Course code	Essentials of Machine Learning	L	T	P	C
XXXX		3	1	0	4
Pre-requisite: Nil		Version			

Course Objectives:

It introduces theoretical foundations, algorithms, methodologies, and applications of Machine Learning also provide practical knowledge for handling and analysing data sets covering a variety of real-world applications.

This course is devised to learn and explore
1. Basic ability to understand the concept of supervised and unsupervised learning techniques
2. Differentiate regression, classification and clustering techniques and able to analyse the performance of various machine learning techniques
3. To select appropriate features for training, reduce the dimension of the dataset, to handle missing values and to combine different machine learning algorithm to achieve a better results.

Course Outcome:

After successfully completing the course the student should be able to
1. Recognize the characteristics of machine learning that makes it useful to solve real-world problems.
2. Provide solution for classification and regression approaches in real-world applications.
3. Apply Neural Networks and Support Vector Machines to solve a variety of classification problems.
4. Gain knowledge to combine machine learning models to achieve better results.
5. Solve real-world problems of machine learning solutions to clustering problems.
6. Understand methods to reduce the number of dimensions in a dataset.

Student Learning Outcomes (SLO):	2,5,7,9

2. Having a clear understanding of the subject related concepts and of contemporary issues
5. Having design thinking capability
7. Having computational thinking (Ability to translate vast data in to abstract concepts and to understand database reasoning)
9. Having problem solving ability- solving social   issues and engineering problems

Module	Topics	Hours	CO
Module:1	**Introduction to Machine Learning**	**6**	**1**
	What is Machine Learning, Examples of Various Learning Paradigms, Perspectives and Issues, Version Spaces, Finite and Infinite Hypothesis Spaces, PAC Learning		
Module:2	**Supervised Learning-I**	**6**	**2**
	Learning a Class from Examples, Linear, Non-linear, Multi-class and Multi-label classification, Generalization error bounds: VC Dimension, Decision Trees: ID3, Classification and Regression Trees, Regression: Linear Regression, Multiple Linear Regression, Logistic Regression		
Module:3	**Supervised Learning-II**	**8**	**3**

	History, Mathematical model of neuron, ANN architectures, Learning rules, Learning Paradigms. Perceptron network, Backpropagation network		
Module:4	**Unsupervised Learning**	7	4
	Introduction to clustering, K-Means Clustering, Self-Organizing Map, Principal Component Analysis		
Module:5	**Optimization Techniques**	7	5
	Derivative based Optimization – Descent Methods – Genetic Algorithms –Particle Swarm Optimization		
Module:6	**Recent Trends**	6	6
	Case Study - fraud detection, speech recognition, health care using machine learning techniques.		
	Total Lecture hours:	**40 hours**	

Teaching Pedagogy: Online Learning materials, Video Lectures and Case studies
Evaluation Criterion: Online Quiz, Digital Assignment, Case Study Analysis Report and Term End Examination

References:
1.Ethem Alpaydin , " Introduction to Machine Learning " , MIT Press, Prentice Hall of India, Third Edition 2014.
2. S.N Sivanandam, S N Deepa," Principles of Soft Computing", Wiley India, 2nd Edition, 2011.
Reference Books
1. Sergios Theodoridis, Konstantinos Koutroumbas, "Pattern Recognition", Academic Press, 4th edition, 2008, **ISBN:**9781597492720
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2012.
3. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition,1997.
4. Charu C. Aggarwal, "Data Classification Algorithms and Applications" , CRC Press, 2014.
5. Charu C. Aggarwal, "DATA CLUSTERING Algorithms and Applications", CRC Press, 2014.
    1. 6. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012

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