

**Semester-VI**
**Subject Name: Fundamentals of Machine Learning**
**Subject Code: 09CE1606**

**Objective:** This Course providing an introductory and overview of the field of ML with the focus of how to collect a data and and analyze data. To learn machine learning different methods and optimization techniques.

**Credits Earned:** 4 Credits

**Course Outcomes:** After completion of this course, student will be able to

- Understand machine-learning concepts.
- Understand Optimization theory and concepts.
- Understand and analyze different method and Techniques.
- Use of Different datasets analyze the data.
- Apply different algorithms and predict the output.

**Pre-requisite of course:** ML

**Teaching and Examination Scheme**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Term work (TW)	
2	0	4	4	50	30	20	25	25	150

**Contents:**

<b>Sr. No.</b>	<b>Content</b>	<b>Total Hrs</b>
<b>1</b>	<b>Linear Algebra for Machine learning</b> Basic introduction to linear algebra and Mathematics equations for Machine learning, Matrices, vectors in linear algebra	<b>4</b>
<b>2</b>	<b>Machine learning Introduction</b> What is machine learning and classification, Machine learning lifecycle, Different applications of ML. Difference between AI and machine learning Machine Learning and deep learning? Data Processing in machine learning.	<b>6</b>
<b>3</b>	<b>Supervised learning</b> How supervised learning works. Types of Supervised learning. Advantage and disadvantage of supervised learning, Regressions-Linear regression, regression trees, on-linear regression and polynomial regression. Classification –random forest, Decision tree, Logistic regression, support vector machine.	<b>8</b>
<b>4</b>	<b>Unsupervised learning</b> What is unsupervised learning and working of unsupervised learning? Types of unsupervised learning. Clustering algorithm k-means and KNN(k-nearest neighbors). Hierarchical clustering, anomaly's detection, neural network, component analysis and Apriori algorithm. Basics of reinforcement learning	<b>8</b>
<b>5</b>	<b>Tree based methods</b> Basics of decision tree, regression tree and classification tree. Trees vs linear models. Advantages and disadvantages of tree, random forests bagging and boosting.	<b>6</b>
		<b>32hrs</b>

**Texts and References:**

- 1) An Introduction to Statistical Learning, James, Witten, Hastie, Tibshirani, Springer, 6th Edition, 2015
- 2) The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Second Edition (Springer Series in Statistics) 2nd Edition
- 3) Introduction to Machine Learning, Second Edition, by Ethem Alpaydin, The MIT Press
- 4) Machine learning an algorithmic perspective by Stephen Marsland, CRC Press
- 5) Machine Learning in Action by Peter Harrington, Manning Shelter Island

**Suggested Theory distribution:** The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

<b>Distribution of theory for course delivery and evaluation</b>					
Remember	Understand	Apply	Analyze	Evaluate	Create
0%	40%	40%	20%	0%	0%

**List of Experiments**

1. Study most useful packages for machine learning and How to install packages in python.
2. Study how to download and load any datasets.
3. Study how to divide dataset into training set and testing set.
4. Create your own linear regression model in python.
5. Develop a cost function of linear regression using sample data.
6. Develop a Gradient descent of linear regression using sample data.
7. Build your own logistic regression model in python and check the accuracy.
8. Develop regularization in already developed logistic regression algorithm
9. Study regression using forecasting and predicting.
10. Create your own random forest model and predict the data.
11. Design an SVM model with use of python.
12. Study clustering algorithms using simple data.
13. Implement k-means algorithm using sample data.
14. Implement KNN algorithms using sample data.
15. Implement wholesale problem using hierarchical clustering.
16. Study anomaly detection techniques in python.
17. How to create simple neural network in python.
18. Study how does the apriori algorithm works.

19. Study reinforcement learning algorithm step by step.
20. Implement Decision tree method in python.
21. Implement random forests and decision tree from scratch in python.
22. Study different bagging and boosting algorithms.

**Instructional Method:**

- a) The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- b) The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c) Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d) Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory Supplementary Resources: 1. Machine Learning by Andrew NG on Coursera

**Supplementary Resources:**

1. Machine Learning by Andrew NG on Coursera
2. analyticsvidhya.com
3. geeksforgeeks.org
4. Javatpoint.com