Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NECD509	Machine Learning	3	0	0	3

Course Objective

Course Philosophy:

- Machine learning is an important component of the growing field of data science. Through the use of statistical methods, algorithms are trained to make classifications or predictions, uncovering key insights within data mining projects. These insights subsequently drive decision making within applications and businesses, ideally impacting key growth metrics. As big data continues to expand and grow, the market demand for data scientists will increase, requiring them to assist in the identification of the most relevant business questions and subsequently the data to answer them.

Learning Outcomes

- Distinguish between, supervised, unsupervised and semi-supervised learning.
- Apply the apt machine learning strategy for any given problem.
- Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem.
- Design systems that use the appropriate graph models of machine learning.
- Modify existing machine learning algorithms to improve classification efficiency.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Module 1: Introduction:** Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression..	06	• To understand the basics of machine learning. • To have a thorough understanding of the Supervised and Unsupervised learning techniques.
2	**Module 2:** LINEAR MODELS: Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines	06	• To understand the different linear models of Machine Learning
3	**Module 3:** TREE AND PROBABILISTIC MODELS: Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map	06	• To understand the concept of tree and various probability based learning techniques.
4	**Module 4:** DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS: Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process	06	• To understand the Dimensionality Reduction and Evolutionary Models of Machine Learning
5	**Module 5:** GRAPHICAL MODELS: Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models –	06	• To understand graphical models of machine learning algorithms

	Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods		
	Total	**42**	

Text book:

1. Tom M Mitchell, "Machine Learning", First Edition, McGraw Hill Education, 2017.

Reference books:

1. Ethem Alpaydin, "Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)", Third Edition, MIT Press, 2014.
2. Jason Bell, "Machine learning – Hands on for Developers and Technical Professionals", First Edition, Wiley, 2014
3. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.
4. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.