Uka Tarsadia University

B. Tech.

CSE / CSE (AI&ML) / CSE (CC) / CSE (CS) / CE / CE (SE) / IT

Semester VI

Program Elective -IV

ARTIFICIAL INTELLIGENCE

AI5021

FFECTIVE FROM December-2024

Syllabus version: 1.00

Subject Code	Subject Title
AI5021	**Artificial Intelligence**

Teaching Scheme				Examination Scheme			
Hours		Credits		Theory Marks		Practical Marks	Total Marks
Theory	Practical	Theory	Practical	Internal	External	CIE	
3	0	3	0	40	60	0	100

Objectives of the course:

- To unfold the foundational principles of artificial intelligence and aligned branches.
- To provide breadth and depth of several approaches required to design artificially intelligent systems.

Course outcomes:

Upon completion of the course, the student shall be able to,

CO1: Understand foundation of artificial intelligence and problem solving with intelligent agent.
CO2: Understand the logical agents and apply planning with logical agents.
CO3: Understand uncertain knowledge and reasoning.
CO4: Understand types of learning and apply statistical methods of solving real world problems.
CO5: Apply deep learning techniques for communication and perceiving in real environment.
CO6: Understand and discuss ethics and future of artificial intelligence.

Sr. No.	Topics	Hours
	Unit – I	
1	**Introduction to Artificial Intelligence (AI):** What is AI? The foundation of AI, The history of AI, Risks and Benefits of AI. **Intelligent Agent:** Agents and Environments, The concept of rationality, The nature of environment, The structure of agents.	8

2	**Solving Problems by Searching:** Problem solving agents, Search algorithms, Uninformed search strategies, Heuristics search strategies, Heuristics functions.	
Unit – II		
3	**Logical Agents and Planning:** Knowledge based agents, Classical planning, Algorithms for classical planning, Heuristics for planning, Hierarchical planning, Planning and Acting in nondeterministic domains.	8
Unit – III		
4	**Uncertain Knowledge and Reasoning:** Acting under uncertainty, Probability notations, Inference using full joint distributions, Independence, Bayes' rule, Naïve Bayes' models, Probabilistic reasoning over time.	6
Unit – IV		
5	**Learning from examples:** Forms of learning, Supervised learning, Learning decision trees, Model selection and optimization, The theory of learning, Linear regression, Linear classification, The concept of deep learning – Feedforward networks, Convolutional networks, Learning algorithms, Generalization, and Recurrent networks, Reinforcement learning.	9
Unit – V		
6	**Communicating, Perceiving, and Acting:** Natural Language Processing (NLP), Deep learning for natural language processing – Word embeddings and Sequence-to-Sequence models.	8
Unit – VI		
7	**Philosophy, Ethics, Safety, and Future of AI:** The limits of AI, Can machines really think? The ethics of AI, The Future of AI – AI Components and Architecture.	6

Text book:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson, Fourth Edition, ISBN 978-93-560-6357-0.

Reference books:

1. Kevin Knight and Elaine Rich, "Artificial Intelligence", Third Edition, TMH Publication.
2. Melanie Mitchell, "Artificial Intelligence: A Guide for Thinking Humans", Farrar, Straus and Giroux Publication, ISBN 0374257833.
3. Thomas Mitchell, "Machine Learning", TMH Publication, ISBN 978-0070428072.
4. Alpaydin Ethem, "Introduction to Machine Learning", MIT Press, ISBN 978-8120350786.
5. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer Publication, ISBN 978-1493938438.
6. Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong, "Mathematics For

Machine Learning", Cambridge University Press, ISBN 978-1108455145.
7. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, ISBN 978-0262018029.
8. Aaron Courville, Ian Goodfellow, and Yoshua Bengio, "Deep Learning", MIT Press, ISBN 978-0262035613.
9. Charu C. Aggarwal, "Neural Networks and Deep Learning", Springer Publication, ISBN 978-3-030-06856-1.
10. Richard S. Sutton, Andrew G. Barto, and Francis Bach, "Reinforcement Learning: An Introduction", MIT Press, ISBN 978-0262039246.
11. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, and Jonathan Taylor, "An Introduction to Statistical Learning: with Applications in Python", Springer Publication, ISBN 978-3031387463.

Course objectives and Course outcomes mapping:

- To unfold the foundational principles of artificial intelligence and aligned branches: CO1, CO2, CO3, CO4, and CO5.
- To provide breadth and depth of several approaches required to design artificially intelligent systems: CO2, CO4, and CO5.

Course units and Course outcomes mapping:

Unit No.	Unit Name	Course Outcomes					
		CO1	CO2	CO3	CO4	CO5	CO6
1	Intelligent Agents and Problem Solving by Searching	✓					
2	Logical Agents and Planning		✓				
3	Uncertain Knowledge and Reasoning			✓			
4	Learning from Examples				✓		
5	Communicating, Perceiving, and Acting and Machine Vision, and Robotics					✓	
6	Philosophy, Ethics, Safety, and Future of AI						✓

Programme outcomes:

PO 1: Engineering knowledge: An ability to apply knowledge of mathematics, science, and engineering.

PO 2: Problem analysis: An ability to identify, formulates, and solves engineering problems.

PO 3: Design/development of solutions: An ability to design a system, component, or process to meet desired needs within realistic constraints.

PO 4: Conduct investigations of complex problems: An ability to use the techniques, skills, and modern engineering tools necessary for solving engineering problems.

PO 5: Modern tool usage: The broad education and understanding of new

engineering techniques necessary to solve engineering problems.

PO 6: The engineer and society: Achieve professional success with an understanding and appreciation of ethical behavior, social responsibility, and diversity, both as individuals and in team environments.

PO 7: Environment and sustainability: Articulate a comprehensive world view that integrates diverse approaches to sustainability.

PO 8: Ethics: Identify and demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work.

PO 9: Individual and team work: An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give/receive clear instructions.

PO 11: Project management and finance: An ability to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: recognition of the need for, and an ability to engage in life-long learning.

Programme outcomes and Course outcomes mapping:

Programme Outcomes	Course Outcomes					
	CO1	CO2	CO3	CO4	CO5	CO6
PO1				√	√	
PO2		√	√	√	√	
PO3						
PO4						
PO5				√	√	
PO6						
PO7						
PO8						
PO9						√
PO10						
PO11						
PO12	√					√