



ಬೆಂಗಳೂರು ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ BANGALORE INSTITUTE OF TECHNOLOGY

Autonomous Institute, Affiliated to VTU, Belgaum

Department of Master of Computer Applications

Semester	3
Course Title	Generative AI and its Applications
Course Code	MMCA311D
Credits	3
Total Hours of Pedagogy	40
L-T-P-S	3-0-0-0
CIE	50
SEE	50
TOTAL	100
Exam Type	Theory
Exam Hours	3 Hrs

Course Learning Objectives:

1. Understand the Fundamentals of Generative AI.
2. Master in Core Generative AI Models: GANs, VAEs, and Diffusion Models.
3. Develop Practical Skills in Generative AI Using Popular Frameworks.
4. Create innovative solutions using prompt engineering.
5. Apply Generative AI to Real-World Applications.

Module I

Introduction to AI and Machine Learning - Types of Generative Models (e.g., Large Language Models (LLMs), Small Language Models (SLMs), Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs), Autoregressive Models) - Neural Networks: Basic Architecture, Feed Forward Network, Backpropagation, Activation Functions - Deep Learning Basics and its Applications.

Text Book	1,2
Chapter	1:8, 2:5,9
RBT	L2

Module II

Introduction to Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs) - Understanding the Generator-Discriminator Architecture in GANs-Latent Space Representation and Loss Functions-Training Strategies, Optimization, and Hyperparameter Tuning-Applications and Case Studies in Image, Video, and Text Generation-Diffusion Models and their Use in Modern AI Art Generation

Text Book	1,2,3
Chapter	1:17, 2:19, 3:3,4,8
RBT	L2, L3

Module III

Introduction to Prompt Engineering – Overview and Applications. Prompt Structure, Prompt Tuning, Hard and Soft Prompts, Prompt Engineering Techniques - Zero Shot, One Shot, Few Shot Prompting, Chain of Thought, Tree of Thought, Graph of Thought Prompting, Vector Stores, RAG Introduction, Need for RAG

Text Book	4
Chapter	1,3
RBT	L2, L3

Module IV

Introduction to TensorFlow and PyTorch for Generative AI Building GANs and VAEs from Scratch Hands-on Projects: Generating Images, Music, and Text - Model Evaluation Techniques (FID Score, Inception Score, BLEU Score) - Fine-tuning Pretrained Models for Specialized Applications

Text Book	5,6
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Accredited by NBA, NAAC A+ and QS-I Gauge(Gold Rating)



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Chapter	5:1,2 6:2
RBT	L2, L3

Module V

AI in Digital Art and Content Creation - Music Generation Using Neural Networks - Healthcare Applications: Drug Discovery and Medical Imaging - Natural Language Generation (NLG) and Chatbots - Case Studies: Generative AI in Gaming, Fashion, and Virtual Reality	
Text Book	5
Chapter	5
RBT	L2, L3

Course Outcomes (Course Skill Set):

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

Sl. No.	Course Outcomes	PO	RBT
1	Understand the Fundamental concepts of Generative AI	PO1, PO2	L2
2	Identify the performance of generative models using metrics	PO1, PO5	L2
3	Create innovative solutions by applying prompt engineering to enhance the capabilities of LLMs	PO2, PO3, PO8	L4
4	Apply algorithms to build and train generative models using frameworks	PO1, PO3, PO5	L3
5	Compare the performance of various generative AI architectures	PO5, PO6	L3

Suggested Learning Resources:

Text Books:

Sl. No.	Name of the author	Title of the Book	Name of the publisher	Edition and Year
1	Christopher M. Bishop, Hugh Bishop	Deep Learning Foundations and Concepts	Springer	1 st Edition, 2024
2	Ian Goodfellow, Yoshua Bengio	Deep Learning	MIT Press	2 nd Edition, 2016
3	David Foster	Generative Deep Learning : Teaching Machines to Paint, Write, Compose, and Play	Oreilly	2 nd Edition, 2023
4	James Phoenix and Mike Taylor	Prompt Engineering for Generative AI Future-Proof Inputs for Reliable AI Outputs at Scale	Manning	1 st Edition, 2024
5	PyTorch Mark Liu	Learn Generative AI	Apress	2 nd Edition, 2024
6	Santanu Pattanayak	Pro Deep Learning with TensorFlow 2.0 A Mathematical Approach to Advanced Artificial Intelligence in Python	Oreilly	1 st Edition, 2023

Reference Books:

Sl. No.	Name of the author	Title of the Book	Name of the publisher	Edition and Year
1	Gohil, P.	Machine learning with Tensor Flow	BPB	1st Edition, 2019

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