NIELIT Virtual Academy

COURSE PROSPECTUS

Name of the Course: *Certificate Course in Generative AI*

Mode of the Conduction: Online-Blended

Starting Date: **12-05-2025**

Last Date of Registration: **09-05-2025**

Objective of the Course

The objective of this course is to provide hands-on experience with foundational concepts in Generative AI. Course is practical oriented and emphasizing on Practical applications and project-based learning.

Prerequisites

- ✓ Candidate must have latest computer/laptop with preferably 4 GB RAM or higher and Graphics Card (2 GB)
- ✓ Internet connection with good speed (preferably 2Mbps or higher)
- ✓ Knowledge of Python Programming and Neural Network

Outcome of the Course:

Upon completion of the course, participants can expect to achieve:

- ❖ Basic Knowledge on Generative AI and will be able to differentiate Generative AI with other AI Types.
- ❖ Hands-on Knowledge on Core Generative Models.
- ❖ Skills to apply Generative Models to Practical Models.
- ❖ Skills of Developing basic Generative AI Project.
- ❖ Skills to Prepare for Advance Study or Professional Work.
- ❖ Certification: A certificate that validates their knowledge and skills in Generative AI, which can be used to enhance their resume and career prospects.

Course Fee: **Rs: 4,000/- (inclusive of GST)**

Eligibility: **12th /+2**

Methodology:

- ✓ Teaching Mode: Online
- ✓ Instructor-led live sessions

- ✓ Weekly One Day Contact Program in NIELIT Chennai (Optional)
- ✓ Online/ Blended lab sessions
- ✓ Content access through LMS
- ✓ Recorded Session Available (after the instructor's led-live session)

Registration Link: http://nva.nielit.gov.in

Contact Details:

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Course Structure:

Module No	Module Title	Duration (Hours)
1	Overview of Generative AI	42
2	Environment Setup for Generative AI.	
3	Working with Autoencoders	30
4	Essentials of Generative Adversarial Networks (GANs)	30
5	Ethical Implications of Generative AI	03
6	Final Project Development	**15**
	Total Duration	***120***

Detailed Syllabus:

Module 1:	**Overview of Generative AI (Duration: 02 Hrs.)**
	Introduction to Generative AI & Examples
	Working of Generative AI.
	Applications of Generative AI
	Challenges and Limitations
	Future of Generative AI
Module 2:	**Environment Setup for Generative AI (Duration: 40 Hrs.)**
	Setting up Python and Configuring Essential Libraries and Frameworks (Tensor Flow, PyTorch etc.)
	Introduction to Jupyter Notes Book and Google Colab
	Basic TensorFlow/PyTorch Operations

	Neural Network Basics
	❖ Understanding Neural Network
	  ➢ Concepts: Neurons, activation functions, layers, forward propagation, loss functions, backpropagation.
	❖ Building a Simple Neural Network.
	❖ Visualizing the result.
	❖ Regularization
	  ➢ Dropout
	  ➢ L2 regularization.
	❖ Optimization
	  ➢ Different optimizers like SGD, Adam.
	❖ Introduction to Convolutional Neural Networks (CNNs).
	❖ Introduction to Recurrent Neural Networks (RNNs).
	❖ Case Studies:
	  ➢ Image Classification.
	  ➢ Text Classification.
	  ➢ Handwritten Digit Recognition.

	Deep Learning Basics ❖ Introduction to deep Learning ❖ Importance of Deep Learning ❖ Deep Learning Algorithms
Module 3:	**Working with Autoencoders (Duration: 30 Hrs.)**
	Introduction to Autoencoders
	Architecture of Autoencoders
	Types of Autoencoders
	Key Concepts: Latent Space and Reconstruction Loss
	Implementing a Basic Autoencoder ❖ Building the encoder and decoder networks ❖ Training the autoencoder on dataset ❖ Visualizing the reconstructed images
	Modifying the Architecture & Training on different Dataset
	Denoising Autoencoders ❖ Adding Noise to input Data. ❖ Training Autoencoder to remove noise. ❖ Evaluating the Denoising Performance.
	Sparse Autoencoders

