GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Subject Code: ME03000131

Subject Name : Generative AI with LLM

w. e. f. Academic Year:	2024-25
Semester:	3
Category of the Course:	MOPEC

Prerequisite:	Machine learning, Deep learning
Rationale:	Generative AI models use neural networks to identify the pattterns and structures within existing data to generate new and original content. This course will cover algorithms in generative models and applications of LLM.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand the concepts behind Generative AI and LLM	R
02	Analyze different algorithms for generative models	U
03	Study various applications of LLM	U
04	Understand challenges and limitation of Generative models	R

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	0	3	70	30	0	0	100

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Overview of Generative AI and Large language models	2	5
2.	Fundamental concepts Probability distribution Neural networks	10	35

	Generative Adversarial Networks(GANs) Variational Autoencoders(VAEs) Transfer Learning Transformer architecture		
3.	Algorithms used in Generative Models Recurrent Neural Networks(RNNs) Long Short Term Memory(LSTM) and Gated Recurrent Unit(GRU) Bidirectional RNNs(BRNNs) Power of convolution neural network(CNNs) Activation Functions used in Generative Models Optimization Techniques for Generative Modeling	12	35
4.	Text Generation Pretraining and Fine tuning of LLM Models Impact of Generative AI and LLM Applications of LLM Natural Language Understanding(NLU) Text Generation and creative writing Language Translation Text summarization Dialog system Content generation and personalization Medical and scientific research	10	15
5.	Challenges and Limitation Bias and Fairness Ethical Use Privacy concerns Computational Resources Environmental Impact\ Interpretability and transparency Data Quality and diversity	2	10
	Total	**36**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
40	**60**				

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Generative AI for Everyone Deep learning, NLP, and LLMs for creative and practical applications By Karthikeyan Sabesan, Sivagamisundari, Nilip Dutta BPB publication

2. Generative AI and LLMs Edited by Balasubramaniam, Seifedine Kadry,A. Prasanth and Rajesh Kumar Dhanaraj published by De Gruyter

3. Generative AI with LangChain: Build large language model (LLM) apps with Python,

   ChatGPT, and other LLMs Kindle Edition by Ben Auffarth

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