PROPOSAL FOR

Five-Level Applied AI Learning Pathway

Computer Science Track

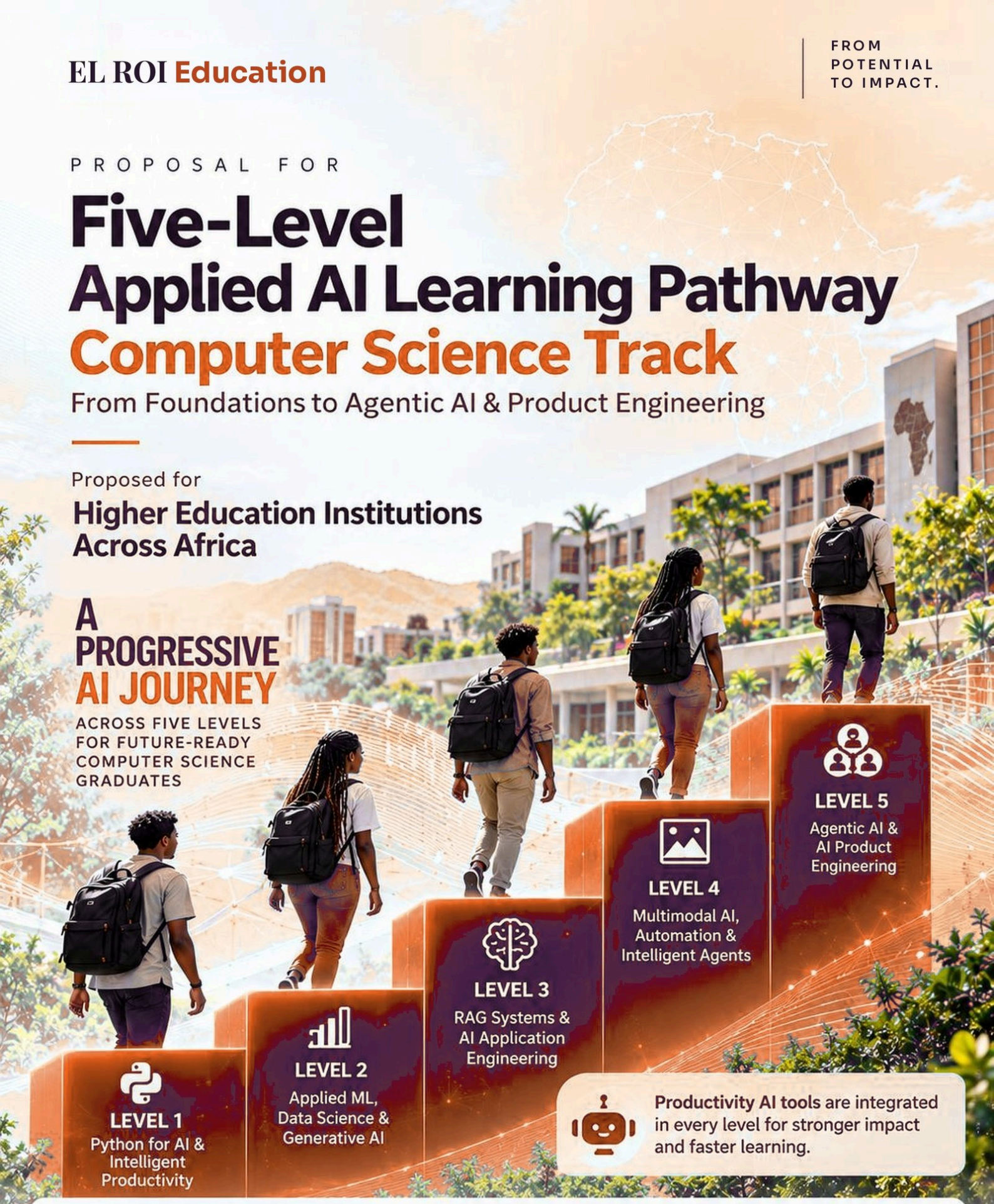
From Foundations to Agentic AI & Product Engineering

Proposed for

Higher Education Institutions Across Africa

A PROGRESSIVE AI JOURNEY

ACROSS FIVE LEVELS FOR FUTURE-READY COMPUTER SCIENCE GRADUATES



Productivity AI tools are integrated in every level for stronger impact and faster learning.

