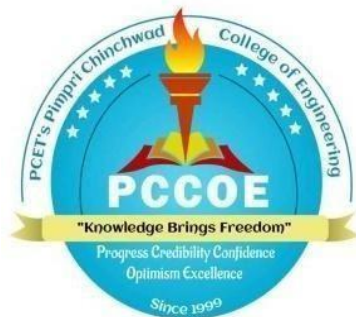**Pimpri Chinchwad Education Trust's**

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

(An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune)

Curriculum Structure and Syllabus

of

Multi-Disciplinary Minor
in Generative AI
(Academic Regulations 2023)

Effective from Academic Year 2024-25

Institute Vision

To be one of the top 100 Engineering Institutes of India in coming five years by offering exemplarily Ethical, Sustainable and Value Added Quality Education through a matching ecosystem for building successful careers.

Institute Mission

1. Serving the needs of the society at large through establishment of a state-of-art Engineering Institute.
2. Imparting right Attitude, Skills, Knowledge for self-sustenance through Quality Education.
3. Creating globally competent and Sensible engineers, researchers and entrepreneurs with an ability to think and act independently in demanding situations.

EOMS Policy

"We at PCCOE are committed to offer exemplarily Ethical, Sustainable and Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders.

We shall strive for technical development of students by creating globally competent and sensible engineers, researchers and entrepreneurs through Quality Education.

We are committed for Institute's social responsibilities and managing Intellectual property.

We shall achieve this by establishing and strengthening state-of-the-art Engineering Institute through continual improvement in effective implementation of Educational Organizations Management Systems (EOMS)."

Course Approval Summary
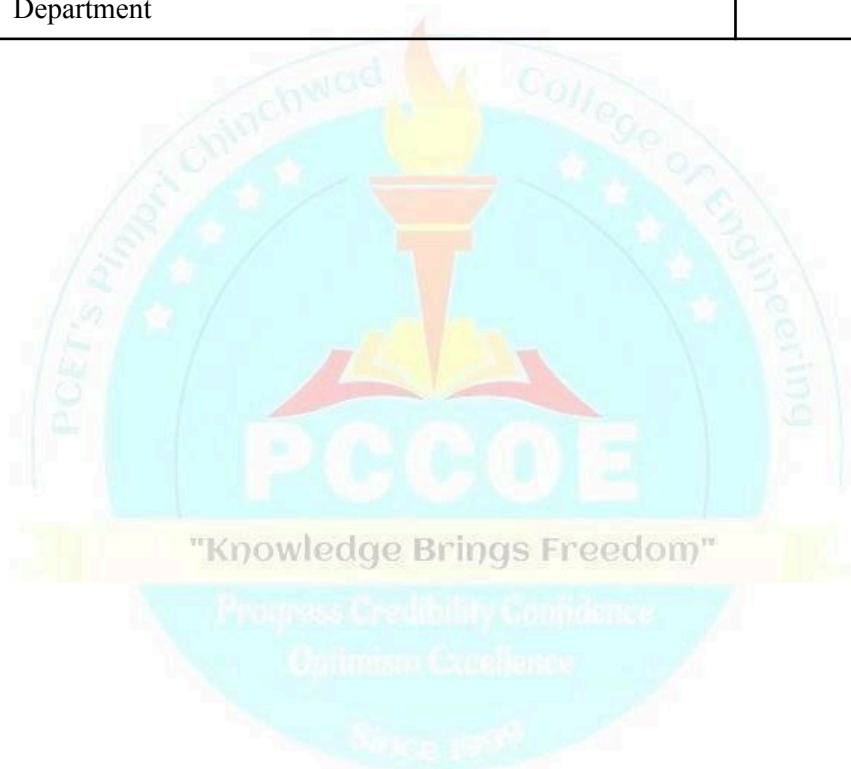
Board of Studies - Department of CSE(AI&ML)

Sr. No.	Name of the Course	Course Code	Page Number	Signature and stamp of BoS Chairman
1.	Introduction to Generative AI	BCS23MD01	5	
2.	Generative AI Models	BCS24MD02	7	
3.	Generative AI Tools & Techniques	BCS25MD03	9	
4.	Generative AI Tools & Techniques Laboratory	BCS25MD04	11	
5.	Generative AI Applications	BCS26MD05	14	
6.	Capstone Project	BCS27MD06	16	

Approved by Academic Council:

Chairman, Academic Council
Pimpri Chinchwad College of Engineering

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Preface

Generative AI represents a dynamic field at the forefront of technological advancement, where algorithms are imbued with the capacity to imagine, create, and innovate. In this course, we aim to provide you with a comprehensive understanding of the principles, techniques, and applications of Generative AI, while offering you the opportunity to delve into specialized topics and hands-on projects tailored to your interests.

