GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Master of Technology	Branch/Spec.	Computer Engineering (Artificial Intelligence)
Semester	I	Version	1.0.0.0
Effective from Academic Year	2025-26	Effective for the Batch admitted in	July 2025
Course Code	3CEAIPE106	Course Name	Generative AI

Teaching Scheme						Examination Scheme (Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	-	1	-	4	Theory	50	50	100
Hours	3	-	2	-	5	Practical	30	20	50

Pre-requisites

NIL

Course Outcomes

On successful completion of the course, the students will be able to:

CO1	Explain the basic concepts and techniques used in generative AI models including GANs, VAEs.
CO2	Implement and train generative models like GANs, VAEs etc. on different data types and evaluate their performance.
CO3	Analyze the architectural details and loss functions for training of generative adversarial networks and variational autoencoders.
CO4	Design conditional generative models for performing image-to-image translation and other tasks by leveraging techniques like conditional GANs/VAEs.

Theory Syllabus

Unit	Content	Hrs.
1	**Introduction to Generative AI:** Overview of Generative AI and its applications, Historical development and evolution of Generative AI, Types of generative models (e.g., GANs, VAEs), Ethical considerations in generative AI.	05
2	**Fundamentals of Machine Learning and Neural Networks:** Basics of machine learning and deep learning, Neural network architectures and their components, Training and optimization in neural networks, Introduction to backpropagation.	06
3	**Introduction to Generative Adversarial Networks (GANs):** Understanding the GAN architecture, Training process and loss functions in GANs, Applications of GANs in image generation, style transfer, etc., Challenges and limitations of GANs.	06
4	**Variational Autoencoders (VAEs):** Introduction to autoencoders and variational autoencoders, Probabilistic modeling in VAEs, Generating new data samples with VAEs,Comparison with other generative models.	07
5	**Natural Language Processing with Generative Models:** Applying generative models to natural language generation, Language modeling with recurrent neural networks, Text generation using GPT (Generative Pre-trained Transformer) models, Conditional text generation and storytelling.	06
6	**Conditional Generative Models:** Conditional GANs and VAEs, Generating data with specific attributes or features, Style transfer in images and text, Applications in image-to-image translation.	05
7	**Advanced Topics in Generative AI:** Deep generative models beyond GANs and VAEs, Reinforcement learning in generative models, Evolutionary algorithms for generative design, Future trends and research directions.	05
8	**Practical Applications and Projects:** Real-world applications of generative AI in industries, Implementation of generative models in projects, Ethical considerations in deploying generative models, Showcase and presentation of final projects.	05

Practical Content

Practicals, Assignments and tutorials are based on the above syllabus.

Text Books

1	"Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play" by David Foster.
Reference Books	
1	"Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville.
2	"Generative Adversarial Networks" by Ian Goodfellow, et al. (GANs Book).
ICT/MOOCs Reference	
1	https://www.udemy.com/course/data-science-and-machine-learning-with-python-hands-on/
2	https://www.udemy.com/course/deeplearning/
3	https://www.udemy.com/course/tensorflow-developer-certificate-machine-learning-zero-to-mastery/

Mapping of CO with PO and PSO:														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	1	3	1	1	1	1	2	1	3	2	3
CO2	1	3	3	2	3	0	0	0	2	2	2	3	2	3
CO3	1	3	3	2	2	0	0	0	1	2	1	2	1	2
CO4	1	2	3	1	2	1	0	1	2	2	2	2	1	3