75 Hours per Level
30 Hours Theory + 45 Hours Hands-on

Flexible Delivery
On-campus, blended or faculty-supported

Real-World Projects
Hands-on use cases in every level

Industry-Oriented Certification
Portfolio and career readiness

El Roi Nexus AI Platform
Platform access, content and guided learning

EXECUTIVE SUMMARY &

Program Objectives

Empowering Future-Ready Computer Science Graduates Through a Structured AI Learning Journey



Executive Summary

This five-level applied AI learning pathway equips computer science students with progressive, in-demand skills, from Python and AI productivity to machine learning, generative AI, RAG, multimodal AI, intelligent agents, and AI product engineering. Each level is 75 hours (30 hours theory + 45 hours hands-on), blending strong foundations with real-world practice. The pathway is designed for colleges and universities across Africa, supported by El Roi Nexus AI and guided content to ensure a consistent, high-impact learning experience.

Program Objectives

1. Build AI and programming foundations for computer science students.
2. Develop data, machine learning and generative AI capability.
3. Enable RAG and AI application development with real-world use cases.
4. Prepare students for multimodal AI and intelligent agent workflows.
5. Strengthen project readiness, productivity, certification awareness, and career outcomes.

Key Highlights

- **5** Progressive Levels
- **375** Total Learning Hours
- **150** Hours Theory
- **225** Hours Hands-on
- **Productivity** AI Tools Embedded
- **Real-World** Use Cases Across Industries

Student Transformation Journey



- **Flexible Delivery** — On-campus, blended or faculty-supported
- **Faculty-Supported Adoption** — Training, resources and implementation help
- **Industry-Oriented Learning** — Real-world projects and use cases
- **Portfolio Development** — Hands-on projects in every level
- **El Roi Nexus AI Platform Access** — Guided content, tools and learning resources

PROPOSAL FOR

Program Architecture & Five-Level Roadmap

From Foundations to Agentic AI & Product Engineering



ACADEMIC STRUCTURE

Each level is designed with a balanced mix of theory and hands-on learning to ensure conceptual clarity and practical capability.

30 Hours Theory per Level

45 Hours Hands-on per Level

75 Hours Total per Level

TOTAL PROGRAM ENGAGEMENT

Across Five Progressive Levels

375 Total Learning Hours (75 Hours × 5 Levels)

FLEXIBLE DELIVERY OPTIONS

The pathway can be embedded into academic delivery, modular bootcamp format, or blended faculty-supported format.

FIVE-LEVEL PROGRAM ROADMAP

A structured and progressive learning journey from foundational skills to real-world AI product engineering.



PROGRAM SUMMARY – GROWING CAPABILITIES ACROSS FIVE LEVELS

Each level builds on the previous one, expanding skills, tools and real-world application capabilities.

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
• Python Programming	• Machine Learning	• RAG & Vector Databases	• Multimodal AI (Text, Image, Audio)	• Agentic AI Systems
• AI Foundations	• Data Science	• AI Application Development	• AI Automation Workflows	• AI Product Engineering
• Productivity Tools	• Generative AI Models	• API Integration	• Intelligent Agents	• Scalable AI Solutions
• Prompt Engineering	• Data Analysis & Viz	• LLM Systems Design	• Multi-Agent Systems	• Deployment & MLOps
• Academic Use Cases	• Real-world Datasets	• Domain-specific Solutions	• Enterprise Use Cases	• Innovation & Entrepreneurship

KEY PROGRAM HIGHLIGHTS

Designed to ensure future-ready graduates with practical skills, real-world exposure and industry relevance.

