Course Name: **CS-245,Machine Learning**
Credit Hours: 2-1
Contact Hours: 2-3
Pre-requisites: Fundamentals of Computer Programing

Course Introduction:
Machine learning is one of the fastest growing areas of computer science, with far-reaching applications. The aim of this course is to: a) Present the basic machine learning concepts; b) Present a range of machine learning algorithms along with their strengths and weaknesses; c) Apply machine learning algorithms to solve problems of moderate complexity.

CLO No	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Describe basic machine learning concepts, theories and applications.	C1 (Knowledge)
CLO-2	Apply supervised learning techniques to solve classification problems of moderate complexity.	C3 (Apply)
CLO-3	Apply unsupervised learning techniques to solve clustering problems of moderate complexity.	C3 (Apply)
CLO-4	Apply reinforcement learning algorithms to environments with complex dynamics.	C3 (Apply)
CLO-5	Develop a reasonable size project using suitable machine learning technique.	C6 (Create)

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Course Outline:
Introduction to machine learning; concept learning: General-to-specific ordering of hypotheses, Version spaces Algorithm, Candidate elimination algorithm; Supervised Learning: decision trees, Naive Bayes, Artificial Neural Networks, Support Vector Machines, Overfitting, noisy data, and pruning, Measuring Classifier Accuracy; Linear and Logistic regression; Unsupervised Learning: Hierarchical Aglomerative Clustering. k-means partitional clustering; Self-Organizing Maps (SOM) k-Nearest-neighbor algorithm; Semi- supervised learning with EM using labeled and unlabled data; Reinforcement Learning: Hidden Markov models, Monte Carlo inference Exploration vs. Exploitation Trade-off, Markov Decision Processes; Ensemble Learning: Using committees of multiple hypotheses. Bagging, boosting.

Reference Materials:
1. Machine Learning, Tom, M., McGraw Hill, 1997.
2. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, MIT Press,2012.