

## Table of Contents

**Training Mode: Half-day Theory + Half-day Practical (Real-time Project Implementation)**

**Duration: 06 Days**

**Tech Stack: GenAI**

<b>DAYS</b>	<b>TOPICS/CONTENTS</b>	<b>Practical / Real-Time Implementation</b>
<b>DAY 1</b>	<b>Introduction to Generative AI: Overview, applications, architecture types (GANs, VAEs, Transformers)</b>	<b>Set up environment (Google Colab / Anaconda), load basic text/image datasets</b>
<b>DAY 2</b>	<b>Python Primer for Generative AI: Variables, functions, loops, NumPy, Pandas, Matplotlib</b>	<b>Code exercises + EDA on text/image datasets</b>
<b>DAY 3</b>	<b>Natural Language Processing (NLP) Basics: Tokenization, Embeddings, Transformers (BERT, GPT)</b>	<b>Build a text generator using GPT-2 / HuggingFace, experiment with prompt tuning</b>
<b>DAY 4</b>	<b>Text Generation and Fine-Tuning: Pre-trained models, model fine-tuning, loss functions</b>	<b>Fine-tune a small GPT model on custom text (student intro data, resumes, etc.)</b>
<b>DAY 5</b>	<b>Image Generation with Diffusion Models and GANs</b>	<b>Generate synthetic images using Stable Diffusion / StyleGAN (pre-trained)</b>
<b>DAY 6</b>	<b>Ethics, Prompt Engineering &amp; Real-World Use Cases</b>	<b>Build a prompt-based chatbot, case study on resume screening or content generation</b>



## DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

### Value Added Course on “Generative AI and its Applications”

#### Syllabus

45 HOURS

#### Course Objectives

- To understand the fundamental concepts, architecture, and real-world applications of Generative AI.
- To learn essential Python programming skills and libraries like NumPy, Pandas, and Matplotlib for handling AI data tasks.
- To implement Natural Language Processing (NLP) techniques and build text generation models using GPT and Transformer architectures.
- To perform fine-tuning of pre-trained models on custom datasets for personalized text generation applications.
- To explore and implement image generation techniques using Diffusion Models and GANs for creating synthetic images.
- To apply prompt engineering techniques, address ethical considerations, and build real-time AI solutions like chatbots and resume screening systems.

#### UNIT 1: INTRODUCTION TO GENERATIVE AI (9)

Understand the concept of Generative AI and its importance in modern AI applications. Explore the practical applications of Generative AI in fields like text generation, image creation, video synthesis, and audio generation. Discuss the architecture of generative models and how they are designed to create new content from learned patterns. Learn and differentiate the major types of Generative AI models such as GANs (Generative Adversarial Networks), VAEs (Variational Autoencoders), and Transformer-based models. Install and set up the working environment using Google Colab or Anaconda for executing Generative AI models. Load and handle basic text and image datasets for practice and experimentation in the environment.

#### UNIT 2: PYTHON PRIMER FOR GENERATIVE AI (9)

Introduction to Python Programming – Overview of Python syntax and coding standards – Understanding variables, data types, and operators in Python – Working with functions, control statements, and loops – Introduction to essential Python libraries for AI such as NumPy, Pandas, and Matplotlib – Performing basic data manipulations and visualizations using Pandas and Matplotlib – Exploratory Data Analysis (EDA) techniques on text and image datasets – Writing and executing code exercises for hands-on practice – Loading and analyzing sample datasets for Generative AI applications.

### **UNIT 3: NATURAL LANGUAGE PROCESSING (NLP) BASICS (8)**

Introduction to Natural Language Processing concepts – Understanding text preprocessing techniques including Tokenization and Text Cleaning – Introduction to Word Embeddings and Vector Representations – Overview of Transformer-based architectures with emphasis on BERT and GPT models – Understanding the working principles of GPT and its applications in text generation – Building a basic text generator using GPT-2 and the Hugging Face library – Experimenting with prompt tuning and model response customization – Performing practical exercises on text data processing and generation.

### **UNIT 4: TEXT GENERATION AND FINE-TUNING (7)**

Introduction to pre-trained language models and their use in Generative AI – Understanding the concept of model fine-tuning and its applications – Overview of loss functions used in text generation models – Fine-tuning a small GPT model on custom text datasets such as student introductions, resumes, and other personalized data – Practical exercises on customizing model outputs through fine-tuning – Evaluating text generation results for relevance and quality – Experimenting with prompt design for improved text generation.

### **UNIT 5: IMAGE GENERATION, PROMPT ENGINEERING & REAL-WORLD USE CASES (12)**

Introduction to image generation techniques in Generative AI – Overview of Diffusion Models and Generative Adversarial Networks (GANs) – Understanding the concepts and workflow of Stable Diffusion and StyleGAN models – Generating synthetic images using pre-trained models – Practical implementation of image generation models in Google Colab or local environment – Hands-on exercises on customizing image prompts and outputs – Evaluating the quality and realism of generated images – Understanding ethical considerations in Generative AI applications – Introduction to prompt engineering techniques for effective AI outputs – Building a prompt-based chatbot for interactive text generation

Case study implementation on resume screening and content generation using AI models – Discussion on bias, fairness, and responsible AI practices – Real-world use case demonstrations and project idea discussions.

### **Course Outcomes**

At the end of the course, students will be able to:

**CO1:** Explain the core concepts, architecture, and applications of Generative AI, including major model types like GANs, VAEs, and Transformers.

**CO2:** Apply Python programming fundamentals and data handling libraries to perform Exploratory Data Analysis (EDA) on text and image datasets for AI applications.

**CO3:** Implement Natural Language Processing techniques and build text generation models using pre-trained Transformer architectures such as GPT.

**CO4:** Generate synthetic images using pre-trained Diffusion Models and GANs, and apply prompt engineering techniques for customizing AI-generated outputs.

**CO5:** Demonstrate ethical awareness in AI applications and develop prompt-based AI solutions for real-world use cases like resume screening, content generation, and interactive chatbots.

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Value Added Course on “Generative AI and its Applications”

14.07.2025 – 19.07.2025

CO-PO Mapping and SDG Mapping

CO - PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	L	L	L	L	L	L	-	L	-	-	H	H	H
CO2	L	M	H	L	H	L	-	L	-	-	H	H	H
CO3	L	M	H	L	H	L	-	L	-	-	H	H	H
CO4	L	M	H	L	H	L	-	L	-	-	H	H	H
CO5	L	M	H	L	H	L	-	M	M	H	H	H	H

SDG Mapping

CO's	SDG mapping with CO's	
CO1	SDG 04 - Quality Education	-
CO2	SDG 04 - Quality Education	-
CO3	SDG 04 - Quality Education	SDG 09 - Industry, Innovation, and Infrastructure
CO4	SDG 04 - Quality Education	SDG 09 - Industry, Innovation, and Infrastructure
CO5	SDG 04 - Quality Education	SDG 09 - Industry, Innovation, and Infrastructure

  
VAC Coordinator

  
HOD-ADS