BSATES EdTech Foundation

6-MONTH CERTIFICATE PROGRAMME

ON

APPLIED ARTIFICIAL INTELLIGENCE & EMERGING TECHNOLOGIES

From Programming Foundations to Building Real-World AI Applications

A structured pathway from Python, data and Machine Learning foundations through Deep Learning, Generative AI, LLMs, NLP, application development and deployment.

WEEKEND PROGRAMME • 3 PROGRESSIVE CAPSTONE PROJECTS • 3-MONTH INTERNSHIP

COURSE MENTOR

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INDUSTRY EXPOSURE

Industry Experts from HCL Technologies

COURSE AT A GLANCE

This programme provides undergraduate students with a structured pathway from programming and data fundamentals to practical Artificial Intelligence application development.

Course	6-Month Certificate Programme on Applied Artificial Intelligence & Emerging Technologies
Format	Weekend Programme
Target Learners	2nd-Year Engineering/Technology Students, Undergraduate Students and Beginners in AI
Learning Model	Concept Learning + Hands-on Labs + Case Studies + Projects
Capstone Projects	3 Progressive Projects
Internship	3 Months after successful completion

PROGRAMME OBJECTIVE

The programme does not attempt to make students experts in every AI specialization. Instead, it develops a strong foundation in Python, data handling, Machine Learning, Deep Learning and Generative AI, followed by practical exposure to AI application development, deployment and responsible AI.

By the end of six months, students should be able to understand an AI problem, prepare data, select an appropriate approach, build and evaluate a basic AI/ML solution, develop an AI-powered application and present their work professionally.

PREREQUISITES

- Basic computer literacy.
- Basic programming exposure.
- Basic understanding of mathematics at school/early undergraduate level.
- Familiarity with files, folders and internet-based tools.

Prior knowledge of Machine Learning or Artificial Intelligence is NOT required. Students with no prior Python experience will receive additional guided practice during the first month.

LEARNING PHILOSOPHY & ROADMAP

The programme follows a consistent, practice-first philosophy across all six months, emphasising learning by building rather than completing a large number of theoretical topics.

LEARN → PRACTICE → BUILD → DEPLOY → PRESENT

COMPONENT	APPROXIMATE WEIGHTAGE
Concept Learning	40%
Hands-on Practice	40%
Project Work	15%
Review, Presentation & Career Skills	5%

SIX-MONTH LEARNING ROADMAP

MONTH	FOCUS
MONTH 1	Programming, Data & AI Foundations
MONTH 2	Machine Learning & Data Analytics
MONTH 3	Advanced Machine Learning & Introduction to Deep Learning
MONTH 4	Generative AI, LLMs & Intelligent Applications
MONTH 5	AI Application Development & Deployment
MONTH 6	End-to-End Capstone, Responsible AI & Career Readiness

MONTH 1 | PYTHON, DATA & AI FOUNDATIONS

Build the programming and data foundation required for subsequent AI/ML learning.

WEEK-WISE BREAKDOWN

WEEK	FOCUS	KEY COVERAGE
Week 1	Introduction to AI & Modern Technology	What is AI; AI vs. Machine Learning vs. Deep Learning; Generative AI and its relationship with AI/ML; real-world applications across healthcare, finance, education, manufacturing and business; understanding an AI problem; the AI project lifecycle; datasets, models and predictions; overview of the modern AI ecosystem.
Week 2	Python Programming Fundamentals	Python environment; Google Colab/Jupyter Notebook; variables and data types; operators; input and output; conditional statements; loops; basic problem solving; writing simple Python programs.
Week 3	Python for Data & AI	Lists, tuples, sets and dictionaries; strings; functions; modules and libraries; file handling; exception handling; introduction to NumPy; introduction to Pandas.
Week 4	Data Preparation & Exploratory Analysis	Understanding datasets; data types; missing values; duplicate data; categorical variables; basic data cleaning; descriptive statistics (mean, median, standard deviation); distributions; correlation; outliers; data visualization; asking questions from data.

PRACTICAL LEARNING

- Identify AI applications in everyday products and analyse a real-world AI use case.
- Programming, number/string and data-manipulation exercises; reading CSV files.
- Basic dataset exploration and cleaning.

