

Artificial Intelligence and Applications

B. Sc. (Information Technology)		Semester – V	
Course Name: Artificial Intelligence and Applications		Course Code: USIT504 (Elective 1)	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2½	75
	Internal	--	25

Pre-requisites:

1. Proficiency in at least one programming language such as C++, Python or Java.
2. Knowledge of fundamental data structures (arrays, linked lists, stacks, queues, trees, graphs) and their algorithms.
3. Understanding of discrete mathematics, linear algebra, probability and statistics.
4. Familiarity with logical reasoning.

Course Objectives:

- To understand the fundamental concepts and history of Artificial Intelligence, including the current state of the field and its foundational principles.
- To develop proficiency in problem-solving techniques using various search algorithms, both uninformed and informed, and apply heuristic functions effectively.
- To gain knowledge and skills in adversarial search, including strategies for games, optimal decision-making, and dealing with uncertainty in partially observable environments.
- To master logical reasoning and inference methods, including propositional and first-order logic, and apply them to knowledge representation and problem-solving tasks.
- To explore advanced topics such as planning algorithms, including classical planning and multi-agent planning, as well as generative AI techniques and their applications.

Unit	Details	Lectures
I	Introduction: What is Artificial Intelligence? Foundations of AI, History, the state of art AI today. Intelligent Agents: Agents and Environment, Good Behaviour, Nature of Environment, Structure of Agents.	12
II	Solving Problems by Searching: Problem Solving Agents, Searching for Solutions, Uninformed Search, Informed Search Strategies, Heuristic Functions. Beyond Classical Search: Local Search Algorithms, Searching with Non-Deterministic Action, Searching with Partial Observations, Online Search Agents and Unknown Environments.	12
III	Adversarial Search: Games, Optimal Decisions in Games, Alpha-Beta Pruning, Stochastic Games, Partially Observable Games. Logical Agents: Knowledge Base Agents, The Wumpus World, Propositional Logic, Propositional Theorem Proving. Probabilistic Reasoning: Uncertainty, Conditional Probability, Bayes Theorem.	12
IV	First Order Logic: Need For First Order Logic, Difference between Propositional and First Order Logic, Knowledge Engineering in First Order Logic. Inference in First Order Logic: Unification and Lifting, Forward and Backward Chaining, Resolution. Artificial Neural Network: Architecture of ANN, Merits and Demerits of ANN, Types of ANN.	12
V	Planning: Definition of Classical Planning, Algorithms for Planning as State	12

Space Search, Planning Graphs, Other Classical Planning Approaches, Analysis of Planning Approaches, Time, Schedules and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multiagent Planning.
Generative AI: What is Generative AI? Types of Generative AI

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Artificial Intelligence: A Modern Approach	Stuart Russel and Peter Norvig	Pearson	Third	2015
2.	A First Course in Artificial Intelligence	Deepak Khemani	TMH	First	2017
3.	Artificial Intelligence: A Rational Approach	Rahul Deva	Shroff Publisher	First	2018
4.	Artificial Intelligence	Elaine Rich, Kevin Knight and Shivashankar Nair	TMH	Third	2009
5.	Artificial Intelligence & Soft Computing for Beginners	Anandita Das Bhattacharjee	SPD	First	2013
6.	Artificial Intelligence & Generative AI for Beginners: The Complete Guide	David M. Patel	GD Publishing	First	2023

Course Outcomes:

After completing the course, the learner will be able to:

- CO1:** Articulate the historical development and current trends in Artificial Intelligence, demonstrating a comprehensive understanding of its foundations and principles.
- CO2:** Demonstrate proficiency in implementing and analyzing various search algorithms, utilizing both uninformed and informed strategies to solve complex problems efficiently.
- CO3:** Apply adversarial search techniques to decision-making in competitive environments, including games, and effectively manage uncertainty and partial observability.
- CO4:** Demonstrate competency in logical reasoning and inference, utilizing propositional and first-order logic to represent and solve real-world problems in AI applications.
- CO5:** Gain practical experience in planning algorithms and generative AI techniques, enabling them to design and implement AI systems capable of planning actions and generating novel content autonomously.