Machine Learning	L	P	C
	3		3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
ECE	6	PCE	PCE-3	ECE-350T
EAE	6	MLDA-EAE	MLDA-EAE-2C	ML-342T
CSE/IT/CST/ITE	7	PCE	PCE-5	CIE-421T
CSE-AIML	7	PC	PC	ML-407T
EAE	7	AIML-EAE	AIML-EAE-3	ML-407T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To understand the need of machine learning
2.	To learn about regression and feature selection
3.	To understand about classification algorithms
4.	To learn clustering algorithms

Course Outcomes (CO)

CO 1	To formulate machine learning problems
CO 2	Learn about regression and feature selection techniques
CO 3	Apply machine learning techniques such as classification to practical applications
CO 4	Apply clustering algorithms

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	3	3	3	3	2	2	-	-	-	-	2
CO 2	3	3	3	3	3	2	2	-	-	-	-	2
CO 3	3	3	3	3	3	2	2	-	-	-	-	2
CO 4	3	3	3	3	3	2	2	-	-	-	-	2

UNIT-I

Introduction: Machine learning, terminologies in machine learning, Perspectives and issues in machine learning, application of Machine learning, Types of machine learning: supervised, unsupervised, semi-supervised learning. Review of probability, Basic Linear Algebra in Machine Learning Techniques, Dataset and its types,Data preprocessing, Bias and Variance in Machine learning , Function approximation, Overfitting

UNIT-II

Regression Analysis in Machine Learning: Introduction to regression and its terminologies,Types of regression,Logistic Regression

Simple Linear regression: Introduction to Simple Linear Regression and its assumption, Simple Linear

Regression Model Building,Ordinary Least square estimation, Properties of the least-squares estimators and the fitted regression model, Interval estimation in simple linear regression , Residuals
Multiple Linear Regression:Multiple linear regression model and its assumption, **Interpret Multiple Linear Regression Output(R-Square, Standard error, F, Significance F, Cofficient P values), Access the fit of multiple linear regression model (**R squared, Standard error)
Feature Selection and Dimensionality Reduction: PCA, LDA, ICA

UNIT-III

Introduction to Classification and Classification Algorithms: What is Classification? General Approach to Classification, k-Nearest Neighbor Algorithm, Random Forests, Fuzzy Set Approaches
Support Vector Machine: Introduction, Types of support vector kernel – (Linear kernel, polynomial kernel, and Gaussiankernel), Hyperplane – (Decision surface), Properties of SVM, and Issues in SVM.
Decision Trees: Decision tree learning algorithm,ID-3algorithm, Inductive bias, Entropy and information theory, Information gain,Issues in Decision tree learning.
Bayesian Learning - Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm
Ensemble Methods: Bagging, Boosting and AdaBoost and XBoost,
Classification Model Evaluation and Selection: Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value, Lift Curves and Gain Curves, ROC Curves, Misclassification Cost Adjustment to Reflect Real-World Concerns, Decision Cost/Benefit Analysis

UNIT – IV

Introduction to Cluster Analysis and Clustering Methods: The Clustering Task and the Requirements for Cluster Analysis , Overview of Some Basic Clustering Methods:-k-Means Clustering, k-Medoids Clustering, Density-Based Clustering: DBSCAN - Density-Based Clustering Based on Connected Regions with High Density, Gaussian Mixture Model algorithm , Balance Iterative Reducing and Clustering using Hierarchies (BIRCH) , Affinity Propagation clustering algorithm,Mean-Shift clustering algorithm, ordering Points to Identify the Clustering Structure (OPTICS) algorithm, Agglomerative Hierarchy clustering algorithm, **Divisive Hierarchical** , Measuring Clustering Goodness

Textbook(s):

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (India) Private Limited, 2013.
2. M. Gopal, “Applied Machine Learning”, McGraw Hill Education

References:
1. C. M. BISHOP (2006), “Pattern Recognition and Machine Learning”, Springer-Verlag New York, 1st Edition
2. R. O. Duda, P. E. Hart, D. G. Stork (2000), Pattern Classification, Wiley-Blackwell, 2nd Edition