The Computer Science & Engineering department offers a Multidisciplinary Minor in Generative AI to the students of Civil, Computer Engineering, Electronics & Telecommunication, and Mechanical Engineering starting from the third semester itself. It spans over five semesters, culminating with a capstone project, adding up to a total of 14 credits.

The course starts with the understanding of Artificial intelligence and machine learning and getting familiar with the concepts of neural networks, deep learning, which provides the necessary foundation for diving deeper into Generative AI. Students will also learn various models in Generative AI and how these models generate new data points by learning the underlying distribution of the training data. Also they will get acquainted with various tools, techniques and applications of Generative AI. Students will gain hands-on experience by implementing generative models using popular deep learning frameworks like TensorFlow or PyTorch along with different architectures, loss functions, and hyperparameters to understand their impact on the quality of generated outputs. Explore creative applications of Generative AI beyond generating realistic images or text. This could include music generation, style transfer, or even generating entire stories or artworks. Students will also learn ethical implications of Generative AI, such as deepfakes and data privacy concerns. Also they will understand the societal impact of these technologies and how they can be used responsibly.

Objectives

- To provide fundamental knowledge of AI and ML

- To prepare the students with demanding industry skills

- To provide an opportunity to develop expertise in AI tools & technologies.

- To apply theoretical understanding to hands-on interdisciplinary projects, solving problems using Generative AI models

Outcomes

- Familiar with basic AI and ML pipeline

- Apply 25+ AI tools to various business models.

- Generate innovative ideas, contents & outputs for industry applications

Curriculum Structure
MDM in
Generative AI

CURRICULUM STRUCTURE
MDM in Generative AI (Regulations 2023)
(With effect from Academic Year 2024-25)

Course Code	Course Name	Credit Scheme				Teaching Scheme (Hours / Week)			Evaluation Scheme and Marks						
		L	P	T	Total	L	P	T	FA		SA	TW	PR	OR	Total
									FA1	FA2					
Semester III															
BCS23MD01	Introduction to Generative AI	2	-	-	2	2	-	-	10	10	30	-	-	-	50
Semester IV															
BCS24MD02	Generative AI Models	2	-	-	2	2	-	-	10	10	30	-	-	-	50
Semester V															
BCS25MD03	Generative AI Tools & Techniques	3	-	-	3	3	-	-	20	20	60	-	-	-	100
BCS25MD04	Generative AI Tools & Techniques Laboratory	-	1	-	1	-	2	-	-	-	-	-	-	50	50
Semester VI															
BCS26MD05	Generative AI Applications	2	-	-	2	2	-	-	10	10	30	-	-	-	50
Semester VII															
BCS27MD06	Capstone Project	-	4	-	4	-	8	-	-	-	-	100	-	50	150
	Total	9	5	-	14	9	10	-							450

L-Lecture, **P**-Practical, **T**-Tutorial, **FA**–Formative Assessment, **SA**-Summative Assessment, **TW**-Term Work, **OR**-Oral, **PR**-Practical

Course Syllabus

"Knowledge Brings Freedom"

Department of Computer Science and Engineering (AI & ML)

MDM : Generative AI (offered by CSE(AI&ML)) (B.Tech: Civil, Computer, E&TC, Mechanical.)		Semester: III
Course :	Introduction to Generative AI	**Code : BCS23MD01**

Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
02	**02**	-	-	**10**	**10**	**30**	**50**

Prior knowledge of Calculus, Linear Algebra, Probability Theory, and Python programming are **essential.**

Course Objectives:
This course aims at enabling students,
1. To learn the fundamentals of Neural Networks and their various types.
2. To explore Generative AI models like GANs, VAEs, and Transformers.
3. To analyze the limitations of traditional RNNs and LSTMs.
4. To discuss current trends and future directions in Generative AI research.