Productivity AI Tools
Integrated at every level for stronger impact and faster learning.

Real-World Mini Projects
Hands-on projects and use cases in every level.

Portfolio-Ready Outcomes
Build a strong portfolio for placements and entrepreneurship.

Faculty Enablement Compatible
Designed for seamless adoption in academic environments.

El Roi Nexus AI Platform Support
Platform access, content and guided learning.

PROPOSAL FOR

Detailed Curriculum – Levels 1 & 2

From Foundations to Generative AI Workflows

Computer Science Track | Higher Education Institutions Across Africa



LEVEL 1 — Python for AI & Intelligent Productivity

Build core programming skills and use AI tools for smarter learning and productivity.

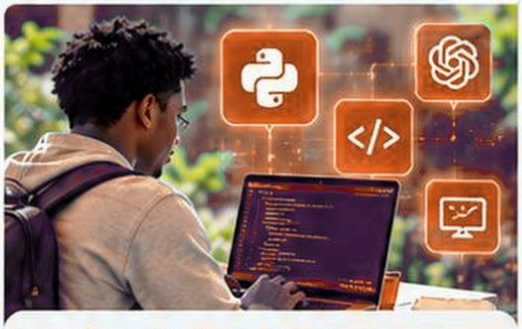
A PROGRESSIVE AI JOURNEY ACROSS FIVE LEVELS

Industry Skills Covered

- Python basics & syntax
- Variables, control flow & functions
- Data structures (lists, dicts, etc.)
- File handling & working with data
- Jupyter notebooks
- Prompt engineering fundamentals
- AI productivity tools (ChatGPT, Copilot, etc.)
- Coding assistants & best practices
- Debugging techniques
- Git & GitHub basics

Hands-on Use Cases

- **AI study helper** (build a personal study assistant)
- **Coding productivity workflows** (use AI tools to write, refactor and explain code)
- **Python mini utilities** (e.g., file organizer, web scraper)
- **Prompt-driven automation** (automate routine academic tasks)
- **Debugging assistant** (use AI to find and fix errors)



Level 1 Outcome

Learners build foundational Python confidence and use AI tools to improve problem solving and productivity.

LEVEL 2 — Applied ML, Data Science & Generative AI

Work with real data, apply machine learning fundamentals and build with generative AI.

A PROGRESSIVE AI JOURNEY ACROSS FIVE LEVELS

Industry Skills Covered

- Data analysis with Python (pandas, numpy)
- Data visualization (matplotlib, seaborn)
- Statistics basics for data science
- Supervised learning foundations
- Unsupervised learning foundations
- Model evaluation & validation
- LLM fundamentals & capabilities
- Prompt patterns & advanced techniques
- GenAI workflow design
- Simple AI app prototyping (Streamlit, Gradio, etc.)

Hands-on Use Cases

- **Student data dashboard** (analyse and visualise real datasets)
- **Classification mini-project** (e.g., predict student performance)
- **Recommendation prototype** (build a simple recommender system)
- **Content generation workflow** (create academic content with GenAI)
- **AI-powered analysis notebook** (combine data analysis and LLMs)



Level 2 Outcome

Learners build practical understanding of ML concepts and can prototype basic GenAI-enabled applications.

