NIRMA UNIVERSITY

Institute of Technology

M Tech Computer Science and Engineering

Semester – I

L	T	P	C
3	0	2	4

Course Code	6CS203
Course Name	Applied Machine Learning

Course Learning Outcomes (CLOs):

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

1. comprehend statistical methods as basis of machine learning domain
2. apply and evaluate variety of machine learning algorithms
3. implement machine learning techniques to solve problems in interdisciplinary domains

Syllabus:

	Teaching Hours
Unit I **Introduction:** Motivation and Applications, Basics of Supervised and Unsupervised Learning	3
Unit II **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, Decision Tree Regression, Evaluation Measures for Regression Techniques	13
Unit III **Classification Techniques:** Naïve Bayes Classification: Fitting Multivariate Bernoulli Distribution, Gaussian Distribution and Multinomial Distribution, K-Nearest Neighbours, Classification Trees, Linear Discriminant Analysis, Support Vector Machines: Hard Margin and Soft Margin, Kernels and Kernel Trick, Evaluation Measures for Classification Techniques	10
Unit IV **Artificial Neural Networks:** Biological Neurons and Biological Neural Networks, Perceptron Learning, Activation Functions, Multilayer Perceptrons, Back-propagation Neural Networks, Learning with Momentum, Winner-take-all Learning, Competitive Neural Networks, Adaptive ANN	9
Unit V **Clustering:** Hierarchical Agglomerative Clustering, k-means Algorithm, Self-Organizing Maps	4
Unit VI **Advances in Machine Learning:**Basics of Semi-Supervised and Reinforcement Learning, Introduction to Deep Learning, Best Practices for Machine Learning, Case Studies in interdisciplinary domain	6

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 above syllabus with minimum 5 experiments to be incorporated.

Suggested Readings^:

1. C. Bishop, Pattern Recognition and Machine Learning, Springer
2. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification and Scene Analysis, Wiley
3. KishanMehrotra, Chilukuri Mohan and Sanjay Ranka, Elements of Artificial Neural Networks, Penram International
4. Tom Mitchell, Machine Learning, TMH
5. RajjanShinghal, Pattern Recognition, Techniques and Applications, OXFORD
6. AthemEalpaydin, Introduction to Machine Learning, PHI
7. Andries P. Engelbrecht, Computational Intelligence - An Introduction, Wiley Publication
8. Andrew Kelleher, Adam Kelleher, Applied Machine Learning for Data Scientist and Software engineers, Addison-Wesley Professional

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

^this is not an exhaustive list