Course Outcomes:
After learning the course, the students should be able to:
1. Understand the evolution of AI and the significance of Deep Learning.
2. Apply various Neural Network architectures for tasks like image recognition and sequence modeling.
3. Analyze data preprocessing and training techniques for neural networks.
4. Design practical solutions using advanced neural networks for diverse applications.

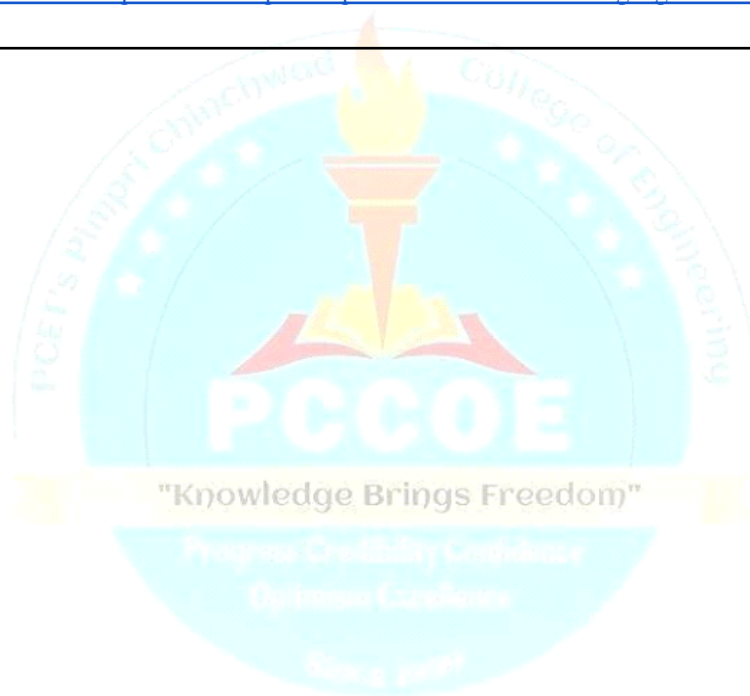|	Detailed Syllabus:	
Unit	**Description**	**Duration [Hrs]**
I	**Foundations of AI and Neural Networks:** History and evolution of AI/ML, Deep learning revolution, Transfer learning, History of Neural Natural Language Processing, Structure of Artificial Neural Networks, Steps in Training an Artificial Neural Network, Parameters and Hyperparameters, Backpropagation.	08
II	**Advanced Neural Network Architectures:** Introduction to advanced architectures, Introduction to Generative AI Models: Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), Transformers, Attention Mechanism in detail Long Short-Term Memory Networks (LSTMs).	08
III	**Data Preprocessing :** Probability and Statistics, Data Preprocessing Techniques, Model Training Techniques	07
IV	**Generative AI Applications:** Applications in Various Fields : Art and Creativity, Image and Video Generation, Text Generation, Music Composition, Healthcare Finance.Real-world use cases and challenges in deploying generative AI models	07
	Total	30

Text Books:
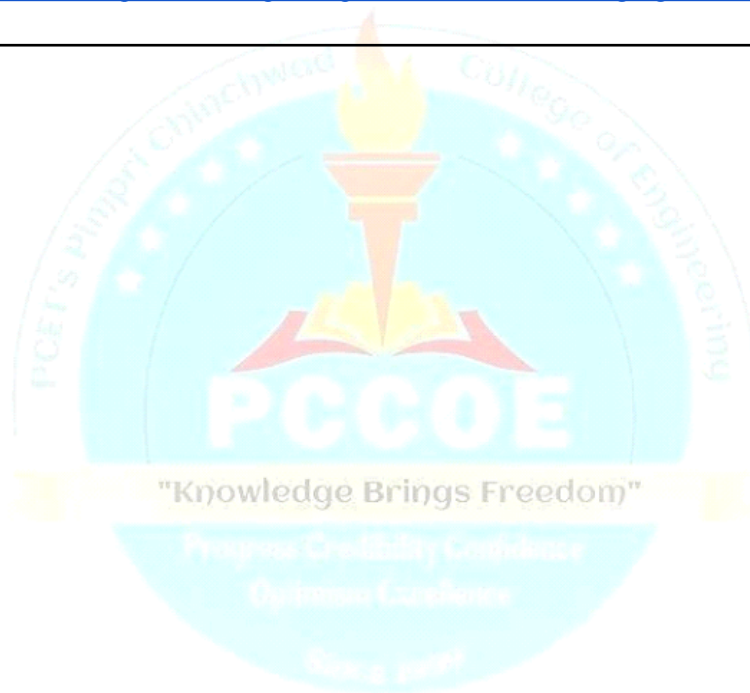1. "Generative AI for everyone: Understanding the essentials and applications of this breakthrough technology". Altaf Rehmani .
2. "Introduction to Generative AI" , Numa Dhamani, Kindle Edition, 2024.
3. "Neural Networks and Deep Learning: A Textbook" by Charu C. Aggarwal.

