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| **Subject Name:** | | | | | | | **Machine Learning using Python** | | | | | | | | | | | | | | | | | | | **Subject Code:** | | | | | | | TMC- 205 | | | | |
| **Course Name:** | | | | | | | **Master of Computer Applications (MCA)** | | | | | | | | | | | | | | | | | | |  | | | | | | |  | | | | |
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| **1** | **Contact Hours:** | | | | | | | | | 45 | | |  | | | | | | | | | | | | | | **L** | | 3 | | **T** | | | 0 | | **P** | 2 |
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| **2** | **Examination Duration(Hrs):** | | | | | | | | | | | | | | |  | **Theory** | | | 0 | 3 |  | **Practical** | | | | | 0 | | 2 |  | | | | | | |
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| **3** | **Relative Weightage:** | | | | | | | | | |  | | | | **CWE:** | | | | 25 | **MTE:** | | | 25 | | **ETE:** | | | | 50 | | |  | | | | | |
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| **4** | **Credits:** | | | | | 0 | | 3 | |  | | | | | | | |  | |  | | |  | |  | | | |  | | |  | | | | | |
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| **5** | **Pre-Requisite:** | | | | | | | | | Understanding of programming language and fundamentals of statistics | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **6** | **Subject Area:** | | | | | | | | | Computer Science | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **7** | **Objective:** | | | | | | | | To enable student to learn and understand the concepts of Machine Learning and its implementation in Python. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| **8** | **Course Outcome:** | | | | | | | | | | | After completion of the course students will be able to | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **CO 1** | | | | To understand the concepts of machine learning. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **CO 2** | | | | To appreciate Classification and Regression algorithms. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **CO 3** | | | | To understand SVM and ANN algorithms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **CO 4** | | | | To understand the clustering algorithms. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **CO 5** | | | | To appreciate the concepts and algorithms of reinforcement learning. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **CO 6** | | | | To know about probabilistic graphic models. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **9** | | **Details of the Course:** | | | | | | | | | | | |  | | | | | | | | | | | | | | | | | | | | | | | |
| **Unit No.** | | | | **CONTENT** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **CONTACT HOURS** | | |
| **1** | | | | **UNIT I INTRODUCTION TO MACHINE LEARNING**  Machine Learning – Basic Concepts in Machine Learning – Types of Machine Learning – Examples of Machine Learning – Applications –The Bias-Variance - Data Pre-processing - Noise removal – Normalization - Principal Component Analysis – Independent Components Analysis.  **Suggested Activities:**  Install python and explore the packages required for machine learning including numpy, scikit- learn, and matplotlib. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **9** | | |
| **2** | | | | **UNIT II SUPERVISED LEARNING - I**  Linear Models for Regression – Multiple Regression – Logistic regression - KNN Algorithms - Neural Networks – Feed-Forward Network Functions – Error Back Propagation – Decision Tree – Evaluation of Classification Algorithms.  **Suggested Activities:**  Practical – Collection of data from different recourses and summarize the data.  Practical – Build linear, multi-linear, logistic Regression model to predict the data. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **9** | | |
| **3** | | | | **UNIT III SUPERVISED LEARNING II**  SVM Classifier – Soft and Hard Margin - Kernel Methods – Ensemble Methods – Bagging – Boosting  – Reinforcement Learning – Model based Reinforcement Algorithms – Model-free Reinforcement  Algorithms - Q-Learning and SARSA algorithms.  **Suggested Activities:**  Practical – Develop SVM model for a two-class problem, whose training points are distributed in a 2D plane and improve the performance of the model by applying kernel methods.  Practical – Implement bagging approach for credit card analysis. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **9** | | |
| **4** | | | | **UNIT IV UNSUPERVISED LEARNING**  Clustering – K-means – Hierarchical Clustering – EM Algorithm in General – Model Selection for  Latent Variable Models.  **Suggested Activities:**  Implement k-means algorithm to cluster the traffic data set based on accident type. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **8** | | |
| **5** | | | | **UNIT V PROBABILISTIC GRAPHICAL MODELS 10**  Directed Graphical Models – Bayes Theorem – Naïve Bayesian Classifier – Laplacian approximation - Bayesian Networks – Markov Models – Hidden Markov Models – Inference – Learning-Generalization.  **Suggested Activities:**  Assignment on solving numerical problem using HMM. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **10** | | |
|  | | | | **TOTAL** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **45** | | |
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| **10** | | **Suggested Books:** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |  | | |
| **Sl. NO.** | | | **NAME OF AUTHERS/BOOKS/PUBLISHERS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | **YEAR OF PUBLICATION** | | | | | | |
| **1** | | | Sridhar S and Vijayalakshmi M, “Machine Learning”, Oxford University Press | | | | | | | | | | | | | | | | | | | | | | | | | | | | **2021** | | | | | | |
| **2** | | | 1. Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer | | | | | | | | | | | | | | | | | | | | | | | | | | | | **2006** | | | | | | |
| **3** | | | Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas Muller | | | | | | | | | | | | | | | | | | | | | | | | | | | | **2016** | | | | | | |
| **4** | | | Python Machine Learning by [Sebastian Raschka](https://www.amazon.in/Sebastian-Raschka/e/B00J1DHHFS/ref=dp_byline_cont_book_1), [Vahid Mirjalili](https://www.amazon.in/Vahid-Mirjalili/e/B07D3Z52YP/ref=dp_byline_cont_book_2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | **2017** | | | | | | |
| **5** | | | Introduction to Machine Learning by [Alpaydin Ethem](https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Alpaydin+Ethem&search-alias=stripbooks), PHI | | | | | | | | | | | | | | | | | | | | | | | | | | | | **2015** | | | | | | |