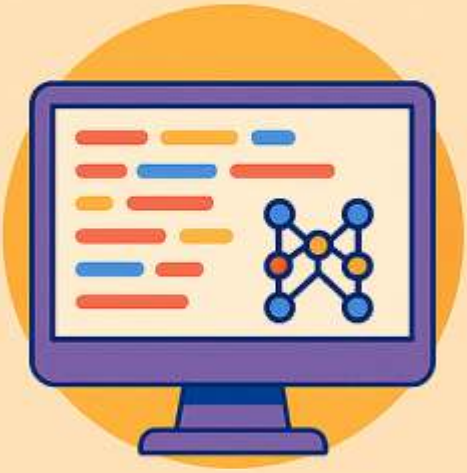
SHARDA UNIVERSITY
Beyond Boundaries

NAAC A+ ACCREDITED

SHARDA SCHOOL OF COMPUTING SCIENCE & ENGINEERING



COURSE

Foundation of Agentic AI

(NV61003)

VALUE ADDED
COURSE BROCHURE-30 HRS
2025-26

ABOUT THE UNIVERSITY

Sharda University envisions to serve the society by being a global University of higher learning in pursuit of academic excellence, innovation and nurturing entrepreneurship. It has 13,000+ students from 95+ countries, 29 states, and Union Territories, providing cultural diversity and global exposure to students. It has 26000+ alumni who are today leaders in their realms. Sharda University is **NAAC A+** University with Overall **NIRF Rank of 86**. Teaching Learning Center at Sharda University is to equip the faculty members with the expertise, skills and knowledge they need for capacity building of students. Teaching as a profession requires highly specialized skills and knowledge to impact significantly on student learning and therefore teachers must refine their conceptual and pedagogical skills.

ABOUT SCHOOL

Sharda School of Computing Science & Engineering is an open platform for diverse voices where teaching runs parallel to the real world and students are groomed to join the global workforce. SSCSE is distinguished as one of the top-ranked engineering schools in India. The students at SSCSE benefit through the professional grooming of renowned faculty and industry experts having experience of tackling pressing engineering problems. Students discover their passion in one of the various offered Engineering majors at the Sharda School of Computing Science & Engineering. A student-centric pedagogy, project-based approach and design-driven curriculum provides students with an inclination for complex problem solving, design, innovation, and a passion for learning.

ABOUT DEPARTMENT

The Department of Computer Science and Applications strives to equip faculty and students with all the computing resources needed to address a wide range of scientific, technological, and socially complex problems. The department imparts technical education for designing quirky technological applications and innovations. The department grails to become a center of excellence and impart knowledge to intellectual professionals so as to equip them with the requisite skills as per Industry standards. The department aims to foster an innovative research environment by providing a supportive, amiable, and challenge-based learning culture. The department utilizes high-performance computing equipment and facilities to impart state-of-the-art technical knowledge to students and instill a desire to pursue lifelong learning. To emerge as a world-class department, we focus on innovative research and quality learning in computer science applications that prepares entrepreneurs and professionals to lead the social, economic, and technical development of society. The department enjoys the full patronage of the Chancellor, Vice-Chancellor, Pro-Vice-Chancellor, and the Dean of the School of Engineering (SSCSE) where it is housed presently. The Value added Education Courses aim to provide additional learner centric graded skill oriented training, with the primary objective of improving the employability skills of students.

VALUE ADDED COURSE (VAC)

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PURPOSE OF VALUE ADDED COURSE

VACs are pertinent instructional strategies designed to close knowledge gaps in students and provide them a competitive edge in the job market. The courses' well-defined structure makes these VACs highly effective in enhancing students' employability quotient by developing diverse competencies. They help students lay the creative groundwork for passion projects (such as interactive dashboards, business analytics, or sector-specific visual reports) beyond their core academic curriculum, offering skills that can transform their enthusiasm into career opportunities.

RESOURCE PERSON

Mr. Rajakumar Perumal, Assistant Professor in the Sharda School of Computer Science and Engineering at Sharda University has 22 years of teaching experience. He is currently pursuing a Ph.D. and holds an M.E. in Computer Science and Engineering from Anna University, Tiruchirappalli, and an MCA from Bharathidasan University, Tiruchirappalli. He has published four patents and eleven research papers in international journals and conferences. His areas of expertise include data analytics; cloud computing, and machine learning.

