



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3170319**

**Semester – VII**

**Subject Name: Fundamentals of Artificial Intelligence**

**Type of course:** Open Elective

**Prerequisite:** Basic Mathematics, Artificial Neural Network, Python Programming

**Rationale:** The subject is intended to provide basic knowledge Pertaining to artificial intelligence and Machine learning. The subject will enable students to learn recent trends in the domain of artificial intelligence. The subject will provide students with hands-on experience to create an expert system.

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

## Content:

Sr. No.	Content	Total Hrs
1	Introduction to AI Introduction - The Turing Test - Roots of AI - Techniques Used in AI - Subfields of AI - Considerations for Knowledge Representation	4
2	Introduction to ML Introduction - Types of Machine Learning - Discipline of Machine Learning - Learning Model - Clases of Learning - Inductive Learning - Discovery based Learning - Reinforcement Learning -Symbol Based Learning- Explanation Based Learning -Machine Learning Application- Basic Research Problems in Machine Learning	6
3	Expert Systems: Rule-based expert systems - knowledge representation - expert system development - Structure - characteristics - Forward chaining and backward chaining inference - Advantages and disadvantages - Uncertainty management in rule-based expert systems - probability theory - Bayesian reasoning - FORECAST: Bayesian accumulation of evidence	8
4	Implementation of AI algorithms: Classification and Regression Using Supervised Learning - Detecting Patterns with Unsupervised Learning - Predictive Analytics with Ensemble Learning - Logic Programming - Case Study: Building A Speech Recognizer, Object Detection and Tracking	6
5	Fuzzy Systems Classical set Vs Fuzzy set – Operation and Properties –Fuzzy Relations – Fuzzy Logic control – Fuzzification, Membership functions- Defuzzification, Rule Based System, and Applications.	6
	<b>Total</b>	30



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**Suggested Specification table with Marks (Theory):**

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	25	20	20	15	-

**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. K. R. Chowdhary, "Fundamentals of Artificial Intelligence", Springer, 2020 (Unit - I)
2. Jang J.S.R., Sun C.T and Mizutani E, "Neuro Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence", Prentice Hall, 2008. (Unit - IV)
3. Michael Negnevitsky, Artificial Intelligence- A guide to intelligent systems, Pearson Education, second edition, 2005 (Unit - II, V)
4. Prateek Joshi, "Artificial Intelligence with Python", Packt Publishing, 2017 (Unit - III)
5. Mariusz Flasiński, Introduction to Artificial Intelligence, Springer, 1st edition, 2016

### Course Outcomes:

**At the end of this course students will be able to**

Sr. No.	CO statement	% weightage
CO-1	Understand the basics of Artificial Intelligence and its applications.	15%
CO-2	Understand the basics of Machine Learning and its applications.	20%
CO-3	Introduction to Rule based Expert system and uncertainty management in Rule based expert systems.	25%
CO-4	Implement Different AI algorithms in Python.	20%
CO-5	Understand and implement the basics of Fuzzy logic, Fuzzy System and its applications.	20%



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## **List of Experiments:**

1. Install suitable python IDE with all required modules.
2. Implement a logistic regression classifier in python.
3. Implement a Naïve Bayes classifier in python.
4. Implement data Clustering with the K-Means algorithm in python.
5. Implement a linear classifier using Support Vector Machines (SVMs) in python.
6. Implement a nonlinear classifier using SVMs in python.
7. Build a Puzzle solver in python.
8. Development of Fuzzy Membership Functions and fuzzy set Properties
9. Development of Logic for Fuzzy Relations.
10. Design of a Fuzzy controller for FAN speed controller using Fuzzy tool of Matlab.

**Major Equipment: Computer/Laptop**

**Software: Matlab, Python**

## **List of Open Source Software/learning websites:**

1. <https://github.com/PacktPublishing/Artificial-Intelligence-with-Python>.
2. <https://github.com/PacktPublishing/Python-Real-World-Machine-Learning>