

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NMSC503	Machine Learning	3	1	0	4

Course Objective

In this course, one will be introduced to the foundations of machine learning along with some popular machine learning techniques. This will also give you insights on how to apply machine learning to solve a new business related problem. The course will be taught with popular software like R, and Python

Learning Outcomes

- To understand the concept of Machine Learning
- To develop understanding in various types of machine learning algorithm
- To develop the skill in application software like Python or R for solving business application problems through machine learning.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction: Basic Principles, Applications, Types, Challenges	4L	Students will learn the fundamental concepts of machine learning, types of learning and their challenges
2	Supervised Learning: Linear Regression (with one variable and multiple variables), Gradient Descent; Ridge and Lasso; Classification (Logistic Regression, Naïve Bayes, Decision Trees, kNN, Support Vector Machines); Artificial Neural Networks (Perceptron, Multilayer networks, and back-propagation);	12L+4T	Students will learn different types of supervised learning algorithms: classification/regression problems.
3	Unsupervised Learning: Clustering (K-means, Hierarchical, DBSCAN); Dimensionality reduction using Principal Component Analysis;	10L + 2T	Students will learn to find the structures and patterns in the data.
4	Theory of Generalization: Bias and Variance Analysis; Overfitting, Regularization; Ensemble Methods: Bagging, Boosting and Stacking. In-sample and out-of sample error, VC inequality, PAC Learning.	10L + 4T	Students will learn different types of error, and techniques to minimize error in the model.
5	Applications: Spam Filtering, recommender systems, Anomaly Detection and others	6L + 4T	Students will learn the implementation of different types of machine learning algorithms for real-life problems.
Total		42L + 14T	

Text Books:

1. "Understanding Machine Learning", Shai Shalev-Shwartz and Shai Ben-David. Cambridge University Press. 2017.

2. The Elements of Statistical Learning. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Second Edition. 2009.

Reference Books:

1. "Foundation of Data Science", Avrim Blum, John Hopcroft and Ravindran Kannan. January 2017.
2. "Machine Learning", Tom Mitchell, First Edition, McGraw-Hill, 1997.