

# GENERATIVE AI

1 Week in Campus Residential Program

## COURSE CURRICULUM

### Introduction

This program has been designed to provide a holistic learning experience. The curriculum balances theoretical knowledge and hands-on practice, ensuring participants gain both foundational understanding and practical expertise. Interactive sessions, real-world use cases, and collaborative hackathons help embed key concepts effectively. The structured flow, from basic concepts to advanced applications, caters to diverse learning paces while promoting teamwork and problem-solving. This methodology ensures a robust, engaging, and outcome-driven learning journey for all participants.

### Duration

1 Week – Residential Program

9<sup>th</sup> – 15<sup>th</sup> March 2026

### Venue

Indian Institute of Technology Goa



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## Day 2 — Large Language Models (LLMs)

### Topics

- Transformer Architecture (Attention, Multi-head Attention, Decoders/Encoders)
- How LLMs work internally
- Prompt Engineering Basics
- Tokenization & model inference pipelines
- Open-source LLMs (LLama 3, Mistral, GPT models, Phi models)

### Hands-on

- Running LLMs locally
- Basic prompt engineering tasks
- Creating a Q&A chatbot using HuggingFace models

## Day 1 — Foundations of Generative AI

### Topics

#### 1. Introduction to AI, ML & Deep Learning

- Evolution of Generative AI
- Understanding Generative Models
- Generative vs Discriminative
- Latent space, embeddings, representations

#### 2. Overview of Modern Models

- GANs
- VAEs
- Diffusion Models
- LLMs

### Hands-on

- Setting up Python + PyTorch/TF environment
- Simple text & image generation demos using pre-trained models

## Day 3 — Fine-Tuning & Customization of LLMs

### Topics

- Why & When to Fine-tune
- Fine-tuning Techniques:
- Full fine-tuning
- LoRA / QLoRA
- PEFT (Parameter Efficient Fine Tuning)
- Retrieval Augmented Generation (RAG)
- Vector Stores (FAISS, Chroma)
- Embeddings
- Knowledge-base Integration

### Hands-on

- Fine-tuning an LLM for a custom domain dataset
- Building a RAG-based assistant





## Day 4 – Image, Video & Multimodal Generative AI

### Topics

- Diffusion Models (Stable Diffusion, SDXL)
- Text-to-Image, Image-to-Image
- Generative Video Models (Sora, Pika)
- Audio & Speech Generation
- Multimodal Models
- CLIP
- LLaVA
- GPT-4o style models

### Hands-on

- Generate images using Stable Diffusion
- Build a multimodal captioning model
- Simple audio generation demo

## Day 5 – Applications, Deployment & MLOps for GenAI

### Topics

- Real-world Applications
- EdTech, Healthcare, FinTech, Robotics, Marketing
- AI Agents & Workflow Automation
- Model Optimization
- Quantization
- Distillation
- Deployment Techniques
- API deployment
- Dockerization
- FastAPI/Streamlit integration
- Ethics, Safety, Bias, Evaluation Metrics

### Hands-on

- Deploy a GenAI app on a local/Cloud server
- Create an interactive GenAI-based web application

## Day 6 – Capstone Project + Industry Sessions + Evaluation

### Activities

#### **Capstone Project (Group Activity):**

##### **Choose one:**

- Custom Chatbot for Institution/Business
- Image Generation Application
- RAG-based Document Assistant
- AI Agent for Workflow Automation
- Multimodal App (image + text)

#### **Industry Expert Lecture / IIT Guwahati Faculty Session**

- Project Presentation & Evaluation
- Feedback & Certification Ceremony

### **Deliverables / Takeaways**

- Certificate of Completion ( Joint certificate of Alchringa IIT Guwahati & Bsates)
- Source Code for all labs
- Deployed GenAI applications
- Project Portfolio for career use