MONTH-END OUTPUT

Mini Project: Data Exploration & Analysis — a cleaned dataset, basic visualizations, key observations and a short analytical report.

MONTH 2 | MACHINE LEARNING & DATA ANALYTICS

Develop a practical understanding of how machines learn from structured data.

WEEK-WISE BREAKDOWN

WEEK	FOCUS	KEY COVERAGE
Week 5	Machine Learning Fundamentals	What is Machine Learning; supervised and unsupervised learning; features and labels; training/testing data; training-validation-test concept; ML workflow; baseline models; introduction to scikit-learn.
Week 6	Regression & Classification	Regression problems; linear regression; classification problems; logistic regression; decision trees; k-nearest neighbors; choosing an appropriate algorithm.
Week 7	Feature Engineering & Model Improvement	Why features matter; data scaling; encoding categorical data; feature transformation and selection; training pipelines; overfitting and underfitting; bias and variance concepts; basic hyperparameter tuning.
Week 8	Model Evaluation & Capstone 1	Confusion matrix; accuracy, precision, recall, F1-score; regression metrics; cross-validation; comparing models; interpreting and communicating results.

PRACTICAL LEARNING

- Build the first complete ML workflow: data → preparation → model → prediction → evaluation.
- Build one regression model and one classification model.
- Improve an existing ML model through preprocessing and feature engineering.

CAPSTONE 1 • FOUNDATION TO APPLICATION

Problem → Dataset → Cleaning → EDA → Features → Model → Evaluation → Report

SUGGESTED PROJECTS — EXPECTED LEVEL: BEGINNER

- Student performance prediction
- House-price prediction
- Customer churn prediction
- Loan approval prediction
- Sales prediction
- Simple disease-risk classification using a suitable public dataset

MONTH 3 | ADVANCED ML & DEEP LEARNING FOUNDATIONS

Move from conventional ML to neural-network-based AI while keeping the mathematics accessible.

WEEK-WISE BREAKDOWN

WEEK	FOCUS	KEY COVERAGE
Week 9	Unsupervised Learning	Why unsupervised learning; clustering; k-means; similarity and distance; customer/data segmentation; introduction to dimensionality reduction; PCA intuition; interpreting clusters.
Week 10	Introduction to Neural Networks	Why neural networks; artificial neuron; perceptron; layers (input, hidden, output); activation functions; forward propagation; loss function; intuition behind gradient descent.
Week 11	Training Neural Networks	Backpropagation (conceptual understanding); epochs; batch size; learning rate; optimizers; training and validation; overfitting in neural networks; dropout; early stopping.
Week 12	Computer Vision & Deep Learning Application	Images as data; image preprocessing and normalization; data augmentation; introduction to CNNs; image classification; transfer-learning concept; model evaluation; error analysis.

PRACTICAL LEARNING

- Build a simple customer/data segmentation solution.
- Build and train a neural-network model using a beginner-friendly framework.
- Practical Project: Image Classification Prototype using a suitable dataset.

MONTH-END OUTPUT

Image Classification Prototype — a simple computer-vision application built and evaluated by students.

MONTH 4 | GENERATIVE AI, LLMs & INTELLIGENT APPLICATIONS

Introduce students to modern Generative AI and teach them how to build useful AI-powered applications.

WEEK-WISE BREAKDOWN

WEEK	FOCUS	KEY COVERAGE
Week 13	Generative AI Fundamentals	What is Generative AI; generative vs. predictive AI; the Generative AI ecosystem; text, image and multimodal generation; tokens; embeddings; inference; AI models and APIs; limitations of Generative AI.
Week 14	Large Language Models	What is an LLM; how LLMs work at a conceptual level; transformer intuition; tokens and context; embeddings; context windows; LLM APIs; hallucinations; limitations and evaluation.
Week 15	Prompt Engineering & AI-Assisted Development	Effective prompt structure (instructions, context, role, task); zero-shot and few-shot prompting; structured outputs; prompt refinement and evaluation; AI-assisted coding; using AI tools for research, documentation and productivity.
Week 16	NLP, Embeddings & RAG	Introduction to NLP; text preprocessing; text classification; sentiment analysis; summarization; information extraction; question answering; embeddings; vector search concept; Retrieval-Augmented Generation; knowledge-based AI applications.

