GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: BE-Minor/Hons.

Level: UG

Branch: Artificial Intelligence and Machine Learning

Course / Subject Code : BE05IAN011

Course / Subject Name : Applied Gen AI

w. e. f. Academic Year:	2024-2025
Semester:	5th
Category of the Course:	**Core Course**

Prerequisite:	• Basic programming knowledge (preferably Python) • Fundamentals of mathematics (linear algebra, calculus, probability, statistics) • Understanding of software engineering principles
Rationale:	This course provides foundational knowledge in AI and ML, aligning with industry standards and emphasizing practical skills. It covers essential concepts, ethical considerations, and agile methodologies, preparing students for real-world applications and advanced studies in AI/ML.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Introduction to Language Models, with focus on Generative Pre-trAIned Transformer (GPT) technology.	U
02	Live demonstrations showcasing GPT applications: Auto HTML generation, IntelliSense, Language Translation, Text Summarization, Question Answering, and Text Classification.	A
03	Understanding Prompt-based Learning and best practices in Prompt Design.	U
04	Exploring the versatility of GPT-3 Models for various tasks.	N
05	Defining Ethics in AI and recognizing its importance in AI systems.	U
06	Identifying threats posed by unethical AI systems and listing ethical system requirements.	N
07	Familiarization with GPT-3 and its potential applications.	R
08	Hands-on experience with GPT-3 playground and configurations.	A
09	Utilizing GPT-3 for solving natural language tasks using both playground and Python programming language.	A
10	Understanding the building blocks of language models and the core workings of transformer models, as exemplified in GPT-3.	U

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme: (Not applicable, self-paced course)

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)	
4	0	0	4	100	0	0	0	100

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction to OpenAI GPT Models** - Who should read this Primer? What is Artificial Intelligence? Discriminative AI vs. Generative AI, Deep Learning, Natural Language Processing, Pre-Trained Models and Large Language Models, Introduction to GPT, Primer - End Note, Introduction to Artificial Intelligence Discriminative vs Generative, Language Model, Transformer Model, Pre-Trained Models, GPT Product and Application Demos, Python code Demo **Prompt Engineering** - Primer, who should read this Primer? What is Artificial Intelligence? Discriminative AI vs. Generative AI, Deep Learning, Natural Language Processing, Pre-Trained Models and Large Language Models, Introduction to GPT-3, Generative Pre-Trained Models, Large Language Models, Large Language Models (Interactive), Understanding GPT-3 (Interactive), Need for Prompt Engineering, Why Prompt Engineering?, Prompt Engineering Concepts, Prompt Engineering Guidelines, Zero-shot, One-Shot, Few-shot learning (Interactive), Prompt Design Guidelines Part, Kinds of Models Available, Text Completion, Classification, Generation, Conversation, Text Transformations, Code Completion, Instructing the Codex, Troubleshooting, Basic Tips to troubleshoot, Completions - Factual vs. Imagined, Limitations of Large Language Models	12	17%
2.	**AI –First Software Engineering,** who should read this Primer? What is Artificial Intelligence? Discriminative AI vs. Generative AI, Deep Learning, Natural Language Processing, Pre-Trained Models and Large Language Models, Introduction to GPT-3, AI-First – a paradigm shift,	16	21%

	Conversational and Sensory AI, Ambient, Multi-device AI, AI-First Interpretations, AI-First at sys, AI-First at sys ETA, AI-First Approach, AI First SDLC Phases, AI First SDLC, Use Case Description, Requirement Elicitation: LLM as an SME! (Interactive), Design using LLMs (Interactive), Requirement Elicitation & Design, Testing (Interactive), Deployment, Limitations of Large Language Models **OpenAI Generative Pre-Trained Transformer 3 (GPT-3) for developers,** Introduction, Getting Started, GPT-3 Examples, Development using GPT-3, Basic Elements, GPT-3 Architecture, Getting access to GPT-3 APIs, Python library, Language Models, Seq2Seq Learning, Transfer Learning, How GPT3 Works? Embedding, Positional Encoding, Transformer Model, Encoder, Decoder, Attention, Multi head attention, Feed-Forward Neural Network, **Capstone Project**		
3.	**Introduction to OpenAI GPT Models -** Primer, who should read this Primer? What is Artificial Intelligence? Discriminative AI vs. Generative AI, Deep Learning, Natural Language Processing, Pre-Trained Models and Large Language Models, Introduction to GPT, Primer - End Note, Introduction to Artificial Intelligence Discriminative vs Generative, Language Model, Transformer Model, Pre-Trained Models, GPT Product and Application Demos, Python code Demo **Prompt Engineering**- Primer, who should read this Primer? What is Artificial Intelligence? Discriminative AI vs. Generative AI, Deep Learning, Natural Language Processing, Pre-Trained Models and Large Language Models, Introduction to GPT-3, Generative Pre-Trained Models, Large Language Models, Large Language Models (Interactive), Understanding GPT-3 (Interactive), Need for Prompt Engineering, Why Prompt Engineering? Prompt Engineering Concepts, Prompt Engineering Guidelines, Zero-shot, One-Shot, Few-shot learning (Interactive), Prompt Design Guidelines Part, Kinds of Models Available, Text Completion, Classification, Generation, Conversation, Text Transformations, Code Completion, Instructing the Codex, Troubleshooting, Basic Tips to troubleshoot, Completions - Factual vs. Imagined, Limitations of Large Language Models, **Capstone Project**	15	20%
4.	**Ethical AI -** AI and Ethics, Humans and AI, what is Ethics? Root Causes, Why Ethics in AI? Guidelines, Regulations & Standards for Ethical AI, Is it a unique problem with technology? How does the industry handle such problems? What are the Guidelines, Regulations, Standards for AI? Current Stance, Building Blocks of Responsible AI, Implementation Challenges, What Next? Framework for Thinking and	15	20%

	acting on Ethical AI practices, Core Ethical Requirements of AI Systems, Core ethical requirements of Ethical AI **Agile Scrum in practice,** Introduction to Agile Software Development, Values and Principles of agility, Agile Vs Waterfall, Agile adoption in projects and its impact, Sprint 0 - Discovery, Discovery Phase, Discovery Phase - Part 2, Sprint 0 - Initiation, Vision Statement, Vision Statement - Activity and Possible Solution, User Stories, User Story Activities and, Possible solution, Prioritization of User Stories, Possible solution		
5.	Release Planning, Story Point Estimation, Sprint Duration, Velocity Computation, Release Date Computation, Release Burn down Chart, Team Enablement, Base Architecture Design and Infrastructure Set up. **Sprint Planning -** Sprint 1 to N, Sprint Planning, Sprint Planning, Split Stories into Task and Estimate - Activity, Sprint Planning - Possible solution, Produce Working Software, Daily Scrum Meeting, Product Backlog Grooming, Review and Retrospective, Technical Practices, Simple Design Principles, Refactoring, The Why and What of refactoring, Test Driven Development, Continuous Integration, Pair Programming, DevOps and Agile, ASIP Conclusion **Software Engineering and Agile software development,** software engineering fundamentals, Need for Software Engineering, Software Engineering Concepts, Software Engineering Models, Project Roles, Agile software development, Why Agile, Agile Principles, Traditional vs, Agile Flavors, Agile Myth-busters.	17	22%
	Total	**75**	**100**

Suggested Specification Table with Marks (Theory): Given here tentative, which may vary as per Author and Course.

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10%	**10%**	**20%**	**20%**	**20%**	**20%**

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

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