

AGENTIC AI AND MULTI-AGENT SYSTEMS

Code: CS33323CS	Course Type: Core	Semester: III
Evolution Scheme (TA-MSE-ESE): 20-30-100	Total Marks: 150	L-T-P (Credits): 3-0-0 (3)

Pre-Requisites: Artificial Intelligence, Machine Learning, Python Programming

To enable students to design, develop, and analyze intelligent autonomous agents and multi agent systems using modern AI techniques, including reinforcement learning and large language model-based agent frameworks.

Course Outcomes: At the end of the course, the student will be able to

CO-1	Understand and model intelligent agents and their environments.
CO-2	Design and implement agent architectures and decision-making systems.
CO-3	Develop and analyze multi-agent systems with coordination and communication.
CO-4	Apply agentic AI using reinforcement learning and LLM-based frameworks for real world applications.

Course Articulation Matrix:

PO	PEO-1	PEO-2	PEO-3	PEO-4	PEO-5	PO
CO 1	3	2	1	-	-	CO 1
CO 2	3	3	2	1	-	CO 2
CO 3	3	2	3	2	1	CO 3
CO 4	3	3	2	1	2	CO 4

1 - Slightly; 2 - Moderately; 3 – Substantially

Syllabus:

Unit-1: Foundations of Agentic AI

Introduction to intelligent agents, characteristics of agents, rational agents, agent-environment interaction, types of agents (simple reflex, model-based, goal-based, utility-based), environment types, perception-action cycle.

Unit-2: Agent Architectures and Design

Agent architectures (reactive, deliberative, hybrid), Belief-Desire-Intention (BDI) model, planning and reasoning, knowledge representation, tool-using agents, introduction to frameworks such as LangChain and CrewAI.

Unit-3: Multi-Agent Systems and Coordination

Introduction to multi-agent systems, agent communication, cooperation and coordination, distributed problem solving, task allocation, centralized vs decentralized systems, basics of Game Theory, negotiation and conflict resolution.

Unit-4: Learning Agents and Agentic AI Applications

Reinforcement learning concepts, Q-learning, multi-agent reinforcement learning (MARL), environments using OpenAI Gym and PettingZoo, LLM-based agents, planning and reasoning loops, autonomous systems using AutoGPT, real-world applications.

Learning Resources:

Textbooks:

1. Stuart Russell & Peter Norvig, *Artificial Intelligence: A Modern Approach*, Pearson.
2. Michael Wooldridge, *An Introduction to MultiAgent Systems*, Wiley.
3. Richard S. Sutton & Andrew Barto, *Reinforcement Learning: An Introduction*, MIT Press.

Reference Books:

1. Gerhard Weiss, *Multi-Agent Systems*, MIT Press.
2. Luc Steels, *Autonomous Agents and Multi-Agent Systems*.
3. Recent research papers on Agentic AI and LLM-based systems.