Executive Post Graduate Certificate

Generative AI & Agentic AI

IIT Kharagpur
Department of Computer Science and Engineering

100% Live Online, Delivered by IIT Kharagpur faculty

4th QS WORLD UNIVERSITY RANKINGS in India, 2025 | 5th nirf Rankings, 2025



Customize LLMs | Build Agents | Deploy Production-Ready AI

About IIT Kharagpur

India's First IIT - Established 1951

Established in 1951, the Indian Institute of Technology Kharagpur is India's first IIT and was declared an Institute of National Importance under the Indian Institute of Technology (Kharagpur) Act, 1956. Located in Kharagpur, West Bengal, the institute occupies a 2,100-acre campus and has consistently maintained its position among India's leading engineering institutions, ranking 5th nationally in the NIRF 2025 Engineering category.

IIT Kharagpur's research ecosystem is built on interdisciplinary collaboration, with a dedicated focus on AI research, industry-applied solutions, and advancing machine learning systems. The institute's seven-decade legacy of developing technical leaders and innovators forms the foundation for rigorous, practice-focused education in emerging technologies.

This Executive Post Graduate Programme in Generative AI & Agentic AI draws directly from IIT Kharagpur's established AI research culture to equip working professionals with production-ready skills in the field's most transformative applications.

Message from the Director



Prof. Suman Chakraborty
Director, IIT Kharagpur

In a world where intelligence is no longer merely programmed but increasingly generated, adaptive, and autonomous, Generative AI and Agentic AI mark a decisive inflection point in technology and society alike.

In this transformative context, IIT Kharagpur launches its Executive Post Graduate Certification in Generative AI and Agentic AI. This program is designed not for passive learning, but for strategic leadership at the frontier of intelligent systems.

The course goes beyond tools and trends. It provides a first-principles-driven understanding of generative models, autonomous agents, multi-agent orchestration, and the ethical dimensions that accompany such power. Participants will learn not just how these technologies work, but why they work, where they fail, and how to architect them responsibly at scale.

What makes this program distinctive is its integration of theory, computation, and real-world deployment, anchored in IIT Kharagpur's legacy of engineering rigor. The curriculum is crafted by leading researchers shaping the global AI discourse, ensuring immediate relevance to high-stakes professional environments.

For working professionals and future leaders, this certification enables the transition from being users of AI to architects of intelligent ecosystems, capable of designing, governing, and scaling AI-driven innovation.

In our Platinum Jubilee year, IIT Kharagpur is proud to shape professionals who will not merely adapt to the future, but actively design it.

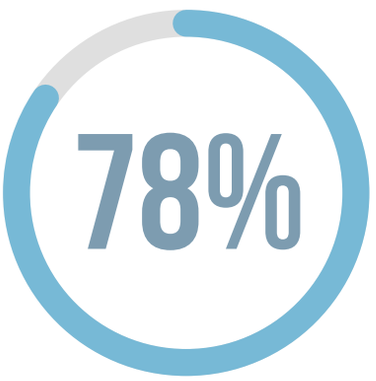
The AI Market Is Shifting Faster Than Skills Are

AI adoption is accelerating across industries — but the talent capable of building, customizing, and scaling GenAI and Agentic AI systems is not keeping pace. The result is a widening opportunity gap for engineers who upskill now.

GenAI & Agentic AI Market Momentum



Organizations now have active **GenAI initiatives.**



Companies reported using AI in 2024, up from **55% in 2023.**

LLM Customization & Deployment Skill Demand

28.6% CAGR LLM Fine-Tuning Services market growth through 2033, reaching USD 1.42 billion in 2024.

65% Tech job postings now require AI integration experience.

Career & Salary Growth

Significant salary premiums reported for engineers with GenAI and LLM customization skills.

GROWING DEMAND

for production-grade AI deployment capabilities across industries.

