GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3170724
Semester – VII
Subject Name: Machine Learning

Type of course: Elective

Prerequisite: Programming and Data Structure, Algorithms, Probability and Statistics

Rationale: The objective of the course is to introduce the students with concepts of machine learning, machine learning algorithms and building the applications using machine leaning for various domains.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:g

Sr. No.	Content	Total Hrs
1	**Introduction to Machine Learning:** Overview of Human Learning and Machine Learning, Types of Machine Learning, Applications of Machine Learning , Tools and Technology for Machine Learning .	02
2	**Preparing to Model:** Machine Learning activities, Types of data in Machine Learning, Structures of data, Data quality and remediation, Data Pre-Processing: Dimensionality reduction, Feature subset selection.	04
3	**Modelling and Evaluation:** Selecting a Model: Predictive/Descriptive, Training a Model for supervised learning, model representation and interpretability, Evaluating performance of a model, Improving performance of a model.	05
4	**Basics of Feature Engineering:** Feature and Feature Engineering, Feature transformation: Construction and extraction, Feature subset selection : Issues in high-dimensional data, key drivers, measure and overall process	03
5	**Overview of Probability:** Statistical tools in Machine Learning, Concepts of probability, Random variables, Discrete distributions, Continuous distributions, Multiple random variables, Central limit theorem, Sampling distributions, Hypothesis testing, Monte Carlo Approximation	04
6	**Bayesian Concept Learning:** Impotence of Bayesian methods, Bayesian theorem, Bayes' theorem and concept learning, Bayesian Belief Network	05

7	**Supervised Learning: Classification and Regression:** Supervised Learning, Classification Model, Learning steps, Classification algorithms, Regression, Regression algorithms,	10
8	**Unsupervised Learning:** Supervised vs. Unsupervised Learning, Applications, Clustering, Association rules	06
9	**Neural Network:** Introduction to neural network, Biological and Artificial Neurons, Types of Activation functions, Implementation of ANN, Architecture, Leaning process, Backpropogation, Deep Learning	06

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
7	14	21	14	7	7

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Machine Learning, Saikat Dull, S. Chjandramouli, Das, Pearson
2. Machine Learning with Python for Everyone, Mark Fenner, Pearson
3. Machine Learning, Anuradha Srinivasaraghavan, Vincy Joseph, Wiley
4. Machine Learning with Python, U Dinesh Kumar Manaranjan Pradhan, Wiley
5. Python Machine Learning, Sebastian Raschka, Vahid Mirjalili, Packt Publishing

Course Outcomes:

Sr. No.	**CO statement**	**Marks % weightage**
CO-1	Explore the fundamental issues and challenges in Machine Learning including data and model selection and complexity	25
CO-2	Appreciate the underlying mathematical relationships within and across Machine Learning algorithms	15
CO-3	Evaluate the various Supervised Learning algorithms using appropriate Dataset.	25
CO-4	Evaluate the various unsupervised Learning algorithms using appropriate Dataset.	20
CO-5	Design and implement various machine learning algorithms in a range of real-world applications.	15

List of Experiments:

Minimum 10 Experiments are to be designed covering various activities and algorithms in machine learning with datasets from different domains

List of e-Learning Resources:

1. **https://www.geeksforgeeks.org/machine-learning/**
2. **https://www.tutorialspoint.com/machine_learning_with_python/index.htm**
3. **https://nptel.ac.in/**
4. **https://www.coursera.org/**