Delivery Style

- On-campus or blended
- Interactive lectures
- Hands-on labs & projects
- Faculty-supported learning

Assessment Components

- Quizzes & assignments
- Hands-on project(s)
- Practical implementation
- Participation & viva

Level Outcome

- Industry-relevant skills
- Portfolio-ready projects
- Confidence with real-world tools
- Foundation for advanced levels

PROPOSAL FOR

Detailed Curriculum – Levels 3 & 4

From RAG Engineering to Multimodal & Intelligent Agents

Computer Science Track | Higher Education Institutions Across Africa



LEVEL 3 — RAG Systems & AI Application Engineering

Build domain-aware AI applications with real-world data

APPLIED INTELLIGENCE FOR REAL IMPACT

Industry Skills Covered

- Embeddings & vector representations
- Data chunking & preprocessing
- Vector databases (e.g., FAISS, Pinecone)
- Semantic search & retrieval pipelines
- Prompt design for grounded answers
- Document QA & question answering
- API integration & application development
- Evaluation basics (relevance, accuracy)
- End-to-end AI application engineering

Hands-on Use Cases

- **Campus knowledge assistant**
  Answer FAQs using institutional content
- **Policy document chatbot**
  Search and summarize academic policies
- **Developer documentation assistant**
  Retrieve technical documentation
- **Searchable academic resource helper**
  Access and summarize research papers and learning materials

Outcome

Learners can build **RAG-powered applications** that retrieve, reason, and respond using domain knowledge.

LEVEL 4 — Multimodal AI, Automation & Intelligent Agents

Combine multiple AI modalities to build real-world solutions

MULTIMODAL INTELLIGENCE FOR HIGHER IMPACT

Industry Skills Covered

- Voice AI fundamentals
- Speech-to-text (ASR)
- Text-to-speech (TTS)
- Computer vision concepts
- OCR & document understanding
- Workflow automation & no-code/low-code
- Tool calling & external integrations
- Structured outputs (JSON, function calling)
- Agent design patterns (ReAct, Planning)
- Orchestration basics & multi-agent workflows

Hands-on Use Cases

- **Voice-enabled assistant**
  Interact using natural speech
- **Image-to-insight workflow**
  Analyze images and generate insights
- **Form/document extraction automation**
  Extract structured data from forms and PDFs
- **Test-case generator**
  Generate software test cases from requirements
- **Intelligent workflow bot**
  Automate multi-step academic or administrative tasks

Outcome

Learners can combine **multimodal AI** with **automation and agentic workflows** for real-world problem solving.

Projects

Build. Apply. Showcase.

- RAG-based campus assistant
- Multimodal document processing tool
- End-to-end intelligent agent prototype
- Open-ended project aligned to local challenges

Skill Progression

From Knowledge to Real Solutions.

Build RAG Apps → Integrate Multimodal AI → Create Intelligent Agents

Progress from retrieval-based applications to multimodal, automated and agentic systems.

Assessment Readiness

Practice. Validate. Get Certified.

- Hands-on assignments and labs
- Real-world projects and case studies
- Demo presentations and peer review
- Preparation for industry certifications

PROPOSAL FOR

Detailed Curriculum – Level 5 & Capstone Studio

Advanced Agentic AI, Product Engineering & Deployment

Computer Science Track | Higher Education Institutions Across Africa



LEVEL 5 — Agentic AI & AI Product Engineering

From Intelligent Agents to Real-World AI Products

APPLY · BUILD · DEPLOY · CREATE IMPACT

Industry Skills Covered

- Multi-agent systems & collaboration
- Planning, reasoning & memory
- Agent orchestration & tool use
- Enterprise copilots & real-world systems
- MCP concepts & standards
- Deployment basics & scalable architecture
- Evaluation, safety & guardrails
- Monitoring & observability
- Product thinking & user-centric design
- API integration & external tools
- Capstone architecture & system design

Hands-on Use Cases

- Enterprise copilot prototype
- Multi-agent academic assistant
- AI workflow automation platform
- Team productivity agent
- Domain-specific capstone solution

Outcome

Learners can design, build, test, and present an end-to-end AI product or agentic solution.

