SHRI VILE PARLE KELAVANI MANDAL'S

SHRI BHAGUBHAI MAFATLAL POLYTECHNIC & COLLEGE OF ENGINEERING

INFORMATION TECHNOLOGY DEPARTMENT

1. COURSE DETAILS

Programme: Information Technology	**Semester: V**
Course: : # Artificial Intelligence & Machine Learning	**Course Category: DSE**
Course Code: AIM230917	**Duration:16 Weeks**

2. LEARNING AND ASSESSMENT SCHEME

Learning Scheme				Credits	Assessment Scheme								
Actual Contact Hrs./Week			Self-Learning (SL^) (Term Work + Assignment) (Hrs)		Paper Duration (Hrs.)	Theory (Marks)			Based on LL & TL Practical (Marks)			Based on Self Learning	Total Marks
CL	TL	LL				FA-TH	SA-TH	Total	FA-PR	SA-PR	SA-OR	SLA (Marks)	
04	-	02	-	03	03	30	70	100	25	-	25	-	150

3. COURSE OBJECTIVE

1. Master advanced machine learning techniques.
2. Use transfer learning for faster and more efficient model building.
3. Enhance practical skills through hands-on coding and real-world projects.
4. Optimize machine learning models for better performance and resilience.

4. SKILL COMPETENCY/INDUSTRY/EMPLOYER EXPECTED OUTCOME

- **Understand the Deep Learning and Artificial intelligence to real world applications**
- **Prepare for roles in AI , LLM and machine learning through in-depth training and practical application**

5. COURSE OUTCOMES (COs): At the end of the semester student will be able to: -

CO No.	COURSE OUTCOME
CO1	Comprehend Artificial intelligence concepts.
CO2	Implement deep learning concepts
CO3	Use Transfer Learning knowledge effectively
CO4	Use Generative AI &Transformer Architecture
CO5	Deploy LLM models for effective usage.
CO6	Develop strategy to apply ethics in Generative AI

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6. CO-PO, CO- PSO MAPPING TABLE - Information Technology

Course and Code	Course Outcomes	Programme Outcomes							Programme Specific Outcomes	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
# Artificial Intelligence & Machine Learning (AIM230917)	CO1	3	1	1	2	-	1	2	-	3
	CO2	3	1	1	2	-	1	2	-	3
	CO3	3	2	2	2	2	2	3	-	3
	CO4	3	1	2	2	1	1	1	-	3
	CO5	3	1	-	-	1	-	1	-	3
	CO6	3	1	-	-	1	-	1		3
	CO Avg.	**3**	**1.2**	**1.5**	**2**	**1.33**	**1.25**	**1.8**	**-**	**3**

7. COURSE CONTENTS

UNIT NO.	TOPIC/Sub-topic
I	**Neural Network Foundations** 1.1 Historical Models and Fundamentals 1.2 McCulloch-Pitts Neuron & Perceptron 1.3 Basics of Artificial and Biological Neural Networks 1.4 Activation Functions & Loss Functions 1.5 Feedforward Neural Networks and Training
II	**Deep Learning Architectures** 2.1 Convolutional Neural Networks (CNNs) 2.2 Recurrent Neural Networks (RNNs) and Variants (LSTM, GRU) 2.3Graph Neural Networks (GNNs) and Generative Adversarial Networks (GANs)
III	**Transfer Learning and Model Optimization** 3.1 Core concepts and benefits of Transfer Learning 3.2 Feature extraction and fine-tuning pre-trained models 3.3 Applications in Computer Vision and NLPModels: VGGNet, ResNet, 3.4 Inception, BERT, GPT-3Challenges and considerations in transfer learning
IV	**Generative AI & Transformer Models** 4.1 Introduction to Generative AI for text, image, and video 4.2 Transformer architecture: Self-attention 4.3 Encoder-Decoder structures 4.4 Pre-trained models and feature extraction 4.5 Large Language Models (LLMs): BERT, GPT-3, T5 4.6 Machine translation using transfer learning