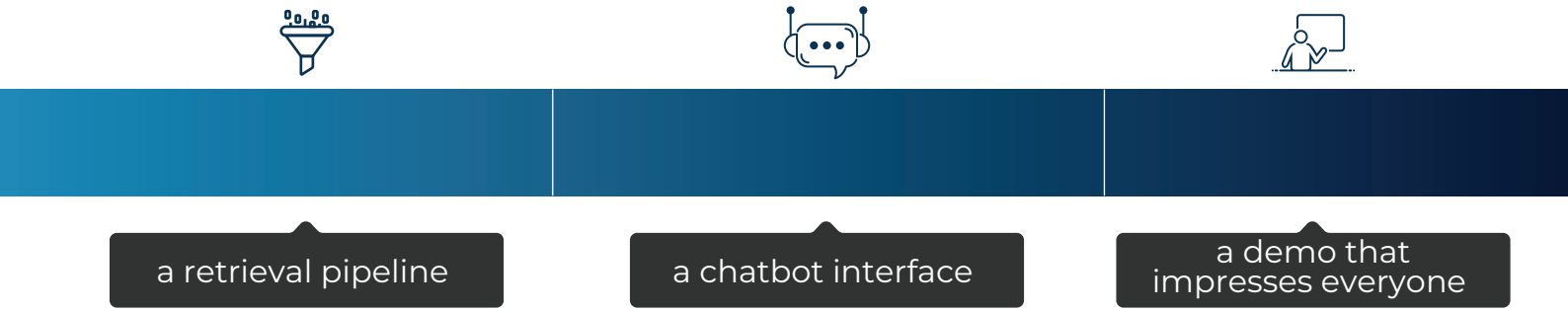
Why: Technical audience questions unsourced statistics. IIT credibility requires attribution.

Sources: [1] Capgemini 2025 [2] Stanford AI Index 2025 [3] LinkedIn 2025 [4] Dataintelo 2025 [5] PwC India 2025

From Business Problem to Production: Where AI Teams Struggle Most

You've seen this happen.

Your team is asked to "add AI" to the product.
Within a week, you have something that looks promising:



And then reality hits

- **Latency** 8 seconds per query
- **Cost** ₹50,000* in the first week
- **Failure** The model gives a confidently wrong answer
- **Status** Prototype abandoned in a notebook

The real gap isn't AI knowledge.

