GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Internet of Things

Course / Subject Code : ME01062041

Course / Subject Name: Fundamentals of Artificial Intelligence

w. e. f. Academic Year:	2024-25
Semester:	1st Semester
Category of the Course:	PEC I

Prerequisite:	Higher Engineering Mathematics, Critical thinking and problem-solving skills, Proficiency with algorithms, Good analytical skills, Programming skills.
Rationale:	To provide the students with the concepts of the main abstractions and reasoning for intelligent systems. To develop the skills to gain a basic understanding of logic theory, soft computing techniques such as neural network theory, fuzzy logic and genetic algorithms.

Course Scheme:

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
				Theory		Practical		
L	T	PR	C	ESE (E)	PA(M)	ESE (V)	PA (I)	
03	00	02	04	70	30	30	20	150

Course Content:

Sr No	Course Content	No of Hours	% of Weightage
1	**UNIT- I: Introduction to Artificial Intelligence(AI):** Introduction and definition of Artificial Intelligence, Intelligent Agents: Agents and Environments, Rationality, Nature of Environment, Structure of Agent, types of Agent,	07	15
2	**UNIT-II: Problem Solving by Intelligent Search:** Searching for solutions, uninformed search strategies – Breadth-first search, depth-first search. Search with partial information (Heuristic search) Hill climbing, A*, AO*	07	15

3	**UNIT-III: Soft Computing:** Soft Computing: Introduction of soft computing, soft computing Vs. hard computing, various types of soft computing techniques, Some applications of Soft computing techniques. Introduction to Fuzzy Set: Fuzzy set theory, Fuzzy set Vs crisp set, Crisp relation & fuzzy relations, membership functions, Fuzzy Logic: Fuzzy Logic basics, Fuzzy Rules and Fuzzy Reasoning, Fuzzy inference systems: Genetic algorithm: operators and constraints in genetic algorithm	10	25
4	**UNIT-IV: Artificial Neural Network:** Introduction –Fundamental concept - Basic Models of Artificial Neural Networks –Important Terminologies of ANNs - McCulloch-Pitts Neuron, Neural Network Architecture: Perceptron, Single layer Feedforward ANN, Multilayer Feed Forward ANN, Supervised Learning: Delta learning rule, Un-Supervised Learning algorithm: Self Organizing Maps	10	20
5	**UNIT-V: AI for IOT:** Predictive Maintenance in IoT, Data-driven Approaches for Smart Homes and Cities, Ethical AI for IoT Security, Resource-constrained AI: Power and Performance, AI Algorithms for Edge Computing Security Challenges in Edge Computing for IoT, Healthcare (AI-driven Healthcare IoT Solutions and data analytics,), and Industry 4.0	08	25

Reference Book:

1. Elaine Rich and Kevin Knight Artificial Intelligence Third Edition, Tata McGraw-Hill Education Pvt. Ltd., 2008. Stuart J. Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach, Second Edition”, Pearson Education.
2. Samir Roy and Chakraborty, Introduction to soft computing, Pearson Edition.
3. AI for IoT: Data-driven Applications and Advances by Abdelrahman Elziny, Neha Kaul, CRC press, ISBN: 978-0367769823
4. Edge AI: The Guide to Machine Learning at the Edge in IoT by Xiaofei Wang, Bo Jiang, et al., Springer Nature, 2020
5. S.N.Sivanandam, S.N.Deepa “Principles of Soft Computing” Second Edition, Wiley Publication.
6. S.Rajasekaran and G.A.VijayalakshmiPai “Neural Networks, Fuzzy Logic and Genetic Algorithms” PHI Learning.

Course Outcome:

After completion of the Course, Students will be able to:

No	Course Outcomes	RBT Level*
01	Understand the basic concepts of artificial intelligence and soft computing	UN
02	Analyze various techniques of fuzzy logic, fundamental theory and concepts of neural network	AN
03	Apply basic principles of AI in solutions that require problem-solving by intelligent search	AP
04	Apply AI techniques to IoT devices.	AP
05	Evaluate the performance of genetic algorithms to combinatorial optimization problems	EL

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Suggested Course Practical List:

At least 10-12 practicals based on topics of the syllabus have to perform either in tools or in hardware kits.

List of Laboratory/Learning Resources Required:

- List of Hardware: Deep Learning Models to NI Hardware
- List of Open Source Tools/Simulators: MxNet. Keras, PyTorch, CNTK., Auto ML. OpenNN, H20:
- Open Source AI Platform, Google ML Kit.
- List of Useful websites/MOOCs: Introduction to Soft Computing By Prof. Debasis Samanta | IIT Kharagpur

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