NEW AGE SOFTWARE ENGINEERING PROGRAM

FROM iHUB DIVYASAMPARK, IIT ROORKEE

About iHUB DivyaSampark, IIT Roorkee

- **iHUB DivyaSampark IIT Roorkee:** DivyaSampark aims to foster research and innovation towards product and technology development and commercialization in CPS, with a strong emphasis on smart devices and smart materials.
- **The Indian Institute of Technology Roorkee:** A legacy of over 175 years. Established in 1847 as India's first engineering college, it became an IIT in 2001, excelling in engineering and technology.
- **Rankings:** IIT Roorkee consistently ranks among the top engineering and research institutions in India. In the NIRF India Rankings 2024, IIT Roorkee was ranked #6 in the 'Engineering' category and #8 in the 'Overall' category.
- **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?

- **Certification from iHUB DivyaSampark, IIT Roorkee:** 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:** Launch into a high-growth, future-proof CyberSecurity career with in-demand skills.
- **Advanced Curriculum:** Access cutting-edge cybersecurity content, engaging simulations, and practical evaluations. Focus on real-time project implementation for hands-on mastery.
- **Case Based Learning:** Engage in real-world, case-based sessions that connect theory with practical CyberSecurity challenges.
- **World Class Faculty:** Learn directly from IIT’s top-tier faculty and industry experts

What Will You Learn?

Elevate your software engineering prowess. Learn to build intelligent applications, deploy scalable cloud solutions, and integrate Generative AI for unparalleled innovation. Drive your career forward with a robust portfolio built from hands-on labs simulating real-world AI development and cloud deployments. Secure your place as a high-impact software engineering professional, ready to lead with data-driven strategies and build intelligent digital products.

Toolkit

Course Details

Course Duration
7 Months

Time Commitment
4-5 hours per week

Certification
iHUB DivyaSampark IIT Roorkee

Course Curriculum

Module 1:
Generative-AI Foundations & Prompt Craft

- Grasping the fundamental architecture behind large language models
- Zero-shot, few-shot, and chain-of-thought prompting for improved model responses
- Using role personas, and formatting outputs with JSON/Markdown.
- Understanding token budgeting, latency considerations, and cost implications
- Introduction to basic safety filters in generative AI

Module 2:
Production-Grade AI Engineering Fundamentals

- Managing the lifecycle of AI models and version control.
- Implementing regression tests and continuous evaluation for AI models.
- Setting up tracing, metrics, and alerting for AI systems.
- Establishing guardrails and policy layers for ethical and safe AI deployment.

Module 03:
Serverless & Edge AI Deployments

- Exploring Cloudflare Workers, AWS Lambda, and Vercel Functions for AI deployment.
- Implementing secrets rotation and authentication mechanisms.
- Handling streaming data, retries, and webhooks for dynamic AI services.
- Understanding autoscaling and mitigating cold-start issues.
- Building dashboards to monitor cost and latency of deployed AI services.

Module 4:
Community Models & Custom Fine-Tuning

- Navigating resources like Hugging Face and PapersWithCode for model discovery.
- Performing local inference with Ollama and GGUF models.
- Utilizing Transformers.js and WebGPU for in-browser AI applications.
- Implementing LoRA (Low-Rank Adaptation) and QLoRA for custom model tuning.
- Understanding the legal and ethical considerations of open models.

Module 5:
Knowledge Retrieval & Semantic Memory

- Techniques for chunking and creating effective text embeddings.
- Working with vector databases like pgvector, Pinecone, and Weaviate.
- Combining hybrid keyword and vector search for comprehensive retrieval.
- Establishing safety and quality controls for RAG systems.
- Understanding recall, precision, and Mean Reciprocal Rank (MRR) for retrieval systems.

Module 6:
AI Agents & Agentic Workflows

- Understanding ReAct (Reasoning and Acting) and Plan-Act-Reflect loops.
- Using JSON-schema for function calling and managing tool registries.
- Implementing reflection, retries, and guardrails for robust agent behavior.
- Coordinating multiple agents using frameworks like CrewAI and LangGraph.
- Ensuring agents adhere to predefined output formats.

Module 7:
Vision-Enabled & Multisensory AI

- Understanding prompt styles and generation techniques for diffusion models.
- Exploring capabilities like image captioning and Optical Character Recognition (OCR).
- Implementing image editing and in-painting chains for creative AI applications.
- Utilizing describe, generate, refine workflows for visual AI.
- Discussing NSFW detection, watermarking, and adversarial risks in visual AI.

Module 8:
Capstone Sprint

- Comprehensive review of solution architecture and design.
- Integrating components like vector databases, AI agents, and a streaming user interface.
- Optimizing the solution for performance and cost efficiency.
- Ensuring the solution meets observability and regulatory compliance standards.
- Preparing the solution for live demonstration and presentation.

Our Instructors

Dr. R. Balasubramanian

Professor in Data Science and Engineering, IIT Roorkee

Dr. Balasubramanian Raman is a Professor and Head of the Computer Science and Engineering Department at IIT Roorkee. He also holds a Joint Faculty position in the Mehta Family School of Data Science and AI and was formerly an iHUB Divyasampark Chair Professor. His career at IIT Roorkee spans roles in both Computer Science and Mathematics departments, and he has been a Guest Professor at Osaka Metropolitan University.

Admission Process

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

Complete Onboarding
Only shortlisted candidates go through the onboarding 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
Remaining Course Fee (Non-Refundable)	₹56,000	₹6,845 x 9 months
Total Program Fee	₹60,000 + GST*	₹65,605 + GST*

**GST at 18% extra, as applicable*

WhatsApp: +91 97530 68796
Email: iitr.programs@masaischool.com