	Code & No:	CS 462
	Credits:	3(3+1+0)
Machine Learning	Pre-requisite:	STAT102
	Co-requisite:	
	Level:	9 or 10

Course Description: The course objective is to study the theory and practice of constructing algorithms that learn (functions) from data. Machine learning is a field with goals overlapping with other disciplines such as statistics, algorithms, engineering, or optimization theory. It also has wide applications in a number of scientific areas such as finance, life sciences, social sciences, or medicine. Python or R Language will be used for implementation of machine learning algorithms.

Course Aims:

1. To introduce students to the basics of mathematics for Machine Learning.
2. To give knowledge of algorithms used in Machine learning.
3. To develop skills of using recent machine learning software for solving practical problems.

Course Learning Outcomes (CLOs):

1. To know the mathematical principles required for machine learning
2. To understand various classification algorithms
3. To understand different regression algorithms and neural networks
4. To use graph models and ensemble models to solve problems in machine learning
5. To understand practical aspects of machine learning

No.	Topics	Weeks	Teaching hours
1	Introduction to Machine Learningand its applications	2	6
2	Supervised learning, Bayesian decision theory	2	6
3	Parametric methods Multivariate methods	1	3

4	Dimensionality reduction Clustering	1	3	
5	Nonparametric methods Decision trees	1	3	
6	Linear discrimination Multilayer perceptrons -Neural Network	1	3	
7	Kernel machines Graphical models	2	6	
8	Hidden markov models	1	3	
9	Ensemble methods Bagging-Boosting-Random forests	2	6	
10	Practical aspects in machine learning Data preprocessing-overfitting-accuracy estimation-parameter and model selection	1	3	
	Total	**14**	**42**	

Textbook:

Introduction to Machine Learning, Ethem Alpaydın, MIT Press, 3rd ed, 2014, ISBN: 978-0-262-02818-9

Essential References:

1. Practical Machine Learning with Python, Dipanjan Sarkar, Raghav Bali, Tushar Sharma, APRESS, 2018, ISBN: 978-1-4842-3206-4
2.The Elements of Statistical Learning - by T. Hastie, R. Tibshirani, and J. Friedman, 2009
3.Understanding Machine Learning: From Theory to Algorithms, 2014 by Shai Shalev-Shwartz and Shai Ben-David
4. Pattern Recognition and Machine Learning - by C. M. Bishop, Springer 2006