SEMESTER S4

MACHINE LEARNING

Course Code	PEPET413	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. To learn and implement various machine learning algorithms.
2. To gain hands-on experience with machine learning frameworks and tools.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Python basics: Data types, control structures, functions, Introduction to Object-Oriented Programming (OOP),Classes and objects, inheritance, polymorphism, encapsulation. Advanced Python concepts: List comprehensions, lambda functions, decorators Introduction to NumPy , Scikit-learn and pandas for data manipulation, Hands-on with NumPy arrays and pandas Data Frames.	9
2	Recap on Linear Algebra Essentials: Vectors, matrices, and operations Eigenvalues and eigenvectors, Linear transformations. Calculus for Machine Learning: Differentiation and integration, Partial derivatives and gradients, Applications in optimization and learning algorithms. Probability theory: Basic concepts, distributions, Descriptive statistics: Mean, median, variance, Inferential statistics: Hypothesis testing, confidence intervals.	9

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	Data cleaning: Handling missing values, outliers, Data normalization and scaling Exploratory Data Analysis (EDA)	
3	Introduction to Supervised Learning: Linear regression: Simple and multiple linear regression. Classification: Logistic regression, decision trees, k-nearest neighbours (KNN). Performance metrics: Accuracy, precision, recall, F1-score.Introduction to Unsupervised Learning: Clustering: K-means, hierarchical clustering, DBSCAN. Dimensionality reduction: Principal Component Analysis (PCA), t-SNE.	**9**
4	Model Evaluation and Hyperparameter Tuning: Model evaluation techniques: Train-test split, cross-validation ,Hyperparameter tuning: Grid search, random search. Advanced Machine Learning Algorithms :Support Vector Machines (SVM),Ensemble methods: Bagging, boosting, random forests, Neural networks and introduction to deep learning.Case studies on machine learning applications in various domains.	**9**

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Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24 marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 subdivisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcomes	Bloom's Knowledge Level (KL)
CO1	Understand the principles and concepts of machine learning.	**K2**
CO2	Implement basic machine learning algorithms.	**K3**
CO3	Apply machine learning models to solve practical problems.	**K3**
CO4	Utilize machine learning frameworks and tools for developing and testing models.	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

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CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**-**	**-**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**3**	**3**	**2**	**3**	**-**	**2**	**1**	**-**	**-**	**-**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**-**	**2**	**1**	**-**	**-**	**-**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**-**	**2**	**1**	**-**	**-**	**-**	**3**

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Machine Learning	Tom Mitchell	McGraw-Hill	1st Ed. 2017
2	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	Aurelien Geron	O'Reilly Media	3rd Ed. 2020
3	Mathematics For Machine Learning	Marc Peter Deisenroth.	Cambridge University Press	1st Ed. 2020

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Deep Learning	Ian Goodfellow, Yoshua Bengio	MIT Press	1st Ed. 2016
2	Python Machine Learning	Sebastian Raschka and Vahid Mirjalili:	Packt Publishing	2nd Ed. 2017

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Video Links
Link ID
https://www.youtube.com/watch?v=jGwO_UgTS7I&list=PLoROMvodv4rMiGQp3WXShtMGgzqpfVfbU