20IT5302–MACHINE LEARNING

Course Category:	ProgrammeCore	**Credits:**	4
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-2
Prerequisites:	---	**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	Understand the fundamental concepts of machine learning
CO2	Apply linear, distance based, and decision tree based models
CO3	Analyze probabilistic, neural network models
CO4	Design a suitable machine learning model for a given scenario

Contribution of Course Outcomes towards achievement of Program Outcomes (1-Low, 2-Medium, 3- High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1													1	
CO2	2	2											3	1
CO3	2	2											3	1
CO4	2	3											3	2

Course Content

UNIT I

The ingredients of machine learning: Tasks, Models, Features

Binary classification and related tasks: Classification, Assessing classification performance, Visualizing classification performance

Beyond binary classification: Multi-class classification, Regression, Unsupervised and descriptive learning

UNIT II

Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Inductive bias in decision tree, Issues in decision tree learning.

Linear models: The least-squares method, Multivariate linear regression, The perceptron, Support vector machines, Soft margin SVM, Going beyond linearity with kernel methods.

UNIT III:

Distance Based Models: Introduction, Neighbours and exemplars, Nearest Neighbours classification, K-Means algorithms, Clustering around medoids

Probabilistic Models: Using Naïve Bayes Model for classification, Expectation Maximization, Gaussian Mixture models

UNIT IV:

Artificial Neural Networks: Introduction, Neural network representation, appropriate problems for neural network learning, Multilayer networks and the

	back propagation, Advanced topics in Artificial Neural Networks **Reinforcement Learning:** Introduction, Learning tasks, Q-learning.
Text books and Reference books	**Text Book(s):** [1]. Machine Learning: The art and Science of algorithms that make sense of data, Peter Flach, Cambridge University Press, 2012 [2]. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education **Reference Books:** [1] AurélienGéron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems 2nd Edition [2] Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014 [3] EthemAlpaydın, Introduction to machine learning, second edition, MIT press. [4] T. Hastie, R. Tibshirani and J. Friedman, "Elements of Statistical Learning", Springer Series , 2nd edition
E-resources and other digital material	[1]. Kevin Murphy,"MachineLearning:AProbabilisticPerspective" , MIT Press, 2012, https://www.cs.ubc.ca/~murphyk/MLbook/pml-intro-5nov11.pdf [2] Machine Learning by Andrew Ng, Stanford University https://www.coursera.org/learn/machine-learning **[3] Professor S. Sarkar IIT Kharagpur "Introduction to machine learning" , https://www.youtube.com/playlist?list=PLYihddLF-CgYuWNL55Wg8ALkm6u8U7gps** [4] Professor Carl GustafJansson, KTH, Video Course on Machine Learning https://nptel.ac.in/noc/individual_course.php?id=noc19-cs35 [5]. Tom Mitchell, *"Machine Learning", http://www.cs.cmu.edu/~tom/10701_sp11/lectures.shtml*