comprehend AI & ES to analyze and map real world activities to digital world
- Ability to identify problems that are amenably solved by AI methods
- Ability to design and carry out an empirical evaluation of different AI algorithms

After completing this course, the student must demonstrate the knowledge and ability to:

CO1: Reason about the state-space search algorithm to use under different problem specific conditions.
CO2: Get deep insight of AI and its problem Solving techniques.
CO3: Implement probabilistic solutions for decision making such as Hidden Markov Models, Bayes' Networks, etc.
CO4: Learn and implement basic supervised methods like Decision Trees, Nearest Neighbours, Perceptron, Linear regression, Logistic regression, SVM and Ensemble Techniques.
CO5: Gain an understanding of basic unsupervised methods like Clustering.

Books:

1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill,3rd ed.,2009
2. Stuart Russell, Peter Norvig, Artificial Intelligence -A Modern Approach, 4/e, Pearson, 2003.
3. Nils J Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publications,2000.
4. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010
5. S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011
6. Aurlien Geron, Hands on Machine Learning with Scikit & TensorFlow- Concepts ,Tools & Techniques To Build Intelligent Systems