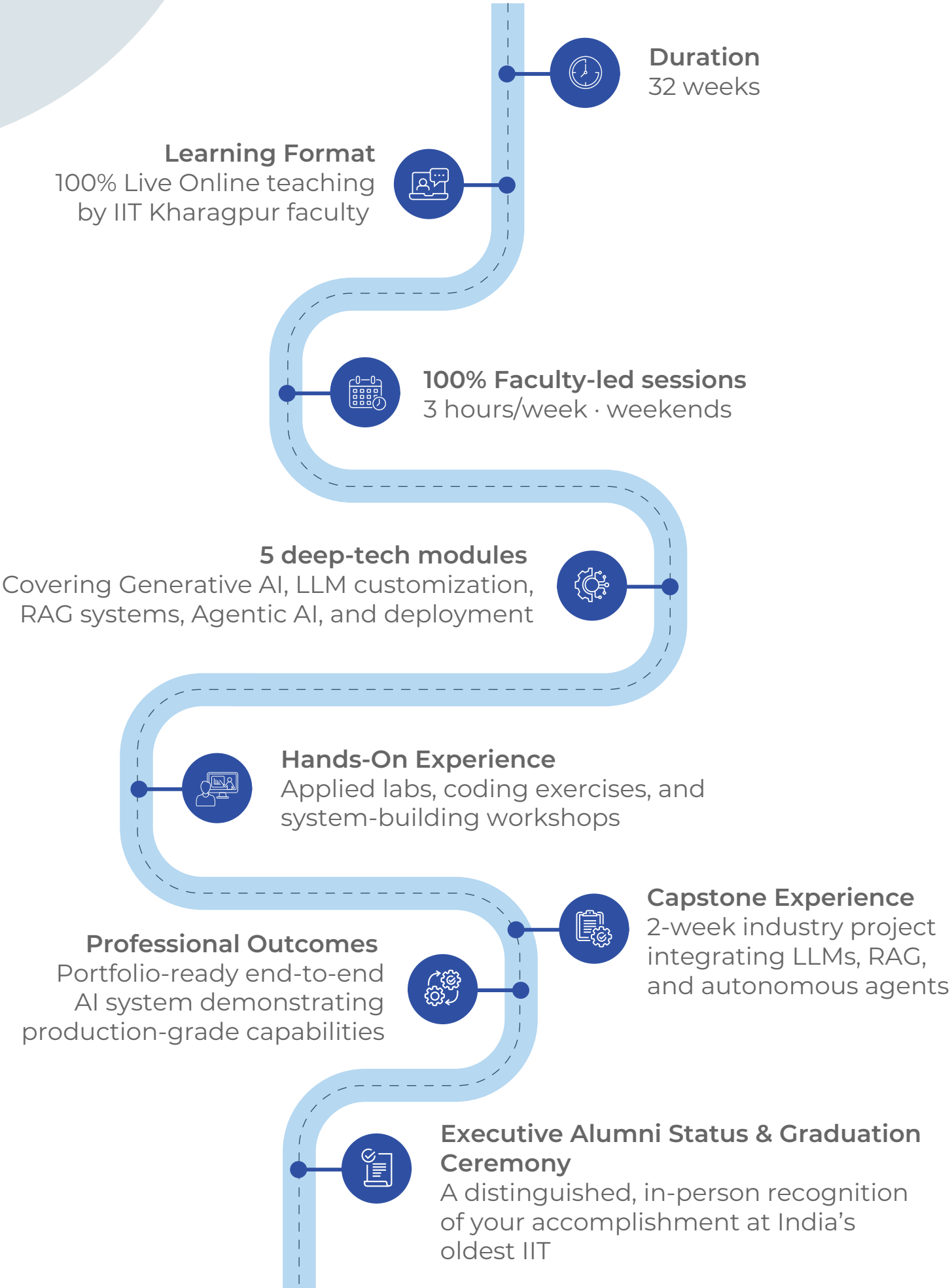
Most engineers today understand the basics of LLMs, RAG, prompts, and APIs.

The gap is the **ability to take an idea all the way to deployment** — from understanding the business problem → choosing the right architecture → optimizing for cost, speed, and reliability → running a system in production where real users depend on it.

This programme builds that end-to-end capability.

**Depends on company usage pattern*

Program Snapshot -Your Roadmap to Becoming a Production-Ready GenAI Engineer



The 32-Week Engineering Transformation

Today	After 32 Weeks
Using LLM APIs effectively	Understanding how transformers work and selecting the right model
Building RAG prototypes	Designing production RAG with hybrid search and measurable accuracy
Working with frameworks like LangChain	Architecting multi-agent systems with planning, tools, and orchestration
Prototyping in notebooks	Deploying systems with monitoring, guardrails, and observability
Contributing to AI projects	After: Leading AI initiatives

The End-to-End Shift

You move from working on individual pieces to owning the full journey and being trusted with it.

From business problem to technical approach.
From implementation to deployment.

That is what this programme builds, and what companies need.



The Uncompromised Advantage: Where AI Research Meets Real-World Engineering

The definitive choice for engineers—built on research, focused on the future.

01

Research-Backed Credibility

Faculty publish in ICML, NeurIPS, ICCV, ACL and IEEE Transactions. The curriculum reflects active research, not tool trends

02

100% Faculty-Led Learning

All 96 live hours are taught by IIT Kharagpur faculty. No outsourced instructors, only academic depth.

03

End-to-End LLM Engineering and Deployment

Learn how LLMs are built and how they behave in real systems. Build, serve and monitor with latency, cost and reliability in mind.

04

Modern fine-tuning

Master PEFT, LoRA and QLoRA to customise LLMs and SLMs for your use case. Evaluate gains against a baseline and iterate with confidence.

05

Beyond GenAI to Agentic AI

Move beyond chatbots to systems that plan, use tools and coordinate tasks. Build agent workflows you can measure, debug and maintain.