Mr. Ashutosh Shankhdhar holds an M.Tech degree from VIT University, Vellore, Tamil Nadu. With over seven years of professional experience in the IT industry, his expertise spans both academic and practical domains. He has authored and published more than 15 research papers in reputed journals and international conferences, reflecting his ongoing commitment to advancing knowledge in his field.

Ms. Arshita Srivastava is an Assistant Professor in the Department of Computer Science & Engineering, Sharda School of Computer Science & Engineering (SSCSE). She holds a Master's degree in Computer Science & Engineering and a Bachelor's degree in Information Technology, both from Dr. A.P.J. Abdul Kalam Technical University, Lucknow. Her research interests focus on Artificial Intelligence and Deep Learning, with an emphasis on developing intelligent and adaptive computing solutions.

COURSE SCHEDULE

Week	Topic	Duration Hrs.
1	Fundamentals of Generative AI	2
2	Agentic AI Fundamentals	2
3	Prompt Engineering for Agentic Behavior	2
4	Core Concepts of Agentic AI	2
5	Overview of Agentic AI Design Patterns and Architectures	2
6	Implementing Agentic AI in Real-World Scenarios, Analysis of real-world applications utilizing agentic AI	2
7	Agent Communication Models	2
8	Planning Agents and Dynamic Task Decomposition	2
9	Interoperability Protocols in Agentic AI	2
10	Introduction to N8N	2
11	Integrating APIs, Databases, and External Systems	2
12	Deploying Scalable, Multi-Agent Pipelines, Combining multiple agents via N8N workflows	2
13	Performance Metrics for Agentic Systems	2
14	Debugging, Fine-tuning, and Agent Control	2
15	Responsible AI and Governance for Autonomous Agents	2
Total		**30 h**

School: Sharda School of Computing Science & Engineering, (Department of Computer Science & Applications)

