CERTIFICATION PROGRAM IN AGENTIC SYSTEMS AND DESIGN

FROM iHUB DIVYASAMPARK, IIT ROORKEE

About iHUB DivyaSampark, IIT Roorkee

- **iHUB DivyaSampark, IIT Roorkee:** A Section 8, not-for-profit Technology Innovation Hub at IIT Roorkee, established under the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS)by the Department of Science & Technology (DST), Government of India.
- **Strong Industry & Research Ecosystem:** With active collaborations, incubators, and innovation hubs, IIT Roorkee bridges academia and industry to drive real-world impact
- **Industry-Focused Learning:** IIT Roorkee maintains strong ties with industries across its campus locations, providing students with opportunities for internships, real-world projects, and networking with business leaders.

Why Choose This Course?

- **Prestigious Certification:** Receive a certificate of completion from iHUB DivyaSampark, IIT Roorkee, recognising your achievement.
- **Campus Immersion:** An optional 3 day campus immersion for direct interaction with industry experts and peers.
- **Future Proof Career Gateway:** Step into the rapidly evolving AI landscape by mastering Agentic AI, LangChain, and multi-agent systems with hands-on expertise guided by top IIM and IIT faculty.
- **Advanced Curriculum:** Access cutting-edge business analysis content, engaging simulations, and practical evaluations. Focus on real-time project implementation for hands-on mastery.
- **Practical-Based Learning:** Work on hands-on projects and real-world AI scenarios, applying LangChain and multi-agent frameworks to solve complex, industry-relevant problems.
- **World Class Faculty:** Learn directly from top-tier faculty and industry experts

What Will You Learn?

Drive your career forward by mastering Agentic AI. Learn to design, govern, and deploy autonomous agents that solve complex business challenges and fortify digital assets. Move beyond simple Generative AI to become a high-impact professional, ready to lead with strategic governance and build robust solutions using 15+ leading frameworks and tools.

Toolkit

python™ LangChain crewai PostgreSQL n8n mongoDB® *& more*

Course Details

Course Duration
6 Months

Time Commitment
8-10 hours per week

Certification
iHUB DivyaSampark IIT Roorkee

Course Curriculum

Module 1: Introduction to AI, Python/SQL Basics

- AI vs. ML vs. GenAI landscape · Git / GitHub / CLI · VS Code / Colab · Environments & secrets
- Python fundamentals (types, flow, functions, files) · Notebook discipline
- NumPy + pandas I (indexing, joins/merge, groupby, missing values)
- SQLite (SELECT / WHERE / GROUP BY / JOIN) + spreadsheets (pivots, XLOOKUP) · pandas > SQL mental model
- Plotting & storytelling (matplotlib / plotly) · EDA checklist · Mini-project: Data Story
- APIs (requests, JSON) + basic ethics / Terms of Service · Ingest > clean > EDA snack app (optional Streamlit)

Module 2: Fundamentals of Machine Learning

- ML workflow & habits: problem framing, train/validation/test split, baselines, cross-validation, metric tables
- Data preparation: missing values, duplicates, categorical encoding, scaling, leakage guard, simple feature engineering (dates, counts), class imbalance basics
- Regression: Linear Regression + regularization; metrics MAE / RMSE / R^2; quick error analysis
- Classification: Logistic Regression; Decision Trees & Random Forests; metrics accuracy, precision / recall, F1, ROC-AUC; threshold tuning
- Unsupervised (intro): k-means clustering for segmentation; PCA for dimensionality reduction & 2D visualization
- Time series (intro): trend & seasonality, time-aware split / rolling evaluation
- Model comparison & selection: choose by metric + simplicity