Your end-to-end journey to becoming a production-ready GenAI engineer

Module 1 (Weeks 1-6)

Foundations of GenAI & LLMs

Understand how LLMs work: deep learning essentials, transformers, embeddings, and how to choose the right foundation model for a use case.

Module 2 (Weeks 7-12)

Advanced Prompting & RAG Systems

Design retrieval-aware prompts and build enterprise-grade RAG pipelines with hybrid search, re-ranking, and evaluation. Go beyond demos to production-ready implementations.

Module 3 (Weeks 13-18)

LLM Fine-Tuning & Alignment

Learn when to fine-tune versus when to use prompting or RAG, then implement PEFT methods (LoRA/QLoRA) and evaluate performance gains against a baseline.

Module 4 (Weeks 19-24)

Multimodal & Agentic AI

Build beyond chatbots: create vision-language systems and agents that can plan, use tools, coordinate tasks, and execute workflows.

Module 5 (Weeks 25-32)

Deployment, Optimization & AI Safety

Take systems to production with model serving, monitoring, latency and cost optimisation, and safety guardrails for responsible use.

Capstone

Build a Production-Ready AI System

Integrate LLM customisation, RAG, agentic workflows, and deployment into one end-to-end system. Design it, build it, and ship it.

Your Credential



**This Executive Education credential does not confer IIT Kharagpur alumni status and is not equivalent to a degree.*

Top 10% performers in each cohort receive a certificate with Distinction, recognised on the credential itself.

Programme Faculty



Prof. Sourangshu Bhattacharya

Lead Faculty, Associate Professor, Department of Computer Science & Engineering, IIT Kharagpur

Research Areas
Artificial Intelligence and Machine Learning, Complex and Social Networks, Data and Web Mining



Prof. Niloy Ganguly

Professor & Head, Dept. of CSE

Research Areas
Artificial Intelligence and Machine Learning, Complex and Social Networks, Data and Web Mining, Natural Language Processing



Prof. Pawan Goyal

Professor, Dept. of CSE

Research Areas
Complex and Social Networks, Data and Web Mining, Communication Medium and Technologies: Language, Speech and HCI



Prof. Sudeshna Sarkar

Professor, Dept. of CSE

Research Areas
Artificial Intelligence and Machine Learning, Natural Language Processing, Machine Learning, Communication Medium and Technologies: Language, Speech and HCI



Prof. Jiaul Hoque Paik

Associate Professor, Dept. of AI

Research Areas
Natural Language Processing, Information Retrieval, Big Data Analytics, Artificial Intelligence, Machine learning



Prof. Plaban Bhowmick

Associate Professor, Dept. of AI

Research Areas
Artificial Intelligence, Natural Language Processing, Digital Library, Machine learning



Prof. Somak Aditya

Assistant Professor, Dept. of CSE

Research Areas
Artificial Intelligence and Machine Learning, Communication Medium and Technologies: Language, Speech and HCI, Knowledge Representation and Reasoning, Probabilistic Logic, Machine Learning, Statistical Relational Learning, Natural Language Understanding, Vision and Language



Prof. Debaditya Roy

Assistant Professor, Dept. of CSE

Research Areas
Computer Vision, Neuro Symbolic AI, Semantic Understanding of Images and Videos, Multimodal language models, Predictive Robotics, Autonomous Driving



Prof. Abhijnan Chakraborty

Assistant Professor, Dept. of CSE

Research Areas
Responsible AI, AI for Social Good, Data and Web Mining, Social Networks



Prof. Koustav Rudra

Assistant Professor, Dept. of AI

Research Areas
Responsible AI, AI for Social Good, AI and ML in healthcare, Information Retrieval. Natural Language Processing

The Curriculum

32 Weeks (8 Months) · 96 Hours Live · 3 Hours Per Week

Module 1 Foundations of GenAI & LLMs

Weeks 1–6 · 18 Hours Live | Build first-principles understanding

1.1 AI & Deep Learning Essentials

Neural network foundations: the minimum you need to reason about modern LLM behaviour.

