

Course Code	240119302			
Category	Core Course			
Course Title	Machine Learning			
Scheme and Credits	Theory	Tutorial	Lab	Credits
	3	0	4	5
Pre-requisites (if any)	Basic Knowledge of Python, Linear Algebra, Statistics and Probability Theory			

1. Course Objectives:

1	Able to remember and understand key features of machine learning and apply them to solve real-world problems
2	Able to understand and enable the student with basic knowledge of techniques to build an intelligent machine for making decisions on behalf of humans.
3	To be able to apply machine learning algorithms to solve problems of moderate complexity effectively.
4	Able to evaluate and compare different machine learning models and techniques for their effectiveness in various scenarios.
5	Understand the principles of biological neural networks and develop artificial neural network models to solve complex problems.

2. Course Contents:

Unit	Contents	Weightage
I	Machine Learning: Introduction, Human learning Vs Machine learning, how does ML works, Applications, benefits and risks of ML, ML vs Artificial Intelligence vs Deep Learning , Tools for Machine Learning, Types of Machine Learning: Supervised, Unsupervised, Semi Supervised and Reinforcement Learning, Comparison of all learning methods.	20%
II	Data Preprocessing: - An Overview of Data Preprocessing – Machine Learning activities, Basic Types of Data in Machine	

	Learning, Data Quality and Data Remediation (Finding Missing Data, Handling Outlier), Dimensionality Reduction, Selecting A model, Training a model(holdout method, k-fold cross validation method bootstrap sampling), model representation and interpretability, evaluating performance of a model, improving performance of a model, Introduction to feature engineering, feature transformation, feature subset selection, Introduction to Probability, conditional probability, Posterior Probability, Bayes's theorem.	20%
III	<u>Supervised Learning:</u> Overview, Advantages and disadvantages of supervised learning, its applications, classification model, classification learning steps, common classification algorithms(Decision tree, Random Forest, KNN, SVM, Naïve Bayes Classifier algorithm), example of regression, common regression algorithms (Simple, Multiple and Logistic Regression techniques)	20%
IV	<u>Unsupervised Learning:</u> Overview, Advantages and disadvantages of unsupervised learning, its application, Unsupervised learning versus supervised learning, clustering and its types (K-means and K-mediods algorithms, Hierarchical), Apriori algorithm for association rule learning.	20%
V	<u>Introduction to Neural Network:</u> Understanding the biological neuron, exploring artificial neuron, types of activation functions, early implementation of artificial neural network, architectures of neural network, learning process in artificial neural network, backpropagation, deep learning introduction.	20%

Course Outcome

Learning Outcome	Bloom's Taxonomy
Define key concepts of machine learning and distinguish between human learning and machine learning.	Remembering
Explain how machine learning works, including the tools used, and differentiate between supervised, unsupervised, and reinforcement learning.	Understanding
Apply data preprocessing techniques such as handling missing data, handling outliers, model training, and performance evaluation to prepare datasets for machine learning.	Applying

Analyze different machine learning algorithms (supervised and unsupervised) and their applications in real-world scenarios.	Analyzing
Evaluate the effectiveness and challenges of machine learning algorithms,	Evaluating
Create neural network models by understanding and applying the principles of artificial neurons, activation functions, and backpropagation to solve complex problems.	Creating

3. Reference Books:

- 1) Machine Learning By Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson Publication
- 2) Machine Learning with Python for Everyone, Mark Fenner, Pearson
- 3) Machine Learning, Anuradha Srinivasaraghavan, Vincy Joseph, Wiley
- 4) Peter Harrington, “Machine Learning in Action”, DreamTech
- 5) Henrik Brink, Joseph Richards, Mark Fetherolf, “Real-World Machine Learning”, DreamTech
- 6) Neural network: Architectures, algorithms and applications, prentice hall international, inc 1994.

4. Webliography:

<https://www.geeksforgeeks.org/machine-learning/>

https://www.tutorialspoint.com/machine_learning_with_python/index.htm

5. Tools: Python / Google Co-lab.**6. Accomplishment of the student after completing the course:**

After completion of the course students should be capable of developing a model based on different Algorithms, discover the patterns in user data, and solve business problems. The students can apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models. The students can perform the training of neural networks using various learning rules.