Reference Books:
1. "Generative Adversarial Networks Cookbook: Over 100 recipes to build generative models using Python, TensorFlow, and Keras" by Josh Kalin.
2. "Generative AI in Software Development: Beyond the Limitations of Traditional Coding" Jesse Sprinter, 2024.

e-sources:
1. https://elearn.nptel.ac.in/shop/iit-workshops/completed/leveraging-generative-ai-for-teaching-programming-courses/?v=c86ee0d9d7ed
2. https://elearn.nptel.ac.in/shop/iit-workshops/completed/introduction-to-language-models/?v=c86ee0d9d7ed

Department of Computer Science and Engineering (AI & ML)

MDM : Generative AI (offered by CSE-AI&ML) (B.Tech: Civil, Computer, E&TC, Mechanical.)		Semester: IV
Course :	Generative AI Models	**Code :BCS24MD02**

Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
02	**02**	**-**	**-**	**10**	**10**	**30**	**50**

Prior knowledge of Calculus, Linear Algebra, Probability Theory, and Python programming, Introduction to Generative AI are essential.

Course Objectives:
This course aims at enabling students,
1. Understand and apply the fundamentals of Generative AI and large language models.
2. Implement GPT architecture for text generation and dialogue systems.
3. Fine-tune BERT for downstream NLP tasks and explore advanced Transformer architectures.
4. Evaluate real-world applications, challenges, and emerging trends in Generative AI.

Course Outcomes:
After learning the course, the students should be able to:
1. Understand large language models' architecture and pre-training techniques.
2. Apply the GPT model for natural language processing tasks.
3. Apply the BERT model for natural language processing tasks.
4. Analyzing the performance and limitations of large language models.

	Detailed Syllabus:	
Unit	**Description**	**Duration [Hrs]**
I	**Introduction to Large Language Models :** Overview of Generative AI and Large Language Models. Basics of attention mechanisms and Transformer architecture. Pre-training techniques and transfer learning strategies.	08
II	**GPT Models and Applications:** Study of GPT architecture and variants. Applications of GPT models in text generation and dialogue systems. Case study based implementation of GPT-based tasks. GPT-based chatbot enhances E-Shop's customer support service	08
III	**BERT and Advanced Techniques:** Understanding BERT architecture and pre-training objectives. Fine-tuning BERT for downstream NLP tasks. Exploration of advanced Transformer architectures and techniques	07
IV	**Applications and Future Directions:** Real-world applications of large language models. Challenges and limitations of current approaches. Emerging trends and future directions in Generative AI.	07
	Total	30

Text Books:
1. Generative AI for Everyone: Understanding the Essentials and Applications of This Breakthrough Technology". Altaf Rehmani .
2. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville.
3. "Neural Networks and Deep Learning: A Textbook" by Charu C. Aggarwal.

Reference Books:
1. "Generative Adversarial Networks Cookbook: Over 100 recipes to build generative models using Python, TensorFlow, and Keras" by Josh Kalin.
2. "Generative AI in Software Development: Beyond the Limitations of Traditional Coding" Jesse Sprinter, 2024.