1.2 The Transformer Architecture

Attention, tokenisation, embeddings, positional encoding: how LLMs actually process language.

1.3 Working with Foundation Models

GPT, Gemini, LLaMA, Mistral: how to select the right model for cost, capability, and constraints.

↗ You understand how transformers work and can justify your model choices to peers, leaders, and clients.

Module 2 Advanced Prompting & RAG Systems

Weeks 7–12 · 18 Hours Live | RAG is easy to demo. Hard to deploy

2.1 Advanced Prompt Engineering

Systematic prompting patterns: tool-calling, retrieval-aware prompts, safety prompts, and failure handling.

2.2 RAG Fundamentals

Chunking, retrieval architectures, vector databases: building retrieval that finds the right information.

2.3 Advanced RAG Techniques

Hybrid search, re-ranking, evaluation (e.g., RAGAS-style thinking), debugging retrieval failures.

↗ You can design RAG systems with measurable, improvable quality, not guesswork.

Module 3 LLM fine-tuning & Alignment

Weeks 13–18 · 18 Hours Live | The module most programmes rush. We go deep.

3.1 Fine-Tuning Fundamentals

When to fine-tune versus prompt versus RAG: a decision framework so you choose what works, not what's trendy.

3.2 Parameter-Efficient Fine-Tuning (PEFT)

LoRA, QLoRA and related methods: fine-tune open models on focused datasets and evaluate gains versus baseline.

3.3 Lab Sprint & Review

Hands-on consolidation: dataset prep, training runs, evaluation, and iteration.

Three full weeks on PEFT methods.
because this is where proprietary data delivers real leverage

↗ You can fine-tune models on domain data and know when it is worth the effort.

Module 4 Multimodal & Agentic AI

Weeks 19–24 · 18 Hours Live | AI that sees. AI that reasons. AI that acts

4.1 Vision-Language Models & Image Generation

Multimodal foundations and practical pipelines for text+image understanding and generation.

4.2 Agentic AI Systems

Planning, tool use, memory, orchestration (e.g., LangGraph-style concepts) and multi-agent workflows.

↗ You can build multimodal applications and agentic workflows for real business use cases.

Module 5 Deployment, Optimisation & AI Safety

Weeks 25–32 · 24 Hours Live | The difference between a demo and a product is engineering decisions.

5.1 Production-Grade RAG & Agent Orchestration

Take RAG/agents from prototype to production scale: reliability, failure modes, and iteration loops.

5.2 Model Serving & API Development

vLLM-style serving concepts, FastAPI, containerisation, monitoring and performance baselining.

5.3 Responsible and Trusted GenAI

Guardrails, privacy, hallucination handling, cost control, and documentation for internal governance.

5.4 Industry Capstone Project

Your signature end-to-end build: designed, built, evaluated, and deployed with faculty mentorship.

↗ You can deploy GenAI systems that are production-ready, responsible, and built for real users.

You graduate as the engineer who can take a business problem, design the right LLM/agent approach, and deploy it safely from end to end.

You become the person your team turns to when AI needs to actually work.

What You Will Build

You graduate with a portfolio of five systems you can demonstrate, defend, and extend.

Five production systems. Not tutorials. Each one is designed to be portfolio-ready — systems you can demonstrate and discuss in depth.



ENTERPRISE RAG SYSTEM

RAG system with hybrid search and reranking. Handles large document collections. Includes evaluation pipeline so you can measure and improve accuracy.



FINE-TUNED LLM

Open-source LLM fine-tuned on domain-specific data using LoRA/QLoRA. Deployed as an API you can call.



MULTI-AGENT SYSTEM

Agents that plan tasks, use tools, and work together. Built for workflows that require multiplesteps and coordination. Deployed and runnable end-to-end.



DEPLOYED GENAI API

Production API serving your model. Containerized, monitored, ready for real traffic.



INDUSTRY CAPSTONE

Your signature project. A complete system — from business problem to deployed solution — built with faculty mentorship.