Integrated Capstone Studio

From Ideas to Real-World Impact

IDEATE · BUILD · TEST · PRESENT

Capstone Components

- Problem selection & domain scoping
- Architecture design & system planning
- Data and knowledge setup
- Agent workflow design & integration
- Testing, evaluation & iteration
- Demo day presentation

Platform & Tool Exposure

- El Roi Nexus AI platform
- Jupyter notebooks & development tools
- Vector databases & knowledge stores
- Prompt engineering tools
- Workflow automation tools (e.g., n8n, LangChain)
- Deployment-friendly stacks (cloud & local)
- Git collaboration & version control

Final Deliverables

- Working prototype (end-to-end solution)
- Technical documentation
- Presentation deck (Demo day)
- Portfolio artifact (showcase-ready)

70 Hours for Level 5
(35 Hours Theory + 35 Hours Hands-on)

Project-Based Learning
Real-world, industry-relevant applications

Industry-Oriented Certification
Portfolio and career readiness

El Roi Nexus AI Platform
Platform access, content and guided learning

PROPOSAL FOR

Delivery Model & Learning Experience

Flexible, Practical, Future-Ready



DELIVERY OPTIONS

Two flexible delivery models to suit different institutional needs across Africa, ensuring practical learning, real-world skills and scale.

1 Immersive Modular Delivery

5 to 6 day intensive blocks plus guided practice and mini-projects.

- **On-campus** — Delivered at your campus facilities
- **5–6 Days** — Intensive hands-on learning blocks
- **Guided Practice** — Daily labs, mentoring & mini-projects
- **Faculty Supported** — Co-delivered with faculty and experts

2 Embedded Academic Delivery

Weekly or periodic sessions integrated into the academic calendar.

- **Integrated Schedule** — Aligned with your academic calendar
- **Blended Delivery** — In-person and online options
- **Continuous Lab Practice** — Weekly labs, assignments & checkpoints
- **Platform Enabled** — Access to El Roi Nexus AI platform and resources

LEARNING METHODOLOGY

A structured learning journey from foundations to real-world impact.

1. **Learn** — Concepts, tools and best practices
2. **Experiment** — Hands-on labs with guided notebooks
3. **Build** — Mini-projects to apply skills
4. **Apply** — Solve real-world use cases and industry problems
5. **Demonstrate** — Present solutions, get feedback and build a portfolio

HANDS-ON COMPONENTS

Rich, practical learning experiences to build technical depth and confidence.

- **Coding Labs** — Hands-on programming environments
- **Guided Notebooks** — Step-by-step exercises and explanations
- **Prompt Labs** — Work with generative AI tools
- **Mini-Projects** — Apply learning in practical scenarios
- **Assignments** — Regular tasks and assessments
- **Capstone Development** — End-to-end project in final level
- **Faculty Mentoring** — Expert guidance and review sessions
- **Platform Access** — El Roi Nexus AI platform with datasets and tools

LEARNING EXPERIENCE

A comprehensive, high-impact learning experience designed for future-ready graduates.

- **75 Hours per Level** — 30 Hours Theory + 45 Hours Hands-on
- **30 Hours** — Concepts, theory and tool foundations
- **45 Hours** — Hands-on labs, projects and real-world practice
- **Real-World Use Cases** — Domain-relevant problems from industry and society
- **Project-Based Progression** — Build a portfolio of solutions across every level

- **Flexible Delivery** — On-campus, blended or fully online options
- **Real-World Projects** — Hands-on use cases in every level
- **Industry-Oriented Certification** — Portfolio and career readiness
- **El Roi Nexus AI** — Platform access, content and guided learning

PROPOSAL FOR

Projects, Assessment & Certification Readiness

Learn | Build | Showcase | Get Certified | Be Career Ready



2. ASSESSMENT FRAMEWORK

A balanced evaluation approach to ensure conceptual clarity, practical skills and real-world application.

