Semester: VII	
Programme: B.Sc. Computer Science (Hons) (Minor – ARTIFICIAL INTELLIGENCE)	
Course: Foundations of Artificial Intelligence	
Paper code: B4CS250712T / B4CS250712P	**Credits: 4**
Hours/week: Theory: 3 / Practical: 2	
Category: Core/MDC/SEC/VAC/Minor: Minor	
Theory / Practical / Composite: Composite	
No of Modules: 1	

Course Overview: This course introduces the core concepts of Artificial Intelligence, including its foundations, applications, and the Turing Test. It covers problem-solving using state-space search and heuristic techniques such as A* and hill climbing, along with game-playing strategies like minimax and alpha–beta pruning. The course also explores knowledge representation using predicate logic and semantic networks, and provides an overview of Generative AI. Practical sessions in Python help students implement AI algorithms and connect theory with real-world applications.

Course Outcome:

1. **Recall** fundamental concepts of Artificial Intelligence, including its history, applications, and the Turing Test.
2. **Explain** state-space representation, production systems, and the working of uninformed search techniques such as breadth-first and depth-first search.
3. **Apply** heuristic search algorithms such as hill climbing, best-first search, and A* to solve AI problems.
4. **Analyze** problem characteristics and compare different search and game-playing strategies, including minimax and alpha–beta pruning.
5. **Evaluate** knowledge representation techniques such as First Order Predicate Logic, resolution, unification, and semantic networks for problem-solving.
6. **Design and implement** AI-based solutions using appropriate algorithms and tools (e.g., Python), including introductory applications of Generative AI.

Prerequisites: Data Structures

SYLLABUS

UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
I.	Introduction to Artificial Intelligence, Background and Applications, Turing Test	5	CO1	K1, K2 (Remember/Understand)
II.	State Space search, Production Systems, formulating the state-space; breadth first search, depth first search	7	CO2, CO3	K2, K3 (Understand/Apply)
III.	Problem characteristics and applications, Use of heuristics; Heuristic Search Techniques: Generate and Test, hill climbing, Best first	10	CO3, CO4	K3, K4 (Apply/Analyze)

	search, A* algorithm, Problem Reduction, AO* algorithm.			
IV.	Game Playing: Minimax and game trees, refining minimax, Alpha – Beta pruning.	6	CO4	K4 (Analyze)
V.	Knowledge Representation: First Order Predicate Logic, Resolution Principle, Unification; Semantic Net	7	CO5	K5 (Evaluate)
VI.	Introduction to Generative AI	4	CO6	K6 (Create)

Text Books		
1. Artificial Intelligence: A Modern Approach by Stuart Russell & Peter Norvig. 2. Artificial Intelligence by Elaine Rich and Kevin Knight. 3. Principles of Artificial Intelligence, Nils J. Nilsson		
Suggested readings		
1. Artificial Intelligence: Foundations of Computational Agents – David L. Poole & Alan K. Mackworth		
Web Resources		
1. An Introduction to Artificial Intelligence – Prof. Mausam (IIT Delhi) [NPTEL]		
Evaluation	Theory CIA: 12 Attendance: 3 Semester Exam: 45	Practical CA: 38 Attendance: 2
Paper Structure for Theory Semester Exam Module: Answer 3 out of 5 of 15 marks each		

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive Levels
CO1	Recall fundamental concepts of Artificial Intelligence, including its history, applications, and the Turing Test	K1–K2 (Remember / Understand)
CO2	Explain state-space representation, production systems, and uninformed search techniques such as BFS and DFS	K2 (Understand)
CO3	Apply heuristic search algorithms such as hill climbing, best-first search, and A* to solve problems	K3 (Apply)
CO4	Analyze problem characteristics and compare search and game-playing strategies such as minimax and alpha–beta pruning	K4 (Analyze)
CO5	Evaluate knowledge representation techniques including First Order Predicate Logic, resolution, unification, and semantic networks	K5 (Evaluate)

COs	CO Description	Cognitive Levels
CO6	Design and implement AI-based solutions using appropriate algorithms and tools, including introductory applications of Generative AI	K6 (Create)