	❖ Sparsity Constraint ❖ Introducing Sparsity Constraint ❖ Implementing Sparse Autoencoders ❖ Comparing with basic Encoder
	Convolutional Autoencoders ❖ Convolutional Layer ❖ Implementing convolutional layers in autoencoders ❖ Training on image datasets ❖ Comparing with fully connected autoencoders

	Variational Autoencoders (VAEs)
	❖ Introduction to VAEs
	  ✚ Architecture and principles of VAE
	❖ VAE implementation
	  ✚ Building encoder and decoder network
	  ✚ Training VAE
	  ✚ Visualization (latent space and generated Images)
	❖ Experimenting
	  ✚ Modifying the architecture
	  ✚ Training on a different dataset (e.g., CIFAR-10)
	  ✚ Exploring the latent space

	Case Studies: ❖ Image Denoising with Autoencoders. ❖ Anomaly Detection with Autoencoders. ❖ Image Generation with VAEs
Module 4:	**Essentials of Generative Adversarial Networks (GANs) (Duration: 30 Hrs.)**
	Overview of Generative Models. ❖ Generative Vs. Discriminative Models. ❖ Types of Generative Models.
	Introduction to GANs ❖ Concept and History ❖ Real World applications of GANs
	GAN Architecture ❖ Generator and Discriminator ❖ Adversarial loss function ❖ Minimax game formulation

	Mathematical Foundations
	❖ Basic Probability and Statistics
	❖ Distribution
	❖ Optimization in GANs
	  ✚ Gradient Descent
	  ✚ Stochastic Gradient Descent
	❖ Adversarial Training
	❖ Convergence Issues
	❖ Evaluation Metrics

	Basic GAN Implementation ❖ Building Generator - Network architecture - Activation Functions ❖ Building Discriminator - Network architecture - Loss Functions ❖ Training a Basic GAN - Data Preparation. - Training loop. - Evaluating the Output.
	Types of GAN ❖ Deep Convolutional GAN (DCGAN) - Convolutional layers in GANs - Implementing a DCGAN ❖ Conditional GAN (cGAN) - Conditioning on additional information - Implementing a cGAN ❖ Wasserstein GAN (WGAN) - Wasserstein distance - Implementing a WGAN ❖ Other Types - CycleGAN - Pix2Pix - Implementation overview
	Advanced Topics ❖ Stabilizing GAN Training - Techniques (e.g., gradient penalty, spectral normalization) - Implementing improvements ❖ GANs for Image Generation - High-resolution image synthesis - StyleGAN and BigGAN ❖ GANs for Other Modalities - Text-to-image synthesis - Music and audio generation
	Case Studies ❖ 1: Image Generation with DCGAN ❖ 2: Image-to-Image Translation with Pix2Pix ❖ 3: Style Transfer with CycleGAN ❖ 4: Text-to-Image Generation with GANs
Module 5:	**Ethical Implications of Generative AI (Duration: 03 Hrs.)**
	Content Authenticity and Deepfakes
	Privacy Concerns
	Bias and Fairness
	Intellectual Property and Copyright
	Job Displacement
	Misuse and Malicious Applications

	Transparency and Accountability
	Human-AI Interaction
	Mitigating Ethical Risks
Module 6:	**Final Project Development (Duration: 15 Hrs.)**
	Test & Project Presentation

Examination & Certification:

Test	Project		Total
	Project	Presentation	
40	40	20	100

After successful completion of the course, candidate will get an online certificate with the following Grading Scheme:

Marks Range	Grade	Certificate Type
85% and above	S	Graded
75-84%	A	Graded
65-74%	B	Graded
55-64%	C	Graded
50-54%	D	Graded
<50%	F	Participation
Attended the Course but not fulfill the minimum academic requirements	N	Participation