V	**Model Deployment and Optimization** 5.1 Efficient AI model deployment techniques 5.2 Optimization strategies for deep learning models 5.3 Reinforcement Learning in AI applications 5.4 Ethical considerations in AI development 5.5 Domains of Generative AI, Text Generation 5.6 Image Generation, Music Generation, Video Generation. 5.7 Limitations of RNN & LSTM 5.8 Future trends in deep learning and machine learning
VI	**Industry Applications & Future Trends** 6.1 AI applications in healthcare, finance, and automation 6.2 Ethical considerations in AI development 6.3 Future trends in deep learning and machine learning

8. LIST OF PRACTICALS/ASSIGNMENTS/ TUTORIALS/DRAWINGS

Term Work consists of Journal containing minimum no of 10 Experiments/assignments/drawings.

Sr. No.	Title of Experiment/Assignment/Exercise/Tutorial/Drawings	Approx. Hrs required	COs
1	Implementing Perceptron and Multi-layer Neural Networks	4	CO1
2	Training CNN for Image Classification	2	CO2
3	Text Classification Using RNN/LSTM	2	CO3
4	Object Detection with Pre-trained Models	2	CO3
5	Implementing Transfer Learning on Custom Dataset	2	CO3
6	Fine-tuning GPT-3 for Text Generation	2	CO4
7	Generating Images Using GANs	4	CO4
8	Large Language Model (LLM) Customization	4	CO5
9	AI-based Recommender System Development	4	CO6
10	Mini Project	4	All COs
	TOTAL	**30**	

9. IMPLEMENTATION STRATEGY

1. Teaching Plan
2. Minimum 10 no of practical/assignments
3. Guest/Expert lectures
4. Demonstrations
5. Slides
6. Self-Learning Online Resources

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10. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication
1	Introduction to Artificial Neural Sytems	Jacek M zurada	Jaico books
2	Generative Deep Learning teaching machines to paint ,write,compose and Play	David Foster	O'Reilly
3	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	Aurélien Géron ,	O'Reilly Media
4	Deep Learning: Foundations and Concepts	Christopher Bishop & Bishop, 2023	Springer, 2023
5	Hands-On Generative AI with Transformers and Diffusion Models	Pedro Cuenca et al., 2024	WIP

11. LEARNING WEBSITE & PORTALS

1. https://generativeai.net/
2. https://www.nvidia.com/en-us/glossary/generative-ai/
3. https://www.geeksforgeeks.org/introduction-deep-learning/
4. https://www.britannica.com/technology/artificial-intelligence
5. https://www.nist.gov/artificial-intelligence

12. ASSESMENT METHODOLOGIES/TOOLS

Formative Assessment (Assessment for Learning)

1. Test
2. Rubrics for COs Assignment
3. Self-Learning
4. Term Work
5. Seminar/Presentation

Summative Assessment (Assessment of Learning)

1. End Term Exam
2. Oral Examination

13. SUGGESTED WEIGHTAGE FOR LEARNING EFFORTS & ASSESMENT PURPOSE

Unit No.	Unit Title	Aligned CO	Teaching Hours	Distribution of Marks			Total Marks
				R Level	U Level	A Level	
I.	Foundational Neural Network	CO1	12	4	4	6	14
II.	Deep Learning Techniques	CO2	12	2	4	6	12
III.	Transfer Learning	CO3	12	0	6	6	12
IV.	Classification using pre-trained models	CO4	8	2	4	4	10
V.	Introduction to Generative AI &Transformer Architecture	CO5	8	2	4	6	12
VI.	Encoders -decoders	CO6	8	2	4	6	10
		Grand Total	**60**	**18**	**24**	**28**	**70**

R Remember, U Understand, A Apply and above, (Bloom's revised taxonomy levels)

NOTE: This specification table provides general guidelines to assist students for their learning and to teachers to teach and assess students with respect to attainment of COs. The actual distribution of marks at different taxonomy levels (R, U, A) in the question paper may vary from above table.

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14. COURSE EXPERT COMMITTEE MEMBERS

Sr. No.		NAME
1	Internal	Mr. Swapna Naik
2	Internal	Mrs Radhika Patwardhan
3	External	Dr Aruna Pawate
		Associate Professor Thakur College of Engineering