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1. https://elearn.nptel.ac.in/shop/iit-workshops/completed/leveraging-generative-ai-for-teaching-programming-courses/?v=c86ee0d9d7ed
2. https://elearn.nptel.ac.in/shop/iit-workshops/completed/introduction-to-language-models/?v=c86ee0d9d7ed

Department of Computer Science and Engineering (AI & ML)

MDM : Generative AI (offered by CSE-AI&ML) (B.Tech: Civil, Computer, E&TC, Mechanical.)						Semester: V	
Course :	Generative AI Tools & Techniques					Code :BCS25MD03	

Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
03	03	-	-	20	20	60	100

Prior knowledge of Calculus, Linear Algebra, Probability Theory, and Python programming, Introduction to Generative AI, AI models
are **essential.**

Course Objectives:
This course aims at enabling students,

1. Develop proficiency in Python and TensorFlow 2 for preprocessing and cleaning data in generative AI applications.
2. Implement and optimize GANs and VAEs for image generation, including training, fine-tuning, and advanced techniques.
3. Master text generation techniques using LSTM and Transformer models, with a focus on fine-tuning language models for various applications.
4. Explore music generation through different models like LSTM and Transformer, evaluating and fine-tuning compositions for diverse music applications.

Course Outcomes:
After learning the course, the students should be able to:
1. Understand generative AI principles and word embeddings for text representation.
2. Apply Large Language Models effectively, including pre training and transfer learning.
3. Evaluate Generative AI models using appropriate metrics.
4. Implement Generative Adversarial Networks (GANs) for image generation tasks using TensorFlow.
5. Identify different types of generative AI models suitable for music generation.
6. Analyze ethical consideration for music composition using GenAI

Detailed Syllabus:		

Unit	Description	Duration [Hrs]
I	**Python and TensorFlow 2 in Generative AI:** Overview of Python and TensorFlow 2, Preprocessing and cleaning data for Generative AI applications. Visualizing data distributions and patterns in Generative AI datasets. Introduction to TensorFlow's computation graph and eager execution.	08
II	**Image Generation with Generative AI:** Introduction to Image Generation, Implementing GANs for Image Generation Training and Fine-Tuning GANs , Generating Images with VAEs, Advanced Techniques in Image Generation, and Image and Video Generation Applications.	07

III	**Text Generation with Generative AI**: Introduction to Text Generation, LSTM-based Text Generation, Transformer-based Text Generation, Fine-Tuning Language Models, and Text Generation Applications	08
IV	**Music Generation with Generative AI:** Introduction to Music Generation, Music Representation, and LSTM-based Music Generation. Transformer-based Music Generation, Evaluation and Fine-Tuning, Music Composition Applications	07
V	**MuseGAN:** Overview of MuseGAN architecture, Multi-track music generation using MuseGAN , Training MuseGAN on polyphonic music datasets, Generating complex music compositions with MuseGAN	08
VI	**Advanced Techniques and Applications** Transfer learning in music generation , Fine-tuning generative models for specific music genres or styles , Ethical considerations in AI-generated music, Future directions and emerging trends in AI-driven music composition.	07
	Total	45

Text Books:
1. Generative AI with Python and TensorFlow 2: Create images, text, and music with VAEs, GANs, LSTMs, Transformer models" , Joseph Babcock and Raghav Bali , 2024
2. Generative AI for everyone: Understanding the essentials and applications of this breakthrough technology". Altaf Rehmani .
3. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville.
4. "Neural Networks and Deep Learning: A Textbook" by Charu C. Aggarwal.

Reference Books:
1. "Generative Adversarial Networks Cookbook: Over 100 recipes to build generative models using Python, TensorFlow, and Keras" by Josh Kalin.
2. "Generative AI in Software Development: Beyond the Limitations of Traditional Coding" Jesse Sprinter, 2024.

e-sources:
1. https://elearn.nptel.ac.in/shop/iit-workshops/completed/leveraging-generative-ai-for-teaching-programming-courses/?v=c86ee0d9d7ed
2. https://elearn.nptel.ac.in/shop/iit-workshops/completed/introduction-to-language-models/?v=c86ee0d9d7ed

MDM: Generative AI (offered by CSE (AI & ML)) (B.Tech: Civil, Computer, E&TC, Mechanical.)				Semester: V			
Course:	Generative AI Tools and Techniques Laboratory			**Code: BCS25MD04**			
Credit	**Teaching Scheme**			**Evaluation Scheme**			
	Lecture	**Practical**	**Tutorial**	**TW**	**PR**	**OR**	**Total**
01	-	**02**	-	-	-	**50**	**50**

Course Objectives:

1. To learn Python and TensorFlow skills for Generative AI.
2. To study techniques for cleaning and preparing data for Generative AI tasks.
3. To implement generative AI models
4. To develop innovative applications using generative AI tools and techniques.

