

**Computer Science Paper II
Machine Learning
[Compulsory Course]**

Semester: III	Credits: 4	Subject Code: MS32002	Lectures: 48
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Course Outcomes:

At the end of this course, the learner will be able to:

- Recognize the characteristics of machine learning
- Develop an ability to estimate machine learning model efficiency using suitable metrics
- Evaluate real world problems using different machine learning techniques
- Process data using libraries and predict the outcome using machine learning algorithms
- Construct a machine learning model to solve real world problem.

Unit 1: Importance of Machine Learning	11
<ul style="list-style-type: none">• Chapter 1: Introduction to Machine Learning<ul style="list-style-type: none">○ Data Science, Artificial Intelligence and Machine Learning○ Why Learn and What is Learning, What is Machine Learning? Traditional Programming Vs. Machine Learning, Machine Learning Process, Types of Data, Key Elements of Machine Learning (Representation, Evaluation and Optimization) , Dimensionality Reduction (Feature Reduction)○ Types of analytics: Descriptive, Diagnostic, Inferential and Prescriptive○ Descriptive and Inferential Statistics: Probability, Distribution, Distance Measures (Euclidean and Manhattan), Correlation and Regression, Hypothesis Testing.○ Creating our own dataset, Importing the dataset, Handling Missing Data, Splitting the dataset into the Training set and Test set, Feature Scaling• Chapter 2: Machine Learning Models<ul style="list-style-type: none">○ Type of Learning- Supervised, Unsupervised and Reinforcement Learning○ Components of Generalization Error (Bias, Variance, underfitting, overfitting)○ A Learning System Cycle and Design Cycle Metrics for evaluation viz. accuracy, scalability, squared error, precision and recall, likelihood, posterior probability○ Classification Accuracy and Performance	6 5

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Unit 2: Supervised Learning	22
<ul style="list-style-type: none">• Chapter 3: Regression Models<ul style="list-style-type: none">○ Linear Regression - Simple, Multiple, Polynomial○ Non-linear Regression – Decision Tree, Support Vector, Random Forest• Chapter 4: Classification Models<ul style="list-style-type: none">○ K – Nearest Neighbours (KNN)○ Logistic Regression○ Naive Bayes Theorem○ Support Vector Machine○ Decision Forest Classification○ Random Tree Classification• Chapter 5: Clustering Models<ul style="list-style-type: none">○ K-means○ Hierarchical Clustering (Agglomerative, Divisive), Dendrogram○ Selecting optimal number of clusters: Within Clusters Sum of Squares (WCSS) by Elbow Method	6 10 6

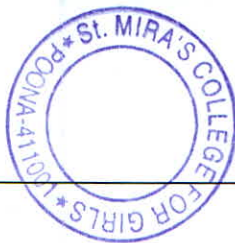
Unit 3: Unsupervised Learning	5
<ul style="list-style-type: none">• Chapter 6: Association Rules<ul style="list-style-type: none">○ Key Terms: Support, Confidence and Lift○ Large Item Set○ Apriori Algorithm○ Measuring the quality of association rules	5

Unit 4: Reinforcement Learning	5
<ul style="list-style-type: none">• Chapter 7: Reinforcement Learning<ul style="list-style-type: none">○ Upper Confidence Bound (UCB)○ Thompson Sampling○ Q-Learning	5

Unit 5: Artificial Neural Network	5
<ul style="list-style-type: none">• Chapter 8: Artificial Neural Network<ul style="list-style-type: none">○ Introduction to Artificial Neural Network○ Architecture of ANN○ Introduction to Deep learning	5

Contact Hours: 12 Hrs.

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Reference Books:

- Andriy Burkov, *The Hundred-Page Machine Learning Book*, Andriy Burkov
- Andreas C Muller and Sarah Guido, *Introduction to Machine Learning with Python*, Orielly
- Friedman, Jerome, Trevor Hastie, and Robert Tibshirani, *The elements of statistical learning*, Vol.1. Springer
- Rogers, Simon, and Mark Girolami. *A first course in machine learning*, CRC Press, 20
- Sutton, Richard S., and Andrew G. Barto, *Reinforcement learning: An introduction*, Vol.1. No. 1. Cambridge: MIT press
- Tom M Mitchell, *Machine Learning*, MC Graw Hill Education publication (Indian Edition)

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Faculty	Shubhangi Jagtap		
Faculty	Swati Pulate		
Faculty	Alka Kalhapure		
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