Module 3: Generative AI & Agents

- **GenAI Core**
  - LLM fundamentals (tokens, context windows)
  - Prompt engineering (role, few-shot, chain-of-thought)
  - Token handling / cost / latency
  - Tool & function calling with structured outputs (JSON / validation)
  - RAG 101: embeddings, chunking, retrievers, vector stores; RAG evaluation (answer correctness/context recall); semantic search
  - Multimodality (intro): STT > summary > TTS pipeline
  - Open-source LLMs: Hugging Face, Ollama, local LLM demo; licensing basics
- **Agents & Orchestration**
  - Agent patterns, memory, and control flow
  - LangGraph (orchestrator) basics: nodes, transitions, retries
  - Build: small agent that plans > retrieves (RAG) > calls a tool > returns structured output
  - Safety: prompt injection, tool abuse, guardrails
- **Coding Agents (Productivity)**
  - Using Cursor / Claude Code effectively (diff review, lint / tests, no silent edits)

Module 4: Agentic Systems & Design

- LLM internals for design: tokens / context, KV cache, decoding, determinism / versioning, rate limits & retries
- Retrieval & grounding++: hybrid (dense + BM25), reranking, metadata filters, chunking, freshness / indexing, caching, cite-to-source
- Agent communication & patterns: planner / executor / supervisor; router vs. supervisor vs. blackboard; JSON-schema message / tool contracts; validation; arbitration; reflection / stop conditions
- Memory architecture: short-term vs. long-term; episodic / semantic; compaction / summarization; forgetting; PII hygiene
- Orchestration (LangGraph advanced): state & subgraphs; checkpoints / resume; idempotency; circuit breakers / timeouts
- Observability & evaluation (LLMOps): tracing; structured logs; golden tasks; offline / online evals; SLIs / SLOs
- Operations, cost & deployment: prompt versioning; caching; concurrency / queues; rate limits; cost dashboards; FastAPI / Streamlit façade; blue-green & canary deployment; disaster-recovery basics

Due to the evolving nature of the industry expectations and partner institute feedback, some syllabus aspects may change. Any updates will be communicated during the Inauguration Session(s) or at the start of the relevant module

Our Instructors

Dr. Suman Banerjee

Assistant Professor in Computer Science & Engineering, IIT Jammu

Dr. Suman Banerjee is an Assistant Professor in the Discipline of Computer Science & Engineering at IIT Jammu. He completed his Ph.D. at IIT Kharagpur and has professional experience as a Post Doctoral Fellow at IIT Gandhinagar. His research interests include Social and Information Network Analysis, Algorithmic Data Management and Time Varying Graph Analysis. He also has teaching interests in Algorithms, Graph Theory and Databases.

Abhinandan S.P.

Assistant Professor in Data Science & Engineering, IIT Palakkad

Dr. Abhinandan S. P. is an Assistant Professor in the Mehta Family School of Data Science and Artificial Intelligence at the Indian Institute of Technology Palakkad. His research focuses on using mathematical and machine learning methods to solve system problems in emerging cloud networking technologies, such as IoT, Edge-Cloud continuum, Systems for AI/ML, and 6G. He has published numerous research papers in prominent journals and conferences and co-authored a book on Cloud Computing.

Anjali Mishra

Product Manager II, Microsoft

Anjali Mishra, Product Manager at Microsoft, drives innovation across Azure Migrate and Azure Arc. She brings expertise in discovery tooling, onboarding flows, and roadmap execution, with a focus on making cloud migration and hybrid infrastructure intuitive and seamless. Anjali's diverse background spans consulting, community-building, and an MBA from IIM Shillong.

Admission Process

Clear Qualifier Test
You must pass the exam to confirm your seat for the program.

Complete Counselling
Only shortlisted candidates go through the counselling process.

Start Learning
Learn from India's top educators and stand out from the crowd.

Fees Structure

Qualifier Test Fee (Non-Refundable)	**₹99**

	Option 1	Option 2
	Upfront	**EMI** (Through Masai's NBFC Partners)
Secure Seat Fee (Non-Refundable)	₹4,000	₹4,000
Programme Fee (Non-Refundable)	₹46,000	₹5,878 x 9 months
Total	₹50,000*	₹56,902*

**GST at 18% extra, as applicable*

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