



AI LABS & RESEARCH CENTER

AI & Machine Learning Program — Detailed Course Syllabus

MindForge AI Labs & Research Center's AI & ML Program takes learners from Python and data foundations through statistics, classical machine learning, generative AI/LLMs, and modern Agentic AI workflows — concluding with a real-world capstone project and a dedicated module on critical thinking and responsible AI use.

Program Duration: 6–8 Weeks (Tentative) | **Mode:** Classroom / Online | **Format:** Live projects + Practical assessments

AI & Machine Learning Program

Covers Python & data foundations, statistics, classical ML, generative AI/LLMs, and Agentic AI (LangGraph, multi-agent systems, RAG) — built for learners aiming to work as AI/ML practitioners or data analysts using modern AI tooling.

Total Duration: 6–8 Weeks (Tentative)

Module 1 — Python & Data Foundations

Duration: 1–1.5 Weeks

- Python essentials: variables, data types, control flow, functions, OOP basics
- Working with Lists, Dictionaries, Sets, and Strings
- NumPy & Pandas fundamentals for data manipulation
- Data cleaning, transformation, and exploratory data analysis (EDA)
- SQL essentials: DDL/DML/DQL, joins, aggregate functions, sub-queries
- Excel/Power BI/Tableau basics for reporting and visualization

Module 2 — Statistics & Mathematics for ML

Duration: 0.5–1 Week

- Descriptive & inferential statistics
- Probability theory, random variables, distributions
- Hypothesis testing and the Central Limit Theorem
- Linear algebra & calculus essentials for ML (vectors, matrices, gradients)

Module 3 — Machine Learning Fundamentals

Duration: 1.5–2 Weeks

- Supervised vs unsupervised learning, the ML lifecycle
- Linear & logistic regression, bias-variance tradeoff
- Cross-validation and hyperparameter tuning
- Decision trees, ensembles, Random Forest, K-Nearest Neighbours
- Naive Bayes, Support Vector Machines
- Unsupervised learning: K-Means clustering, PCA
- Introduction to Natural Language Processing & recommender systems

Module 4 — Generative AI & LLMs

Duration: 1–1.5 Weeks

- Understanding Large Language Models (LLMs): what they are and how they work
- Popular LLMs overview: GPT, Gemini, Claude, LLaMA, and open-source alternatives
- Prompt engineering fundamentals: writing clear, effective prompts
- Practical prompting for data cleaning, summarization, and reporting
- RAG (Retrieval-Augmented Generation) fundamentals and optimization basics
- AI copilots in everyday tools: Excel, SQL, Power BI, Tableau add-ins

Module 5 — Agentic AI

Duration: 1–1.5 Weeks

- Introduction to AI agents and the ReAct pattern
- Agent architecture, tool calling, and using AI SDKs
- Building agent workflows with LangGraph (including loops & advanced flows)
- Agentic RAG and human-in-the-loop workflows
- Multi-agent systems & orchestration basics
- Overview of MCP Server & A2A protocol concepts
- Guardrails, governance, and context engineering essentials

Module 6 — Critical Thinking, Ethics & Capstone Project

Duration: 1 Week

- Critical thinking with AI: AI as a tool, not a replacement
- Evaluating AI-generated answers, checking accuracy, making final decisions
- Understanding AI limitations, bias, and responsible/ethical use
- Keeping data private and secure when using AI tools
- Capstone project: real-world AI/ML use case (assigned per latest industry topic)
- Resume building, mock interviews, and AI/ML interview preparation

Program Summary

- **Total Program Duration: 6–8 Weeks (Tentative)**

Program Outcomes

- Strong foundation in Python, statistics, and data handling for ML workflows
- Hands-on experience with classical machine learning algorithms
- Practical understanding of LLMs, prompt engineering, and RAG
- Ability to build and orchestrate AI agents using modern frameworks (LangGraph, MCP, A2A)
- Applied critical thinking to evaluate and responsibly use AI-generated output
- Resume building, mock interviews, and placement support

Who Should Enroll

Freshers, computer science / data graduates, and working professionals looking to build a career in AI, Machine Learning, or modern Agentic AI development. Basic familiarity with programming logic is helpful but not mandatory.