Course Outcomes:

After learning the course, students will be able to:

1. Implement Python and TensorFlow basics, including data handling and preprocessing techniques.
2. Implement Generative AI models such as GANs, VAEs, LSTM networks, and Transformer models for image, text, and music generation tasks.
3. Evaluate model performance and experiment with hyperparameters and optimization techniques to enhance Generative AI outcomes.
4. Develop innovative applications in image, text, and music generation, showcasing practical skills.

Guidelines for Students:
1. The laboratory assignments are to be submitted by students in the form of a journal.
2. Each assignment write-up should have a title, objectives, outcomes, Theory- Concept in brief, dataset used, data description, conclusion, and assessor's signature.
3. Program codes with sample output of all performed assignments should be submitted.

Guidelines for Laboratory /TW Assessment:
1. Continuous assessment of laboratory work is done based on the overall performance and laboratory performance of the students.
2. Each laboratory assignment assessment should assign grade/marks based on parameters with appropriate weightage.
3. Suggested parameters for overall assessment as well as each laboratory assignment assessment include- timely completion, performance, innovation, efficiency, punctuality, and neatness.

Guidelines for Laboratory Conduction & Assessment
1. The suggested list of assignments is given below. Instructors can frame suitable assignments.
2. Perform any 7 assignments which include data preprocessing, GAN, text generation, image, video and music generation.

Department of Computer Science and Engineering (AI & ML)

Assignment No.	Suggested List of Assignments
Group A assignment (Compulsory Assignments on Mobile Application Development)	
1	Write Python scripts to implement basic operations and TensorFlow 2 tensors.
2	Preprocess and clean datasets for Generative AI applications using Python libraries such as Pandas and NumPy. Handle missing data, normalize features, and encode categorical variables.
3	Use Matplotlib or Seaborn to visualize data distributions and patterns in Generative AI datasets. Plot histograms, scatter plots, and heatmaps to analyze data characteristics.
4	Implement a Generative Adversarial Network (GAN) architecture using TensorFlow 2. Train the GAN model on a dataset such as MNIST or CIFAR-10 for image generation tasks.
5	Train a GAN model on a custom dataset for image generation. Experiment with hyperparameters, loss functions, and optimization techniques to optimize GAN training.
6	Explore advanced techniques such as Wasserstein GANs, Progressive GANs, or StyleGANs for image generation. Implement and compare these techniques for generating high-quality images.
7	Develop applications for image and video generation using trained Generative AI models. Use the models to generate art, create deep fakes, or synthesize video content.
8	**Text Generation:** Implement a Long Short-Term Memory (LSTM) network using TensorFlow 2 for text generation tasks. Train the LSTM model on a dataset of text sequences and generate new text samples.
9	**Text generation**: Implement a Transformer-based language model (e.g., GPT) using TensorFlow 2 for text generation. Fine-tune the model on a text corpus and generate coherent and contextually relevant text.
10	**Text generation**: Fine-tune a pre-trained language model (e.g., GPT, BERT) using transfer learning techniques. Fine-tune the model on a domain-specific dataset and evaluate its performance for text generation tasks.
11	**Text generation**: Develop applications for text generation tasks such as story generation, dialogue generation, or code generation using trained Generative AI models.
12	**Music Generation:** Preprocess music data and represent it in a suitable format for music generation tasks. Explore MIDI or audio representations for training Generative AI models.
13	**Music Generation:** Implement a Long Short-Term Memory (LSTM) network using TensorFlow 2 for music generation. Train the LSTM model on a dataset of music sequences and generate new musical compositions.
14	**Generate Novel Music Compositions:** Transformer-based Music Generation: Implement a Transformer-based architecture (e.g., MusicBERT, MusicGPT) using TensorFlow 2 for music generation. Fine-tune the model on a music dataset and generate novel music compositions.

