



MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

COURSE CONTENT

GENERATIVE AI								
II Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
2525828	Foundation	3	0	0	3	40	60	100
		Practical Classes: Nil			Total Classes: 45			
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			

Prerequisites: To understand and build generative models.

Course Overview:

This course refers to artificial intelligence models that can create new data including text, images, audio, video, 3D models, code, and more by learning patterns from existing datasets. These systems include large language models like ChatGPT, generative adversarial networks diffusion models, and other deep learning architectures.

Course Objectives:

1. To understand the foundations and evolution of Artificial Intelligence, Machine Learning, Deep Learning, and Generative AI.
2. To study advanced neural architectures such as GANs, VAEs, Transformers, and LSTMs for generative modelling.
3. To develop skills in Large Language Models, prompt engineering, and AI-based content generation techniques.
4. To explore multi-agent systems and real-world applications of Generative AI in diverse domains.
5. To analyze multimodal AI frameworks, ethical issues, and responsible deployment strategies for Generative AI systems.

Course Outcomes: After Completion of the Course, Students should be able to

1. Apply foundational AI, deep learning, and generative modeling techniques to build transfer-learning based solutions for real-world applications.
2. Analyze advanced neural architectures and Transformers to determine their effectiveness in generating realistic data across different domains.
3. Evaluate large language models and prompt engineering strategies to optimize chatbot design, creative writing, and intelligent text generation systems.
4. Distinguish multi-agent systems and collaboration frameworks to orchestrate generative AI tasks in areas such as healthcare and finance.
5. Create multimodal generative AI applications using frameworks while addressing ethical, social, and legal challenges for responsible deployment.

UNIT - I: Foundations of AI and Generative Models

Introduction and historical evolution to Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP) and Deep Learning (DL), Structure of Artificial Neural Networks (ANNs), Mathematical and computational foundations of generative modeling, Overview of generative models and their applications across various domains; Importance of Generative AI in modern applications, Transfer learning and in advancing Generative AI.

UNIT - II: Advanced Neural Architectures for Generative AI

Variational Autoencoders (VAEs): principles and applications, Generative Adversarial Networks (GANs): architecture and working principles; Transformer architecture and attention mechanisms (in detail); Long Short-Term Memory Networks (LSTMs) and the limitations of traditional RNNs/LSTMs, Advanced Transformer architectures and techniques, Pre-training and transfer learning strategies for generative models.

UNIT - III: Large Language Models and Prompt Engineering

Overview of Large Language Models (LLMs), GPT architecture, variants, and working principles, Pré- training and fine-tuning GPT models for applications (e.g., chatbots, text generation), Case study: GPT- based customer support chatbot, BERT architecture, pre-training objectives, and fine-tuning, Prompt Engineering: Designing effective prompts, controlling model behavior, and improving output quality, Fine- tuning language models for creative writing and chatbot development.

UNIT - IV: Multi-Agent Systems and Generative AI Applications

Introduction to Multi-Agent Systems (MAS),Types of agents: reactive, deliberative, hybrid, and learning agents, Multi-agent collaboration and orchestration for generative tasks, Use cases: autonomous research assistants, cooperative creative generation, distributed problem-solving, Frameworks and tools: AutoGen, CrewAI, Hugging GPT for LLM-powered multi-agent systems, Generative AI applications: Art, Creativity, Image/Video generation, Music composition, Healthcare, Finance, Real-world case studies and deployment challenges.

UNIT - V: Frameworks, Multimodal Applications, and Ethics

Lang Chain framework: components and LLM application development, Retrieval-Augmented Generation (RAG), Embeddings, Indexing networks, and Vector databases, Generative AI across modalities: Text, Code, Image, and Video generation, Image and Video generation using GANs and VAEs, Multimodal Generative AI: integration and training strategies, Ethical considerations: bias, fairness, trust, and responsible AI deployment, Social and legal implications of Generative AI, Risk mitigation strategies and real-world ethical case studies.

TEXT BOOKS:

1. Altaf Rehmani, Generative AI for Everyone: Understanding the Essentials and Applications of This Breakthrough Technology.
2. Charu C. Aggarwal, Neural Networks and Deep Learning: A Textbook. Joseph Babcock, Raghav Bali, Generative AI with Python and TensorFlow 2, 2024.

REFERENCE BOOKS:

1. Josh Kalin, Generative Adversarial Networks Cookbook.
2. Jesse Sprinter, Generative AI in Software Development: Beyond the Limitations of Traditional Coding, 2024.

ELECTRONIC RESOURCES:

1. <https://www.coursera.org/explore/generative-ai>
2. <https://www.coursera.org/learn/getting-started-with-generative-ai>
3. <https://www.codecademy.com/learn/intro-to-generative-ai>
4. <https://www.mygreatlearning.com/academy/learn-for-free/courses/generative-ai-for-beginners>

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)