GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering (Part Time)
Subject Code: 2970908
Semester – VII
Subject Name: AI and Machine learning

Type of course: Professional Elective Course

Prerequisite: Linear Algebra, Probability

Rationale:

Artificial Intelligence is now a day used in nontechnical and technical fields. In every branch of engineering the AI has been used and Electrical engineering is also one of them infect, the use of AI technique in Electrical engineering is inevitable. The branches of electrical Engineering like Electrical Power Systems, Power Electronics and Smart grid technologies are some of them. The course is aimed to provide exposure about the fundamentals of AI techniques and use of some basic machine learning algorithms to be used in electrical engineering and in other branches of electrical engineering too; the commonly used AI techniques from the application viewpoints will be covered in the this course.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE Viva (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Contents:

Sr. No.	Content	Total Hrs
1	**Introduction:** Scope of the Course, Introduction to AI, Brief review of History of AI, Related fields	03
2	**Introduction to Artificial Neural Networks:** Biological Neurons and Biological Neural Networks, Artificial Neural Networks, Activation Functions, Perceptron NN, Multilayer Perceptron NN, Back-propagation Neural Networks, Training Methods, Basic definition of supervised and unsupervised Learning.	07
3	**Introduction to Machine Learning:** Introduction (Different Types of Learning) Hypothesis Space, Inductive Bias, Evaluation and Cross Validation	02
4	**Main Algorithms used in Machine Learning:** Linear Regression, Decision Trees, Learning Decision Trees, K-nearest Neighbour, Collaborative Filtering, Overfitting, Dimensionality Reduction Technique :Feature Selection, Feature Extraction	08
5	**Logistic Regression and Support Vector Machine:** Logistic Regression, Introduction to Support Vector Machine, The Dual Formation, Maximum Margin with Noise, Nonlinear SVM and Kernel Function, SVM: Solution to the Dual Problem	06
6	**Advanced Learning methods and Clustering:** Introduction to Clustering, K-means Clustering, Agglomerative Hierarchical Clustering, Basics of Semi-Supervised and Reinforcement Learning, Introduction to Deep Learning	06

7	. **Fuzzy Logic** Introduction , Conventional set vs fuzzy set, Operations of fuzzy set , Membership function, Fuzzy rules, Fuzzy inference, De-fuzzification,, Application for control	**06**
8	**Genetic algorithm** Introduction, Comparison with traditional optimisation Technique, Steps for GA, reproduction, Crossover, Mutation, Termination parameter of GA, Application.	**07**

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**25**	**30**	**15**	**10**	**10**

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

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Machine Learning with Python for Everyone, Mark Fenner, Pearson
2. Machine Learning, Anuradha Srinivasaraghavan, Vincy Joseph, Wiley
3. Machine Learning with Python, U Dinesh Kumar Manaranjan Pradhan, Wiley
4. Neural Networks, Fuzzy Logic, and Genetic Algorithms : Synthesis and Applications By S. Rajshekharan, G. A. Vijayalakshmi Pai, PHI
5. KishanMehrotra, Chilukuri Mohan and Sanjay Ranka, Elements of Artificial Neural Networks, Penram International
6. Tom Mitchell, Machine Learning, TMH
7. AthemEalpaydin, Introduction to Machine Learning, PHI
8. Andries P. Engelbrecht, Computational Intelligence - An Introduction, Wiley Publication

Course Outcomes:

After completing the course, students will be able to;

Sr. No.	**CO statement**	**Marks % weightage**
CO-1	Learn the basic concepts of how to use various AI techniques.	25
CO-2	Learn, realize and implement various basic machine learning algorithms.	25
CO-3	Learn the appropriateness and steps to use fuzzy systems and Genetic algorithm for engineering problem solving	25
CO-4	Comprehend basic concepts of Neural network and use of machine learning for training	25

List of Open Source Software/learning website:

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