Course Type	Course Code	Name of the Course	L	T	P	Credits
DC (Hons)	**NCSH303**	**INTRODUCTION TO MACHINE LEARNING**	3	1	0	4

Course Objective

This course provides a thorough understanding of machine learning techniques, algorithms, and applications. Students will learn the theoretical foundations of machine learning models through lectures. Understand the principles and methodologies of machine learning

Learning Outcomes

Develop skills in data preprocessing, model selection, and evaluation. Apply machine learning techniques to solve real-world problems and analyze datasets. Understand the principles and methodologies of machine learning. Explore advanced topics in machine learning, including deep learning and reinforcement learning

Unit No.	Topics to be Covered	Lecture+ Tutorial	Learning Outcome
1	**Introduction to Machine Learning**: Definition and types of machine learning, Overview of the machine learning process, nature of machine learning tasks using motivating applications.	6+2	Understanding introductory concepts and machine learning process.
2	**Supervised Learning**: Linear regression; Logistic regression Decision trees and ensemble methods (Random Forests, Gradient Boosting); Support Vector Machines (SVM).	8+3	Understanding Supervised learning techniques
3	**Model Evaluation and Selection**: Cross-validation; Evaluation metrics (accuracy, precision, recall, F1-score), Hyperparameter tuning.	6+2	Understanding Evaluation and Selection
4	**Unsupervised Learning**: Clustering algorithms (K-means, Hierarchical clustering), Dimensionality reduction techniques (PCA, t-SNE), Anomaly detection.	8+3	Understanding Unsupervised learning techniques
5	**Introduction to Deep Learning**: Neural networks architecture; Training neural networks with backpropagation; Convolutional Neural Networks (CNNs) for image classification; Recurrent Neural Networks (RNNs) for sequence modeling.	8+2	Understanding Deep Learning Techniques
6	Advanced Topics in Machine Learning; Reinforcement learning fundamentals; Deep reinforcement learning algorithms (Q-learning, Deep Q-Networks), Transfer learning and domain adaptation, Model interpretability and explainability	6+2	Understanding advanced topics in Machine Learning.
			Total: 42 (L) + 14 (T)

Text Books:

1. Christopher M. Bishop, “Pattern Recognition and Machine Learning", SPRINGER
2. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, “Deep Learning”, MIT Press

Reference Books:

1. Ethem Alpaydin, “Introduction to Machine Learning”, PHI Learning Pvt. Ltd, 2015.
2. Shai Shalev-Shwartz and Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge University Press, 2014.