

NIRMA UNIVERSITY
Institute of Technology
B. Tech. Computer Science and Engineering
Open Elective (open to all branches except Dept. of CSE, EC and IC Eng)

L	T	P	C
2	0	2	3

Course Code	2CSOE51
Course Title	Machine Learning

Course Outcomes:

At the end of the course, students will be able to –

1. comprehend statistical methods as basis of machine learning domain
2. learn variety of learning algorithms for appropriate applications
3. identify various machine learning techniques to solve problems in applicable domains

Syllabus:

**Teaching
Hours**

Unit I

Probability and Statistics: Empirical Probability, Theoretical Probability, Joint Probability, Bayes' Theorem, Descriptive Statistics, Measure of Center, Measure of Variability, Measure of Position

03

Unit III

Regression Techniques: Basic concepts and applications of Regression, Simple Linear Regression – Gradient Descent and Normal Equation Method, Non-Linear Regression, Linear Regression with Regularization, Hyper-parameters tuning, Loss Functions, Evaluation Measures for Regression Techniques

08

Unit IV

Classification Techniques: Basics of supervised learning, Naïve Bayes Classification, Fitting Multivariate Bernoulli Distribution, Gaussian Distribution and Multinomial Distribution, K-Nearest Neighbours, Decision trees, Random Forest

Support Vector Machines: Hard Margin and Soft Margin, Kernels and Kernel Trick, Evaluation Measures for Classification Techniques

11

Unit V

Artificial Neural Networks: Biological Neurons and Biological Neural Networks, Perceptron Learning, Activation Functions, Multilayer Perceptron, Back-propagation Neural Networks

04

23

Unit VI

04

Clustering: Basics of unsupervised learning, Hierarchical Agglomerative Clustering, k-means Algorithm, Self-Organizing Maps

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on applications of the above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings[^]:

1. Tom Mitchell, Machine Learning, TMH
2. C. Bishop, Pattern Recognition and Machine Learning, Springer
3. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification and Scene Analysis, Wiley
4. Kishan Mehrotra, Chilukuri Mohan and Sanjay Ranka, Elements of Artificial Neural Networks, Penram International
5. Rajjan Shinghal, Pattern Recognition, Techniques and Applications, OXFORD
6. Athem Ealpaydin, Introduction to Machine Learning, PHI

L=Lecture, T=Tutorial, P=Practical, C=Credit

[^]this is not an exhaustive list