



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:**

- Understand the Fundamentals of Generative AI.
- Master in Core Generative AI Models: GANs, VAEs, and Diffusion Models.
- Develop Practical Skills in Generative AI Using Popular Frameworks.
- Create innovative solutions using prompt engineering.
- 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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**BANGALORE INSTITUTE OF TECHNOLOGY**  
Autonomous Institute, Affiliated to VTU, Belgaum  
Department of Master of Computer Applications

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

**Module V**

<b>AI in Digital Art and Content Creation</b> - 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
Chapter
RBT

**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 <sup>st</sup> Edition, 2024
2	Ian Goodfellow, Yoshua Bengio	Deep Learning	MIT Press	2 <sup>nd</sup> Edition, 2016
3	David Foster	Generative Deep Learning : Teaching Machines to Paint, Write, Compose, and Play	Oreilly	2 <sup>nd</sup> Edition, 2023
4	James Phoenix and Mike Taylor	Prompt Engineering for Generative AI Future-Proof Inputs for Reliable AI Outputs at Scale	Manning	1 <sup>st</sup> Edition, 2024
5	PyTorch Mark Liu	Learn Generative AI	Apress	2 <sup>nd</sup> Edition, 2024
6	Santanu Pattanayak	Pro Deep Learning with TensorFlow 2.0 A Mathematical Approach to Advanced Artificial Intelligence in Python	Oreilly	1 <sup>st</sup> 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