Program: B.Tech IT **Semester:** V/VII

Batch: 2023-27 **Current Academic Year:** 2022-26

1. Course Code	NV61003	
2. Course Title	**Foundation of Agentic AI**	
3. Credits	0	
4. Contact Hours (L-T-P)	30 Hours	
Course Type	Value added course	
5. Course Objective	This course covers Agentic AI fundamentals and implementation. This course introduces students to the principles, patterns, tools, and frameworks of Agentic Artificial Intelligence (AI) - a new class of autonomous systems built using modern LLM-based technologies. Equips students to design and deploy real-world intelligent agents emphasis is on Agentic reasoning, autonomy, and collaborative decision-making using current-generation tools.	
6. Course Outcomes	After the completion of this course, students will be able to: CO1: Demonstrate foundational Agentic AI concepts, architecture, and design patterns. CO2: Design high-quality prompts to guide agent behavior using LLMs. CO3: Use modern Python-based frameworks (CrewAI, Pydantic, OpenAI Agent Swarms) to build autonomous agents. CO4: Construct collaborative multi-agent systems using dynamic planning and protocols like MCP & A2A. CO5: Deploy end-to-end intelligent workflows using tools like N8N and external APIs. CO6: Evaluate, troubleshoot, and ethically manage real-world Agentic AI applications.	
7. Course Description	"Foundations of Agentic AI" is a cutting-edge course focused exclusively on LLM-driven autonomous agent development. Beginning with core Agentic AI design patterns and prompt engineering, the course explores the construction of modular, reusable, and scalable agentic workflows. Students learn to use specialized frameworks for orchestration and automation. The course bridges theory with practice and equips students to build autonomous agents capable of planning, tool usage, collaboration, and decision-making.	
8. Outline syllabus		CO Mapping
Unit 1	**Introduction to Agentic AI and Prompt Engineering**	
A	Fundamentals of Generative AI: Understanding Generative AI ; Overview of Large Language Models (LLMs) & different models and their capabilities; Applications of Generative AI in various domains	CO1
B	Agentic AI Fundamentals: Defining Agentic AI vs. traditional AI; Components of an Agent: goal setting, memory, reasoning, action; Autonomy, tool usage, feedback loops	CO1
C	Prompt Engineering for Agentic Behavior: Role prompting, Chain-of-thought, ReAct prompting; Zero-shot, few-shot, self-reflection prompting; System prompts vs. user prompts in agent systems, Structuring prompts for multi-agent interactions; Addressing challenges like prompt injection and ensuring prompt hygiene	CO1, CO2, CO6
Unit 2	**Agentic AI Design Patterns and Architectures**	
A	Core Concepts of Agentic AI: Understanding autonomy, reactivity, proactiveness, and social ability in agents; Differentiating between reactive and deliberative agents.	CO2, CO3
B	Overview of Agentic AI Design Patterns and Architectures: Exploration of design patterns such as Reflection, Tool Use, ReAct, Planning, and Multi-Agent Collaboration; Architectural considerations for building robust agentic systems.	CO2, CO3
C	Implementing Agentic AI in Real-World Scenarios, Analysis of real-world applications utilizing agentic AI	CO2, CO3
Unit 3	**Multi-Agent Collaboration and Task Management**	
A	Agent Communication Models: Direct vs. mediated communication strategies; Structured vs. unstructured message passing; Designing reusable internal APIs for agent message exchange; Leveraging shared context and state (e.g., blackboards, memory clouds).	CO3
B	Planning Agents and Dynamic Task Decomposition: Using planning agents to dynamically assign subtasks to other agents; DAG-based chaining, priority queues, and cooperative planning; Self-evaluating planners with scoring and routing policies. Feedback-driven iteration: recursive delegation and review.	CO3
C	Interoperability Protocols in Agentic AI: Model Context Protocol (MCP); Agent-to-Agent (A2A) Protocol; Building sandbox-safe cross-agent communication pipelines.	CO2, CO3
Unit 4	**End-to-End Agentic AI Pipelines**	
A	Introduction to N8N, N8N as a low-code orchestrator for Agentic AI, Triggers, Webhooks, and automation nodes; Connecting agents with workflows and data pipelines.	CO2, CO3, CO4
B	Integrating APIs, Databases, and External Systems; API authentication and secure token management; Data retrieval and task triggers from emails, Slack, REST APIs, etc; Agent-controlled automation (e.g., write email, summarize docs).	CO4
C	Deploying Scalable, Multi-Agent Pipelines, Combining multiple agents via N8N workflows; Error handling, fallback agents, retry mechanisms; Scheduled and event-driven agentic execution.	CO5
Unit 5	**Testing, Optimization, and Ethics of Agentic AI**	
A	Performance Metrics for Agentic Systems: Task success rate, latency, reasoning depth; Prompt entropy, response coherence, factual accuracy; Cost tracking for token-efficient agents.	CO2, CO6
B	Debugging, Fine-tuning, and Agent Control: Tools for sandboxing and monitoring agent behavior; Limiting hallucinations and tool misuse; Versioning prompts and fallback routing.	CO5, CO6
C	Responsible AI and Governance for Autonomous Agents: Ethics of autonomous decision-making; Transparency, explainability, and auditability; Designing guardrails and human-in-the-loop interfaces.	CO6
Mode of examination	Jury/Practical/Viva	
Text Books	1."Designing Autonomous Agents: Theory and Practice from Biology to Engineering and Back" – Pattie Maes. 2. "Multi-Agent Systems: Algorithmic, Game-Theoretic, and Logical Foundations" – Yoav Shoham and Kevin Leyton-Brown.	
Reference Books	"The Age of AI Agents" – Andrej Karpathy	
	CrewAI Documentation – https://docs.crewai.com Pydantic Documentation – https://docs.pydantic.dev OpenAI Agent Swarms Overview – https://platform.openai.com/docs/agent-swarms N8N Workflow Automation – https://n8n.io Prompt Engineering Guide – https://www.promptingguide.ai/ Coursera: Generative AI Prompt Engineering for Everyone – https://www.coursera.org/learn/generative-ai-prompt-engineering-for-everyone	