PRACTICAL LEARNING

- Experiment with multiple Generative AI applications.
- Build a simple application using an LLM API.
- Prompt Engineering Laboratory — develop and compare prompts for different tasks.

CAPSTONE 2 • INTELLIGENT AI APPLICATION

Students build one practical, AI-powered application.

SUGGESTED PROJECTS — EXPECTED LEVEL: INTERMEDIATE

- College information chatbot
- Document Q&A assistant
- Study assistant
- FAQ chatbot
- Knowledge-base assistant
- Resume analysis assistant
- AI-powered text analysis application

MONTH 5 | AI APPLICATION DEVELOPMENT & DEPLOYMENT

Teach students how to convert their AI/ML models into usable applications — introductory, practical exposure rather than cloud or MLOps specialization.

WEEK-WISE BREAKDOWN

WEEK	FOCUS	KEY COVERAGE
Week 17	Building AI Applications	From model to application; application architecture; front-end vs. back-end concepts; APIs; introduction to FastAPI/Flask; connecting models to applications; input/output handling; basic application interface design.
Week 18	Model & AI Application Deployment	What is deployment; local vs. cloud deployment; model serving; API endpoints; environment management; dependencies; application packaging; introduction to Docker concepts; basic deployment workflow.
Week 19	Git, GitHub & MLOps Fundamentals	Version control; Git fundamentals; GitHub; repositories, branches and commits; collaboration; reproducibility; experiment tracking; data/model lifecycle; introduction to MLOps.
Week 20	Monitoring, Testing & AI Developer Skills	Testing AI applications; debugging; logging; model performance monitoring; data/model drift basics; retraining concept; documentation; AI-assisted software development; code review with AI tools; writing a professional README.

PRACTICAL LEARNING

- Convert an existing ML/AI model into a simple application.
- Deploy a simple AI application; publish a project on GitHub with proper documentation.
- Improve and document the deployed application.

MONTH-END OUTPUT

Deployment-Ready AI Application, published and documented on GitHub.

MONTH 6 | END-TO-END AI PROJECT & PROFESSIONAL READINESS

Integrate the skills developed during the programme into one complete portfolio project.

WEEK-WISE BREAKDOWN

WEEK	FOCUS	KEY COVERAGE
Week 21	AI Solution Design	Identifying a real-world problem; user requirements; problem definition; dataset/data requirements; technology selection; solution architecture; AI model selection; project planning and milestones.
Week 22	Responsible AI	AI ethics; bias; fairness; privacy; data protection and security awareness; transparency; explainability; human oversight; responsible use of Generative AI; copyright and responsible content use; limitations of AI systems.
Week 23	Final Capstone Development	Data pipeline; model/application development; AI integration; API integration; testing; debugging; deployment; documentation; performance evaluation.
Week 24	Final Demonstration & Career Readiness	Technical presentation; project storytelling; demonstrating results; explaining architecture and model selection; discussing limitations; GitHub portfolio; technical CV; LinkedIn profile; interview preparation; AI/ML career pathways; continuing learning after the programme.

PRACTICAL LEARNING

- Final Capstone Proposal: problem statement, target users, proposed solution, technology stack, architecture and expected outcome.
- Responsible-AI assessment of the final project.
- Intensive project development with mentor review.

CAPSTONE 3 • END-TO-END AI SOLUTION

Problem → Data → AI Approach → Application → Deployment → Evaluation → Responsible AI → Business/Use-Case Value

THREE PROJECT STRUCTURE

Three progressively complex projects convert classroom learning into practical, portfolio-ready experience.