Your Capstone:
Build Agentic AI Systems in Your Chosen Domain

Domain-Driven Problem Selection -
Choose a real-world challenge across Healthcare, BFSI, Manufacturing, or related domains.

Multi-Agent System Design -
Architect autonomous agents capable of planning, reasoning, tool usage, and task execution, coordinated through robust agent workflows.

End-to-End System Implementation -
Build a complete agentic pipeline integrating data retrieval, decision logic, monitoring, and ethical safeguards.

Evaluation & Performance Metrics -
Measure system effectiveness using clear performance indicators, reliability checks, and operational considerations.

Working Prototype & Technical Report -
Deliver a fully functional prototype with a structured report covering architecture, implementation insights, results, and deployment considerations.

The Campus Graduation Ceremony

Your learning journey concludes on campus at IIT Kharagpur, India's first IIT established in 1951.









- **Certificate awarded in person**[**]
  Your EPGC certificate is presented by Department of CSE IIT Kharagpur.

- **Meet your faculty face-to-face**
  Interact directly with the professors who taught you throughout the 32-week programme.

- **Connect with your cohort**
  Celebrate alongside engineers who completed the journey with you.

- **Experience the IIT Kharagpur legacy**
  Walk a campus that has shaped India's engineering leaders for over seven decades.

- **Attendance encouraged, not mandatory**
  You receive your certificate even if you cannot attend the ceremony.

- **A defining milestone**
  This ceremony marks your transformation the IIT way — adding a credential backed by IIT Kharagpur's longstanding reputation.

*** Exclusions: Travel & Accommodation, Food*
If someone is not able to attend, their certificate will be couriered to them

What Makes This Different

DEPTH OVER BREADTH

5 modules across 32 weeks. Not a survey of 50 tools. Each topic gets the time it deserves.

PRODUCTION FOCUS

8 weeks on deployment, monitoring, and reliability. More time than many programmes devote in total.

EVALUATION, NOT EYEBALLING

Every system you build gets measured: retrieval accuracy, model performance, latency, cost. No guesswork.Shape

FINE-TUNING DONE RIGHT

Three full weeks on PEFT methods (LoRA/QLoRA). Fine-tune on domain data and validate gains.

AGENTS, NOT JUST CHATBOTS

Build agents that plan, use tools, and execute workflows. Not scripted prompt chains.

CAPSTONE THAT SHIPS

One end-to-end system that integrates RAG, fine-tuning, agents, and deployment. Designed, built, and delivered.Shape

THE IIT KHARAGPUR CREDENTIAL

India's first IIT (est. 1951). A credential rooted in academic rigour and engineering excellence. Designed to carry real signal in the market

If you are already building with LLM APIs and want to step up to production-grade systems, this programme is designed for you.

Who This Is For

Software Engineers
(3+ Years)

You ship production systems. You want to add GenAI capabilities by understanding retrieval, evaluation, and deployment, not just calling APIs.

ML / Data Practitioners
(2+ Years)

You build models and data pipelines. You want to turn experiments into reliable GenAI features with measurable quality, cost control, and safety.

Technical Leads & Architects

You make technology decisions. You need to evaluate approaches, design the system, and lead implementation, not just delegate it.

Eligibility

- B.Tech/M.Tech, B.E/M.E (CS, IT, AI, ECE, EE preferred)
- B.Sc (Computer Science/Maths/ Statistics/Physics), BCA, MCA
- Graduates from other disciplines with a minimum of 2 years of experience in in Technical roles

Minimum marks:
50% from a recognised university

Technical Prerequisites

A quick self-check

- Can you write Python functions and work with basic data structures?
- Have you worked with APIs, either calling them or building them?
- Are you comfortable reading technical documentation
- Are you comfortable with the basic maths and statistics behind common ML concepts?

If yes, you have the foundation for this programme.

This programme is NOT for:• Beginners seeking first exposure to programming or ML• Professionals looking for a management-only perspective on AI• Those seeking a quick certification without hands-on work

Enrol in 4 small steps,
Then take a giant leap.

