NIRMA UNIVERSITY
Institute of Technology
B. Tech. Computer Science and Engineering
Semester – V

L	T	P	C
3	0	2	4

Course Code	2CS501
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. apply variety of learning algorithms for appropriate applications
3. implement machine learning techniques to solve problems in applicable domains
4. evaluate and compare algorithms based on different metrics and parameters.

Syllabus:

Teaching Hours: 45

Unit I **3**

Introduction: Motivation and Applications, importance of Data Visualization, Basics of Supervised and Unsupervised Learning

Unit II **14**

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

Unit III **10**

Classification Techniques: Naïve Bayes Classification, Fitting Multivariate Bernoulli Distribution, Gaussian Distribution and Multinomial Distribution, K-Nearest Neighbours, Decision trees.

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

Unit IV **9**

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

Unit V **4**

Clustering: Hierarchical Agglomerative Clustering, k-means Algorithm, Self-Organizing Maps

Unit VI 5

Advanced Concepts: Basics of Semi-Supervised and Reinforcement Learning, Linear Discriminant Analysis,Introduction to Deep Learning

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. Ethem alpaydin, Introduction to Machine Learning, PHI

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

^this is not an exhaustive list