Department of Computer Science and Engineering (AI & ML)

Text Books:

1. Responsible AI: Implementing Ethical and Unbiased Algorithms, by Shashin Mishra and Sray Agarwal
2. Generative AI in Practice: 100+ Amazing Ways Generative Artificial Intelligence is Changing Business and Society, Bernard Marr

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Reference Books:

1. "Generative AI with Python and TensorFlow 2: Create images, text, and music with VAEs, GANs, LSTMs, Transformer models", Joseph Babcock and Raghav Bali
2. "Generative Adversarial Networks: An Overview" by Vinod Nair and Geoffrey E. Hinton.
3. "Hands-On Generative Adversarial Networks with PyTorch 1.x" by Stefano Bosisio and Vijayabhaskar J.

Department of Computer Science and Engineering (AI & ML)

MDM : Generative AI (offered by CSE-AI&ML) (B.Tech: Civil, Computer, E&TC, Mechanical.)		Semester: VI				
Course :	Generative AI Applications				Code : BCS26MD05	

	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
Credits	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
02	02	-	-	10	10	30	50

Prior knowledge of Calculus, Linear Algebra, Probability Theory, and Python programming, are **essential.**

Course Objectives:
This course aims at enabling students,
1. To analyze the impact of GenAI in business
2. Understand ethical implications of Generative AI in science.
3. Analyze practical case studies for real-world insights.

Course Outcomes:
After learning the course, the students should be able to:
1. To understand the impact of generative AI in various fields.
2. Apply the concept of Gen AI in finance.
3. Apply Generative AI for simulation and modeling in various scientific fields.
4. Recognize the importance of ethical algorithms for fairness in AI systems

	Detailed Syllabus:	

Unit	Description	Duration [Hrs]
I	**Introduction** The Impact of Generative AI on Business and Society, Emerging Trends and Technologies in Generative AI, Ethical Challenges and Regulatory Frameworks, Real-World Applications of Large Language Models, and Challenges and Limitations of Current Approaches.	08
II	**Generative AI in Finance and Business** Algorithmic Trading and Financial Forecasting, Fraud Detection and Risk Management Customer Service and Chatbots, Marketing and Advertising Creativity, Business Process Automation and Optimization	08
III	**Generative AI in Science and Research** Scientific Discovery and Hypothesis Generation Simulation and Modeling in Various Fields, Data Augmentation and Synthesis, Collaboration and Knowledge Sharing, and Ethical and Social Implications of Generative AI.	07
IV	**Responsible AI** Importance of ethical and unbiased algorithms in AI systems, Ethical frameworks and principles for AI development, Techniques for Implementing Unbiased Algorithms, Roles and responsibilities of stakeholders in the AI ecosystem. Case Study : IBM's AI Fairness 360 Toolkit	07
	Total	30

Text Books:
1. Generative AI in Practice: 100+ Amazing Ways Generative Artificial Intelligence is Changing Business and Society, Bernard Marr
2. Responsible AI: Implementing Ethical and Unbiased Algorithms, by Shashin Mishra and Sray Agarwal

Department of Computer Science and Engineering (AI & ML)

Reference Books:
1. "Generative Adversarial Networks Cookbook: Over 100 recipes to build generative models using Python, TensorFlow, and Keras" by Josh Kalin.
2. Applications of Generative AI, Zhihan Lyu, Springer International Publishing, 2024.

e-sources:
1. https://elearn.nptel.ac.in/shop/iit-workshops/completed/leveraging-generative-ai-for-teaching-programming-courses/?v=c86ee0d9d7ed
2. https://elearn.nptel.ac.in/shop/iit-workshops/completed/introduction-to-language-models/?v=c86ee0d9d7ed

MDM : **Generative AI** (offered by CSE-AI&ML) (B.Tech: Civil, Computer, E&TC, Mechanical.)						**Semester: VII**	
Course:	Capstone Project					**Code: BCS27MD06**	

Credits	**Teaching Scheme (Hrs. /Week) Evaluation Scheme and Marks**						
	Theory	**Practical**	**Tutorial**	**TW**	**OR**	**PR**	**Total**
04	-	08	-	100	50	--	150

