SEMESTER S8

MACHINE LEARNING

Course Code	OEEVT 832	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 understand basics of machine learning and different types
2. To understand different machine learning algorithms.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Basics of machine learning, supervised and unsupervised learning, examples, features, feature vector, training set, target vector, test set, feature extraction, over-fitting, curse of dimensionality. Review of probability theory, Gaussian distribution, decision theory.	9
2	Regression: linear regression, error functions in regression, multivariate regression, regression applications, bias and variance. Classification : Bayes' decision theory, discriminant functions and decision surfaces, Bayesian classification for normal distributions, classification applications.	9
3	Linear discriminant based algorithm: perceptron, gradient descent method, perceptron algorithm, support vector machines, separable classes, non-separable classes, multiclass case.	9
4	Unsupervised learning: Clustering, examples, criterion functions for clustering, proximity measures, algorithms for clustering. Ensemble methods: boosting, bagging. Basics of decision trees, random forest, examples. Dimensionality reduction: principal component analysis, Fischer's discriminant analysis. Evaluation and model Selection: ROC curves, evaluation measures, Confusion matrix, recall, precision, accuracy.	9

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 =24marks)**	• 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 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

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

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Describe basics of machine learning and types.	**K2**
CO2	Differentiate regression and classification, apply Bayes' decision theory in classification	**K3**
CO3	Apply linear algebra and statistical methods in discriminant based algorithms	**K3**
CO4	Illustrate the basics of unsupervised learning, non-metric methods, ensemble methods, dimensionality reduction, evaluation, model selection.	**K2**

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

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2		2	-	-	-	-	-	-	-
CO3	3	2	2		2	-	-	-	-	-	-	-
CO4	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	Pattern Recognition and Machine Learning	Bishop, C. M.	Springer, New York	2006
2	Pattern Recognition	Theodoridis, S. and Koutroumbas, K.	Academic Press, San Diego	2003

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	The Elements of Statistical Learning	Hastie, T., Tibshirani, R. and Friedman, J.	Springer	2001
2	Pattern Classification	Duda, R.O., Hart, P.E.	Wiley, New York	2001

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://onlinecourses.nptel.ac.in/noc23_cs18/preview - Introduction to Machine Learning By Prof. Balaraman Ravindran, IIT Madras
2	https://onlinecourses.nptel.ac.in/noc23_cs18/preview - Introduction to Machine Learning By Prof. Balaraman Ravindran, IIT Madras
3	https://onlinecourses.nptel.ac.in/noc23_cs18/preview - Introduction to Machine Learning By Prof. Balaraman Ravindran, IIT Madras
4	https://onlinecourses.nptel.ac.in/noc23_cs18/preview - Introduction to Machine Learning By Prof. Balaraman Ravindran, IIT Madras