Certification in Software Engineering with AI Program

from E&ICT Academy, IIT Roorkee

In association with masai

About E&ICT Academy, IIT Roorkee

- **The Electronics & ICT Academy (E&ICT)**, supported by MeitY, Govt. of India, aims to bridge the gap between industry demand and academic knowledge by delivering specialized, hands-on training and upskilling programs in emerging areas of the Information & Communication Technology and Electronics sector.
- **The Indian Institute of Technology (IIT) 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?

- **Prestigious Certification:** Receive a Certificate of Completion from E&ICT Academy 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 Software engineering career with in-demand skills powered by AI.
- **Advanced Curriculum:** Access cutting-edge Software Engineering content, engaging simulations, and practical evaluations. Focus on real-time project implementation for hands-on mastery.
- **Practical-Based Learning:** Engage in real-world, case-based sessions that connect theory with practical Software engineering challenges.
- **World-Class Faculty:** Learn directly from top-tier faculty and industry experts.
- **Placement Opportunities:** Receive resume reviews, career coaching, and placement support to land your dream role.

*Eligibility: 7+ CGPA and 65% attendance

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	Time Commitment	Certification
6 Months	8-10 hours per week	E&ICT Academy, IIT Roorkee

Course Curriculum

Module 1: Programming Foundations and Developer Setup

- Python Fundamentals: Start from the ground up—variables, data types, operators, input/output, and writing simple programs with clear structure
- Control Flow & Problem Solving: Conditionals, loops, nesting, and building the habit of thinking in steps (break a problem into small, testable parts)
- Functions & Modularity: Functions, parameters, return values, scope, and writing reusable code that is readable and maintainable
- Core Data Structures and Algorithms: Lists, tuples, sets, dictionaries, strings, and important algorithms (searching and sorting)
- Practical Python for Engineering: Error handling, basic file I/O, working with JSON, and writing simple utilities that feel "real"
- Developer Environment Setup: Python setup, virtual environments, dependency management basics, using terminals confidently, and debugging workflows
- Git & GitHub Essentials: Version control basics, branching, commits, pull requests, code reviews, and collaborating safely on shared code

Module 2: Web Fundamentals + JavaScript (Frontend-101)

- How the Web Works: Understand HTTP methods, status codes, headers, cookies, sessions, and CORS, with practical examples
- APIs as Contracts: Learn how API design works in real products: request/response shape, error contracts, pagination, filtering, and documentation
- Browser Basics for Backend Engineers: Learn enough HTML/CSS to create simple pages and understand how frontend teams consume backend APIs
- JavaScript for Integration: Learn modern JavaScript essentials (ES6+), asynchronous programming (promises, async/await), and calling APIs from the browser
- Intro to React: Foundations of component-based architecture, hooks, and connecting a frontend interface to FastAPI

Module 3: Backend Engineering with FastAPI

- FastAPI Core: Build REST APIs with routing, request validation, response models, error handling, and auto-generated OpenAPI docs
- Database Foundations: SQL basics, schemas, relationships, and how to model data for real applications
- CRUD and Beyond: Implement real endpoints with filtering, sorting, pagination, and robust error handling
- Authentication & Authorization: Learn identity concepts, JWT/session patterns, password hashing, RBAC basics, and secure API access
- Security Fundamentals: Validate input, prevent common API mistakes, handle secrets safely, and build secure defaults

Module 4: LLM Foundations + OpenAI APIs (Build Reliable AI Features)

- The Rise of LLMs (Builder Level): Understand what tokens are, why context windows matter, what knowledge cutoff means, and why outputs can vary
- OpenAI API Essentials (Python): Learn how to call LLM APIs, understand response structure, handle errors, retries, and rate limits in a professional way
- Prompting for Real Products: Learn zero-shot and few-shot prompting, role prompting, structured output prompting, and how to design prompts that are stable
- Controllability and Tradeoffs: Learn when temperature and max tokens matter, how stop sequences work, and what penalties affect
- Security for LLM Apps: Learn prompt injection, untrusted inputs, safe retrieval patterns, and how to keep systems robust in adversarial settings
- Integrating AI into FastAPI: Expose AI endpoints from your backend and design safe contracts around them

Module 5: AI-First Software Development (Coding Agents, Workflow, and Context Engineering)

- AI Pair Programming in Practice: Learn to use AI as a senior pair programmer for scaffolding, refactoring, debugging, and explaining code, while enforcing your code standards
- GitHub Copilot as a Daily Tool: Learn how Copilot supports autocomplete, code suggestions, docstrings, and tests, and when to reject suggestions to avoid silent bugs
- Context Engineering: Learn what to include in context (and what to avoid), how to keep the model grounded in your codebase, and how to reduce hallucinations with constraints
- Building Specs with AI: Use AI to draft PRDs, user stories, acceptance criteria, API contracts, and edge cases, then refine them with human judgment
- AI Coding Agents (Staying in Control): Learn a disciplined workflow where the agent proposes a plan, asks clarifying questions, makes small diffs, and gets reviewed through PRs
- Design and UI/UX with AI: Rapidly draft UI flows and wireframes, then translate them into implementable user journeys and API requirements
- Personal AI-First Coding Framework: Each student builds their own repeatable workflow for using AI across design, implementation, and debugging