20%	20%	25%	25%	10%
Participation & Attendance	**Quizzes**	**Guided Labs**	**Mini-Projects**	**Final Project / Demo**
Active involvement in classes, discussions and peer learning	Concept checks to reinforce learning	Hands-on exercises and applied learning	Build and solve real-world problems using AI tools	Capstone showcase and presentation

3. CERTIFICATION READINESS

Aligned with industry-relevant skills and globally recognized certification areas.

Foundation Stage

Build core skills and earn early certifications.

Python Froduations	Cloud AI Awareness	Prompt Engineering Fundamentals
Programming fundamentals, problem solving and data handling	Basics of cloud platforms and AI services	Effective prompting, AI tool usage and productivity skills

Advanced Stage

Specialize in applied AI and enterprise-ready skills.

AI Application Development	Generative AI and RAG Systems	Agentic Systems Awareness
Build AI-powered applications with real-world use cases	Work with LLMs, RAG pipelines and knowledge systems	Multi-agent concepts, automation and enterprise use cases

4. FINAL OUTCOME

Portfolio-Ready Artifacts	Stronger AI Productivity	Real Project Exposure	Improved Employability
Completed projects to showcase your skills	Practical skills to work smarter and faster	Experience with industry-relevant use cases	Be ready for internships, placements and career growth

PROPOSAL FOR

Commercial Model, Roles & Institutional Impact

A Flexible Pathway for Scalable AI Enablement in Higher Education



COMMERCIAL MODEL

Flexible. Transparent. Scalable.
Tailored to Your Institutional Goals.

Per-Student Pricing

Scalable pricing based on cohort size and program scope.

Per-Level Engagement

Flexible commercials for individual levels or the full six-semester track.

Bundled Programs

Cost-efficient packages for multi-level engagement across the complete pathway.

Annual Platform Access Options

Institution-wide access with flexible licensing models for students and faculty.

Faculty Enablement Add-ons

Optional workshops, certifications and train-the-trainer programs for faculty and staff.

Custom Implementation Support

Tailored deployment, integration support and consultancy based on institutional needs.

Final commercials are based on cohort size, program scope, delivery model (on-campus / blended / online), and any additional customisation or integration requirements.

ROLES & RESPONSIBILITIES

A Collaborative Partnership for Lasting Impact.

EL ROI EDUCATION

- Provide platform access and technical infrastructure
- Design and curate content and curriculum
- Develop guided learning assets and resources
- Provide assessment templates and rubrics
- Share real-world project frameworks and use cases
- Support faculty onboarding and enablement
- Provide progress reporting and learning analytics support

INSTITUTION / PARTNER

- Student enrolment and cohort management
- Classroom, lab and infrastructure coordination
- Faculty facilitation and student support
- Academic scheduling and calendar alignment
- Local mentoring and project guidance
- Student attendance and participation tracking
- Institutional approvals and governance support

INSTITUTIONAL IMPACT

Measurable Outcomes for Students, Faculty and Institutions.

AI-Enabled Student Learning

Practical, hands-on skills for real-world application.

Stronger Project Portfolios

Industry-relevant projects and showcases.

Faculty-Supported Adoption

Capacity building for sustainable AI integration.

Internship & Innovation Readiness

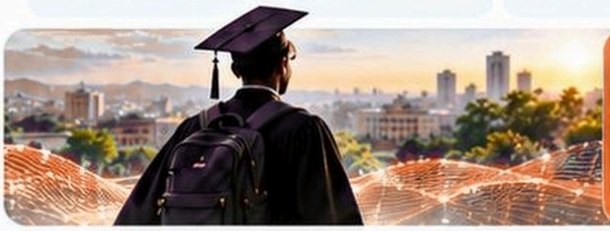
Better preparation for internships, innovation challenges and industry collaboration.

Improved Employability

Job-ready graduates with in-demand AI and product engineering skills.

Scalable AI Adoption

A repeatable model across departments, programs and campuses.



Enterprise AI Engineering Outcomes

Students progress from AI foundations to real-world AI application engineering and product thinking — ready for industry, innovation and global opportunities.