Prior knowledge of Generative AI Tools and Techniques **is essential.**

Course Objectives:

1. Understand the fundamental concepts and technologies involved in Generative AI development.
2. Study the principles of GenAI models applied to various interdisciplinary tasks.
3. Collaborate with cross-functional teams to design and deploy AI solutions that address specific challenges and opportunities in the target industries

Course Outcomes:

After completion of this course, the students will be able to,
1. Plan, design, and implement a complex GenAI application.
2. Use GenAI models and tools to design the multidisciplinary project .
3. Utilize appropriate tools and technologies for multidisciplinary project development
4. Collaborate effectively within a team environment.

Guidelines:

Guidelines for Students:

The purpose of Capstone project work is to generate a concept and execute it methodically, utilizing the knowledge acquired during college mostly to innovate or streamline processes. A cohort of undergraduate students in their final year will engage in project work. The task entails assessing the viability of the project, devising a project plan, examining current systems and available tools for project implementation, and employing advanced software testing methods and technology using case tools. The objective is to transform the design into a functional prototype.

Project work should be done in groups and each group formed in 3-4 students.

Self-sponsored project: The expenses incurred towards the completion of the project work will be borne by the students.

Industry / Research institutes sponsored project: The sponsoring industry or research institute will provide financial support for the expenses associated with completing the project work. Students are required to submit a sponsorship letter or relevant paperwork that includes all the essential information such as the student's name, guide's name, problem definition, work to be conducted, and sponsorship details.

Institute sponsored project: The expenses incurred towards the completion of the project work will be supported by any of the institutes or organizations. Students shall submit the sponsorship letter or relevant document mentioning the sponsorship in monetary support from the institutes or organizations.

Guidelines for Assessment:
1. The project work assessment will be done in following stages:
      Review 1: Starting of the semester (within 15 Days) [Presentation & synopsis]
      Review 2: After 1 month of review 1 [Presentation]
      Review 3: After 1 month of review 2 [Presentation and Report]
      Final Examination: At the end of semester

Suggested List of projects

Manufacturing :

- Gen AI based quality control system to identify defects in manufactured products and improve overall product quality.
- Develop a generative AI model to identify and classify defects in manufactured products, such as surface imperfections, dimensional inaccuracies, or material inconsistencies, to improve quality control processes in manufacturing.
- Create a generative AI tool that generates customized product designs based on customer preferences and specifications, enabling mass customization and personalized manufacturing solutions.
- Develop a generative AI predictive maintenance system that analyzes equipment sensor data to forecast potential failures, schedule proactive maintenance tasks, and optimize equipment performance in manufacturing facilities.

Construction :

- Optimize construction schedules, automate tasks, and improve safety.
- Generate Construction blueprints as per clients specification.
- Develop a generative AI system that can automatically generate building designs based on project requirements, site constraints, and architectural preferences, streamlining the design process and enabling rapid prototyping of construction projects.
- Create a generative AI tool that can recommend optimal material selections for construction projects based on factors such as cost, durability, sustainability, and performance, helping architects and engineers make informed decisions during the design phase.

Electronics & Telecommunication :

- Developing a predictive maintenance system using generative AI for telecommunications equipment.
- Develop a generative AI system to optimize signal processing algorithms for telecommunications applications, such as noise reduction, channel equalization, and data compression, to improve signal quality and transmission efficiency.
- Implement a generative AI model to optimize antenna designs for wireless communication systems, satellite communication, or radar applications, aiming to enhance signal coverage, bandwidth efficiency, and overall performance.
- Create a generative AI tool that can predict network traffic patterns and bandwidth demands in telecommunications networks, enabling proactive network management, resource allocation, and capacity planning to ensure optimal performance.

Vision and Mission of the Computer Science & Engineering (AI&ML) Department

Vision:

To provide value-based technical Education in Computer Science and Engineering with a specialization in Artificial Intelligence and Machine Learning.

Mission:

- To develop technically competent and innovative computer science engineers with in-depth knowledge of Artificial Intelligence and Machine Learning.
- To build ethically responsible, knowledgeable, and skilled engineers to serve the needs of industry and society at large.
- To provide a conducive environment and opportunities for the holistic development of students.