Module 6: Shipping & Running AI Apps (Multimodal, LLMOps, Quality, Patterns)

- Deploying FastAPI Applications: Package and deploy services with correct environment management, secrets handling, and stable production configs
- LLMOps Foundations: Learn prompt versioning, evaluation sets, regression testing for prompts, caching strategies, and latency/cost budgeting
- AI-Assisted Code Review and Quality: Use AI tools to review PRs, identify risks, suggest refactors, and improve readability while maintaining human ownership
- Software Testing using AI (Practical): Use AI to generate test ideas and test cases, then validate them by running and debugging like an engineer
- Multimodal AI (Practical Builders): Build at least one feature that uses non-text input (like images) and integrates safely into a product workflow

Module 7: Capstone Project (Portfolio-Ready AI Product)

- Build Sprint: Students build an end-to-end product with a FastAPI backend, a minimal frontend, and at least one meaningful AI feature
- Engineering Artifacts: Students produce a PRD/spec, API documentation, architecture notes, evaluation notes for AI behavior, and a short demo
- Quality Gate: The final submission must include a clean repository, working deployment, and clear documentation that another engineer can run

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

Under The Guidance Of



Prof. Sanjeev Manhas

Principal Investigator of E&ICT Academy, IIT Roorkee

Prof. Sanjeev Manhas, Principal Investigator of E&ICT Academy, IIT Roorkee, is a distinguished academician, researcher, and innovator with extensive experience in academia, research, and industry. He holds a Ph.D. in Electronics and Computer Engineering from De Montfort University, UK, and an M.Tech. from IIT Madras. He has worked at Micron Semiconductor and the Institute of Microelectronics, Singapore, contributing to advanced DRAM and CMOS process integration. His research spans nanoscale devices, device-circuit co-design, novel memories, MEMS, sensors, and CMOS process technologies.

Our Instructors



Prof. Pravendra Singh

Assistant Professor, IIT Roorkee

Prof. Pravendra Singh is an Assistant Professor in the Department of Computer Science and Engineering at IIT Roorkee. He holds a Ph.D. and M.Tech. from IIT Kanpur and brings strong academic and research experience in the areas of deep learning, machine learning, computer vision, image processing, pattern recognition, medical imaging, and artificial intelligence. His work focuses on advancing intelligent visual systems and AI-driven applications, and he has contributed to research and teaching in core areas of modern computer science and computational intelligence.



Prof. Awanish Pandey

Assistant Professor, IIT Roorkee

Prof. Awanish Pandey is an Assistant Professor in the Department of Computer Science and Engineering at IIT Roorkee. He holds a Ph.D. in Computer Science from IIT Kanpur and a B.Tech. from NIT Uttarakhand. His research focuses on program analysis, compiler optimization, cyber security, concurrent programming, and software security. Prior to joining academia, he worked in the semiconductor industry with AMD as a Member of Technical Staff and with Qualcomm as a Senior Engineer, where he contributed to compiler technologies, static analysis tools, and performance optimization. His work has been published in leading ACM conferences and journals, and he has received industry recognitions such as the Qualcomm Rising Star and Orion Award. At IIT Roorkee, he teaches courses in compiler design and software systems while leading research on secure and reliable software systems.



Deepak Kasera

Software Engineer, Microsoft

Deepak Kasera is a Software Engineer with around 9 years of experience in building scalable backend systems, APIs, and distributed applications. He currently works at Microsoft, where he contributes to developing cloud-based and large-scale technology solutions. He has previously worked with leading organizations such as Amazon, Arcesium, Samsung, and Scaler, gaining strong expertise in system design, algorithms, and high-performance backend development. Deepak holds a Bachelor's degree in Computer Science and has a solid background in data structures, distributed systems, and software architecture.



Aman Raj

Senior Application Engineer, Oracle

Senior Application Engineer at Oracle with over 5 years of hands-on experience in building and maintaining large-scale, production-grade systems. He specializes in backend engineering, data structures, databases, and enterprise application development, and brings real-world industry insights from Oracle into the classroom to bridge theory with practical execution.

Admission Process

Submit Application
Complete application form to showcase your motivation and goals

Complete Selection and Enrolment Session
Only shortlisted candidates go through the counselling process

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

Fee structure

Application Fee Non-refundable	**₹100**
Registration Fee	**₹4,000**
Program Fee	**₹48,000**
Total Fee	**₹52,000** + GST

Upfront Payment
₹57,360*

EMI via NBFC Partners
₹7,329/month × 9

**Inclusive of GST | All payments are non-refundable. This policy ensures the sustained quality and provision of our services*

WhatsApp: +91 8792974750
Email: eictiitrprograms@masaischool.com