# 19CS4101 - MACHINE LEARNING

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| **Course Category** | Professional Core | **Credits** | 3 |
| **Course Type** | Theory | **Lecture – Tutorial – Practical** | 3-0-0 |
| **Prerequisite** | Basic foundations in data Base and data Mining knowledge. | **Sessional Evaluation**  **Univ. Exam Evaluation**  **Total Marks** | 40  60  100 |
| **Objectives** | * Define machine learning and problems relevant to machine learning. * Differentiate supervised, unsupervised and reinforcement learning. * Apply neural networks, Bayes classifier and k nearest neighbor, for problems appear in machine learning. * Perform statistical analysis of machine learning techniques. | | |

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| **Course Outcomes** | Upon successful completion of the course, the students will be able to: | |
| CO1 | Recognize the characteristics of machine learning that make it useful to real-world Problems. |
| CO2 | Characterize machine learning algorithms as supervised, semi-supervised, and Unsupervised. |
| CO3 | Have heard of a few machine learning toolboxes. |
| CO4 | Be able to use support vector machines. |
| CO5 | Be able to use regularized regression algorithms. |
| CO6 | Understand the concept behind neural networks for learning non-linear functions. |
| **Course Content** | UNIT-I | |
| **Introduction:** Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.  **Concept Learning:** Concept learning task, Concept learning as search, Find-S**:**finding a maximally specific Hypothesis, Version space and Candidate Elimination algorithm, Inductive Bias. | |
| **UNIT-II** | |
| **Decision Tree Learning:** Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning. | |
| **UNIT-III** | |
| **Artificial Neural Networks:** Introduction, Neural Network representation, Appropriate problems, Perceptrons, Multilayer networks and Back propagation algorithm. | |
| UNIT-IV | |
| **Bayesian Learning:** Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Naïve Bayes classifier, Bayesian belief networks, EM algorithm. | |

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| **Course Content** | **UNIT-V** |
| **Evaluating Hypothesis:** Motivation, Estimating hypothesis accuracy, Basics of sampling theory, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms.  **Instance Based Learning:** Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning, |
| **UNIT-VI** |
| .**Reinforcement Learning:** Introduction, Learning Task, Q Learning, Non deterministic rewards and actions, Temporal difference learning, Generalizing from examples, relationship to dynamic programming.. |
| **Text Books and References:** | **TEXT BOOKS:**  1. Tom M. Mitchell, Machine Learning**,** India Edition 2013, McGraw Hill Education.  **REFERENCE BOOKS:**  1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical  Learning, 2nd edition, springer series in statistics.  2. EthemAlpaydın, Introduction to machine learning, second edition, MIT press. |
| **E-Resources** | 1. [https://nptel.ac.in/courses](about:blank) 2. [https://freevideolectures.com/university/iitm](about:blank) |