Semester: 2	
Programme: Data Science	
Course: Artificial Intelligence	
Paper code: M2C4DS26023CT / M2C4DS26023CP	**Credits: 6**
Hours/week: Theory: 4 classes per week; Practical: 2 classes per week	
Category: Core/MDC/SEC/VAC: Core	
Theory / Practical / Composite: Composite	
No of Module: 1	

Course Outcome:

Remember the fundamental concepts of Artificial Intelligence, intelligent agents, problem formulation, knowledge representation and reasoning.
Understand state-space representation, search strategies, constraint satisfaction, adversarial search, logical reasoning, probabilistic reasoning and agent architectures.
Apply uninformed and informed search techniques, constraint satisfaction methods, game-playing algorithms and logical inference techniques to solve AI problems.
Analyze AI problems using search strategies, game trees, knowledge representation structures, probabilistic models and agent-based approaches.
Evaluate alternative AI techniques with respect to computational complexity, solution quality, uncertainty, consistency and suitability for a given problem.
Create intelligent systems using classical AI techniques and integrate appropriate reasoning, search, constraint-solving and agent-based methods for practical applications.

SYLLABUS

UNIT	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
1	**Introduction to Artificial Intelligence:** Introduction to Artificial Intelligence; background and evolution of AI; applications of AI; Turing Test; characteristics and foundations of intelligent systems; intelligent agents and rationality; overview of classical AI approaches and their continuing relevance.	**4**	CO1, CO2	K1, K2
2	**Problem Solving, Search and Constraint Satisfaction:** Problem characteristics; problem formulation; state-space representation; production systems; control strategies; informed and uninformed search concepts; heuristic search; Best-First Search; A* Search; problem reduction; Constraint Satisfaction Problems (CSP); constraint	**14**	CO2, CO3, CO4	K2, K3, K4

	formulation and backtracking; applications of CSP including map colouring and class scheduling; Means–End Analysis. BFS and DFS are covered conceptually where useful, but are not required as primary implementation exercises.			
3	**Game Playing:** Game trees; adversarial search; Minimax; evaluation functions; refining Minimax; Alpha–Beta Pruning; comparison of Minimax with and without pruning; analysis of simple game-playing strategies.	**4**	CO2, CO3, CO4	K2, K3, K4
4	**Knowledge Representation and Reasoning:** Introduction to First Order Predicate Logic; resolution principle; unification; semantic nets; conceptual dependencies; frames; knowledge graphs; ontologies; rule-based reasoning; basic neuro-symbolic AI concepts; verification and interpretation of AI-generated outputs using structured knowledge and reasoning.	**12**	CO1, CO2, CO3, CO4	K1, K2, K3, K4
5	**Dealing with Uncertainty and Inconsistencies:** Truth Maintenance Systems; default reasoning; probabilistic reasoning; Bayesian probabilistic inference; Bayesian networks and conditional independence; reasoning under uncertainty and incomplete information; interpretation and validation of probabilistic results.	**8**	CO2, CO3, CO4, CO5	K2, K3, K4, K5
6	**Agent-Based Systems and Intelligent AI Applications:** Rational agent approaches to AI; intelligent agents; agent structure, behaviour and environment; types and architectures of agents; basic multi-agent systems; coordination and interaction among agents; practical AI applications; transition from classical AI methods to modern intelligent systems; importance of neural language models and Small Language Models (SLMs); introductory comparison of statistical/older language models with modern neural language models; verification of outputs for industry-ready and research-ready use.	**7**	CO2, CO4, CO6	K2, K4, K6
7	**Ethical and Social Implications of AI:** Bias and fairness in AI systems; privacy and data protection concerns; impact of AI on employment and the workforce;	**3**	CO1, CO5, CO6	K1, K5, K6

	AI and social inequality; ethical guidelines and responsible AI practices; reliability, verification and responsible use of AI/SLM systems.			
Total Practical Hours: 26 Hours (13 Labs × 2 Hours = 26 Hours).				
Text Books				
1. Russell, S. and Norvig, P., Artificial Intelligence: A Modern Approach, 4th Edition, Pearson.				
2. Khemani, D., A First Course in Artificial Intelligence, McGraw-Hill Education.				
3. Luger, G. F., Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson.				

Evaluation		
Marks	CIA: Class Performance: 2 Attendance: 3 Mid-term Exam: 10 Total: 15 End Semester Exam: 45	Continuous Assessment: 40
Paper Structure for Theory Semester Exam	Short Questions: 5 marks each	Long Questions: 10 marks each
	3 out of 5	3 out of 5

Course outcomes (COs) and Cognitive Level Mapping

COs	**CO Description**	**Cognitive levels**
CO1	**Remember** the fundamental concepts of Artificial Intelligence, intelligent agents, problem formulation, knowledge representation and reasoning.	K1
CO2	**Understand** state-space representation, search strategies, constraint satisfaction, adversarial search, logical reasoning, probabilistic reasoning and agent architectures.	K2
CO3	**Apply** uninformed and informed search techniques, constraint satisfaction methods, game-playing algorithms and logical inference techniques to solve AI problems.	K3
CO4	**Analyze** AI problems using search strategies, game trees, knowledge representation structures, probabilistic models and agent-based approaches.	K4
CO5	**Evaluate** alternative AI techniques with respect to computational complexity, solution quality, uncertainty, consistency and suitability for a given problem.	K5
CO6	**Create** intelligent systems using classical AI techniques and integrate appropriate reasoning, search, constraint-solving and agent-based methods for practical applications.	K6