PROJECT 1 • BEGINNER LEVEL

Data & Machine Learning Project

Duration: 3–4 weeks • Expected Level: Beginner

FOCUS

- Data preparation
- Exploratory data analysis
- ML model
- Evaluation
- Report

PROJECT 2 • INTERMEDIATE LEVEL

Generative AI / Intelligent Application

Duration: 3–4 weeks • Expected Level: Intermediate

FOCUS

- LLM
- Prompt engineering
- Embeddings
- RAG/NLP
- Application interface

PROJECT 3 • ADVANCED STUDENT PROJECT

End-to-End AI Application

Duration: 4–5 weeks • Expected Level: Applied / Portfolio level

FOCUS

- Problem identification
- Architecture
- Data/model
- AI application
- API
- Deployment
- GitHub
- Testing
- Responsible AI
- Presentation

RECOMMENDED TECHNOLOGY STACK

Students should not be required to learn dozens of tools. The stack below keeps the programme focused and practical.

AREA	TOOLS
Programming	Python; Jupyter / Google Colab
Data	NumPy; Pandas; Matplotlib
Machine Learning	Scikit-learn
Deep Learning	PyTorch or TensorFlow/Keras (one framework taught in depth)
Generative AI	LLM APIs; Hugging Face ecosystem; prompt engineering; embeddings; RAG
Development	VS Code; Git; GitHub; FastAPI or Flask
Deployment	Docker fundamentals; one selected cloud platform
AI Productivity	AI-assisted coding; AI research tools; documentation tools

WHAT STUDENTS SHOULD NOT BE EXPECTED TO MASTER

To keep the programme academically honest, students receive introductory/practical exposure — rather than mastery — in:

- Advanced MLOps
- Advanced cloud architecture
- Advanced mathematics
- Large-scale distributed AI
- Training LLMs from scratch
- Advanced reinforcement learning
- Advanced computer vision
- Advanced NLP research
- Production-scale AI infrastructure

These can become subjects for advanced programmes later.

EXPECTED LEARNING OUTCOMES

After completing the six-month programme, a student should be able to:

- Write basic-to-intermediate Python programs.
- Work with structured datasets using Python.
- Clean and analyse data.
- Perform exploratory data analysis.
- Build basic Machine Learning models.
- Compare and evaluate ML models.
- Understand the fundamentals of neural networks and deep learning.
- Build a basic computer-vision application.
- Understand Generative AI and LLM concepts.
- Design effective prompts.
- Build a basic LLM-powered application.
- Understand embeddings and RAG.
- Build a simple AI application using an API.
- Understand basic deployment concepts.
- Use Git and GitHub for project development.
- Understand the fundamentals of MLOps.
- Apply basic Responsible AI principles.
- Develop and present three progressively complex projects.
- Create a technical portfolio demonstrating their work.
- Identify suitable pathways for further study or AI-related internships.

ASSESSMENT MODEL

COMPONENT	WEIGHTAGE
Weekly Labs & Assignments	20%
Quizzes / Concept Checks	10%
Capstone 1	15%
Capstone 2	20%
Final Capstone	25%
Presentation & Professional Portfolio	10%
Total	100%

Assessment focuses on what students can build and explain, not simply what they can memorise.

PROGRAMME POSITIONING

Recommended positioning: A 6-month, hands-on certificate programme designed to take undergraduate students from programming and AI foundations to building and deploying practical AI applications.

LEARN AI → BUILD PROJECTS → DEVELOP APPLICATIONS → BUILD YOUR PORTFOLIO

Not: *"Become an AI expert in six months."*

Instead: *"Build a strong foundation in AI and develop the practical skills required to create real-world AI applications."*

BUILD YOUR FUTURE WITH

APPLIED AI & EMERGING TECHNOLOGIES

A six-month, hands-on learning journey followed by a three-month internship — taking students from programming foundations to building and deploying real-world AI applications.

SIX-MONTH JOURNEY AT A GLANCE

MONTH 1 — Python + Data + AI Foundations

MONTH 2 — Machine Learning + Analytics

MONTH 3 — Advanced ML + Deep Learning + Computer Vision

MONTH 4 — Generative AI + LLMs + NLP + RAG

MONTH 5 — AI Applications + APIs + Git/GitHub + Deployment + MLOps

MONTH 6 — End-to-End Project + Responsible AI + Portfolio + Career Readiness

3-MONTH INTERNSHIP — Apply → Build → Document → Present → Grow

LEARN AI → BUILD PROJECTS → DEVELOP APPLICATIONS → BUILD YOUR PORTFOLIO

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