

COURSE HANDOUT

Generative Artificial Intelligence (COM-801)

CSE- 8th SEMESTER

ACADEMIC YEAR (2024)

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Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
COM-801	Generative Artificial Intelligence	Core	3	3	0	0	50	100	150

COURSE OUTCOMES

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

CO1	Explain the foundational concepts of Generative Artificial Intelligence.
CO2	Analyze various AI based generative models and their applications.
CO3	Describe GANs and their applicability to various unsupervised learning problems.
CO4	Evaluate RNNs and LSTM models for sequential processing in Natural Language Processing.
CO5	Explore use of pre-trained language models including metrics for evaluating generative models.

Section-A

Unit 1: Introduction: Overview of Generative AI (GenAI) and its applications in various domains, Understanding the difference between generative and discriminative models, Taxonomy of generative models, GenAI modalities mappings.

(10 Hrs)

Unit 2: Generative Models: Fundamentals and Techniques, Introduction to basic generative models (Gaussian Mixture Models (GMMs) and Hidden Markov Models (HMMs)), Latent Variable Models, Statistical Language Models (SLM), Role of encoder and decoder networks.

(10 Hrs)

Unit 3: Generative Adversarial Networks (GANs): Introduction to GANs and the GAN framework, Generator-discriminator adversarial training process, Variants of GANs: Conditional GANs, Wasserstein GANs. Autoregressive Models (PixelCNN and PixelRNN architectures for image generation).

(10 Hrs)

Section-B

Unit 4: Sequence Generation and Transformers: Recurrent Neural Networks (RNNs), Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU) cells, Introduction to Transformers: Motivation for Transformers and their advantages over RNNs, Transformer architecture: self-attention and feed-forward layers, multi-head attention mechanism.

(10 Hrs)

Unit 5: Language Generation with Transformers: Using pre-trained language models like GPT (Generative Pre-trained Transformer), Conditional language generation, Metrics and techniques for evaluating generative models.

(10 Hrs)

Textbooks

S.No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub.Yr.)
1	Generative AI with python	Joseph Babcock, Raghav Bali	Packt	1 st (2021)
2.	ChatGPT for Thought Leaders and Content	Dr. Gleb Tsipursky	Intentional Insights	1 st (2023)



	Creators: Unlocking the Potential of Generative AI for Innovative and Effective.			
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Reference Books

S.No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub.Yr.)
1	Exploring Deepfakes	Bryan Lyon (Author), Matt Tora	Packt Publishing	1 st (2023)

COURSE PLAN		
Unit-I Introduction to Gen AI		
S.No	Topics	Recommended Books
1	Overview of Generative AI (GenAI) and its applications in various domains	Book 1, Ch.1
2	Understanding the difference between generative and discriminative models	Book 1, Ch.1
3	Taxonomy of generative models,	Book 1, Ch.1
4	GenAI modalities mappings.	Book 2, Ch.2
Unit-II Generative Models		
5	Fundamentals and Techniques	Book 1, Ch.2
6	Introduction to basic generative models (Gaussian Mixture Models (GMMs)	Book 1, Ch.2
7	Hidden Markov Models (HMMs))	Book 1, Ch.1
8	Latent Variable Models	Book 2, Ch.2
9	Statistical Language Models (SLM)	Book 2, Ch.2
10	Role of encoder and decoder networks.	Book 2, Ch.2
Unit-III Generative Adversarial Networks (GANs)		
11	Introduction to GANs and the GAN framework	Book 2, Ch.2
12	Generator-discriminator adversarial training process	Book 2, Ch.2
13	Variants of GANs: Conditional GANs	Book 2, Ch.2
14	Wasserstein GANs	Book 2, Ch.2
15	Autoregressive Models	Book 2, Ch.2
16	PixelCNN and PixelRNN architectures for image generation.	Book 2, Ch.2
Unit-IV Sequence Generation and Transformers		
17	Recurrent Neural Networks (RNNs)	Book 2, Ch.3
18	Long Short-Term Memory(LSTM)	Book 1, Ch.1
19	Gated Recurrent Unit (GRU) cells	Book 1, Ch.4
20	Introduction to Transformers	Book 2, Ch.3
21	Motivation for Transformers and their advantages over RNNs	Book 1, Ch.3
22	Transformer architecture	Book 2, Ch.3
23	Self-attention and feed-forward layers	Book 1, Ch.3



24	multi-head attention mechanism.	Book 1, Ch.3
Unit-V Language Generation with Transformers		
25	Using pre-trained language models like GPT (Generative Pre-trained Transformer),	Book 2, Ch.8
26	Conditional language generation	Book 1, Ch.8
27	Metrics and techniques for evaluating generative models	Book 2, Ch.8

ADDITIONAL WEB RESOURCES

1.	MOOC: Introduction to Artificial Intelligence https://www.coursera.org/learn/generative-ai-with-llms
2.	NPTEL: https://www.cloudskillsboost.google/course_templates/536

GRADING AND ASSESSMENT

- **Sessional Test:** 20 marks
- **Assignment:** 20 marks
- **Attendance:** 10 marks
- **Final Examination:** 100 marks

COURSE POLICIES

- **Attendance:** Minimum 75% attendance is mandatory to appear in the final examination of the course.
- **Academic Integrity:** MIET's academic integrity policies apply. Plagiarism will not be tolerated.
- **Late Submissions:** Assignments and projects must be submitted by the specified timelines.

FACULTY INFORMATION

- **Office Hours**
Tuesday(12:05 PM - 12:55 PM)
Friday (12:05 PM - 12:55 PM)
- **Contact Information**
azra.cse@mietjammu.in