



**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**Syllabus for Integrated MSc, 8<sup>th</sup> Semester**  
**Branch: Computer Science**  
**Subject Name: Machine Learning**  
**Subject Code: 1380304**

**Teaching and Examination Scheme:**

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

**Content:**

Sr. No.	Content	Teaching Hours	Module Weightage (%)
1	<b>Introduction to Machine Learning:</b> Overview of Human Learning: Human Learning and its Types, Well Posed learning problem, Machine Learning and its Types, Applications of Machine Learning, Issues in Machine Learning, Tools and Technology for Machine Learning,	02	06
2	<b>Preparing to Model:</b> Steps in developing Machine Learning Application, Structures of data, DIKW pyramid, Types of data in Machine Learning, Data quality and remediation, Data Pre-Processing: Dimensionality reduction	04	07
3	<b>Modelling and Evaluation:</b> Selecting a model, Training a model for Supervised learning: Holdout Method, K-fold Cross Validation, Bootstrap Sampling, Lazy Vs Eager learner, Model representation and interpretability: Overfitting, Underfitting, Bias and variance, Model Performance Evaluation, Improving performance of a model	04	15
4	<b>Basics of Feature Engineering:</b> Introduction to Feature and Feature Engineering, Feature Transformation: Feature Construction and Feature Extraction, Feature Subset Selection	05	10
5	<b>Overview of Probability:</b> Basic concept of probability, Random variables, Discrete distribution, Continuous Distribution, Central limit theorem, Sampling distributions, Monte Carlo Approximation	05	10
6	<b>Supervised Learning</b> Basics of Supervised Learning; Decision Tree; K nearest neighbor methods, Bayes' Rule and Naive Bayes Model, Bayesian Belief Network, SVM - Introduction, Support	09	25



	Vectors & Margin, Random Forest, Regression, Regression algorithms		
7	<b>Unsupervised Learning:</b> Basics of Supervised Learning; Clustering Techniques, Association rules	06	20
8	<b>Basics of Neural Network:</b> Introduction to neural network, Biological and Artificial Neurons, Types of Activation functions, Implementation of ANN, Architecture of Neural Network, Backpropagation	05	07

**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"; Tom M. Mitchell; McGraw-Hill publications.
5. "MACHINE LEARNING: An Algorithmic Perspective; Stephen Marsland; CRC Press
6. Machine Learning: A Probabilistic Perspective, Kevin Murphy, MIT Press.

**Course Outcome:**

1. Explore the fundamental issues and challenges in Machine Learning including data and model selection and complexity
2. Appreciate the underlying mathematical relationships within and across Machine Learning algorithms
3. Evaluate the various Supervised Learning algorithms using appropriate Dataset.
4. Evaluate the various unsupervised Learning algorithms using appropriate Dataset and Understand the concept of Neural Networks.
5. Design and implement various machine learning algorithms in a range of real-world applications