STEP 1



Submit Your Application

STEP 2



Get Shortlisted

STEP 3

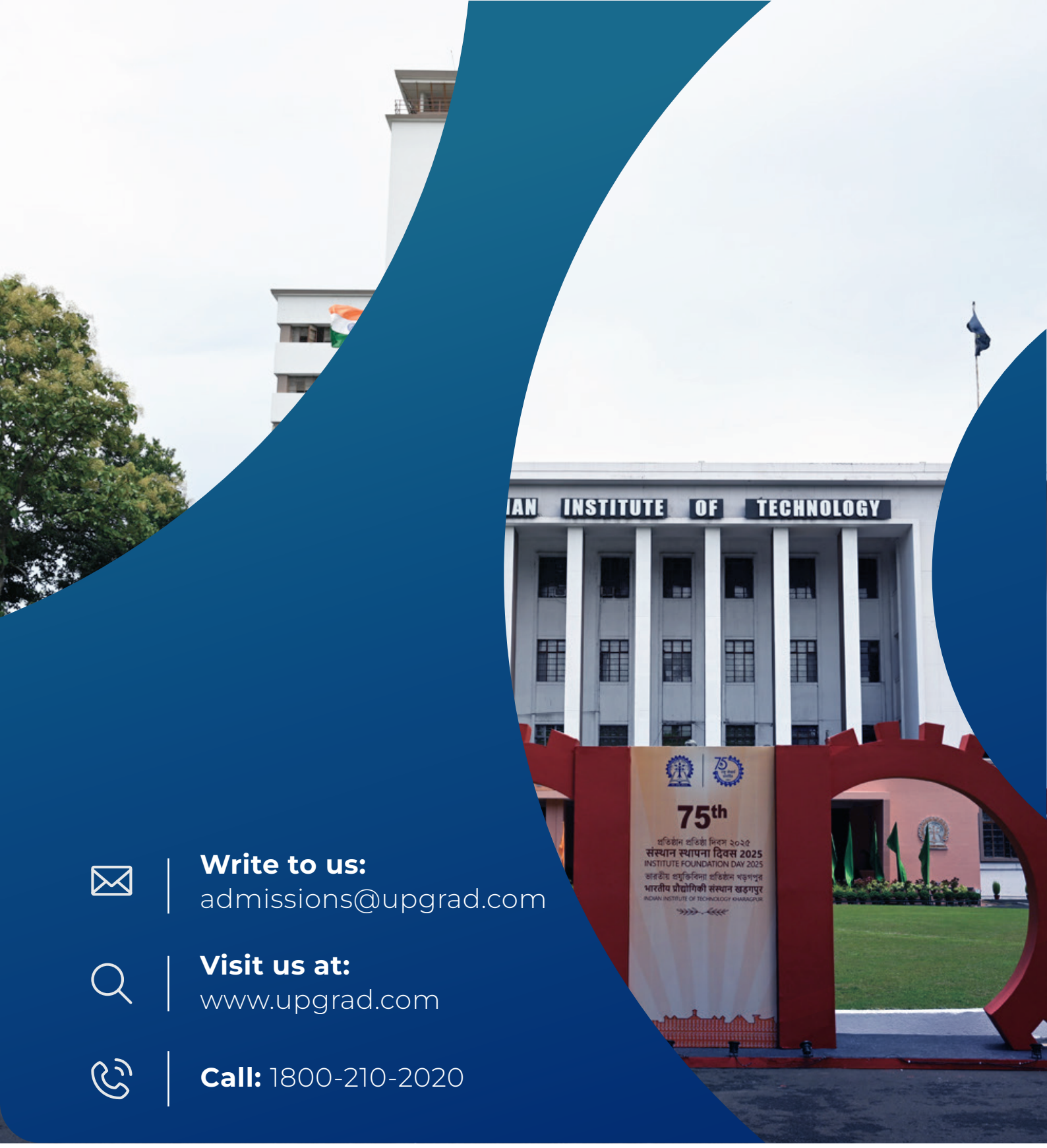


Receive Your Offer

STEP 4



Block Your Seat



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LET'S TALK