

Branch Name:	MCA
Program Code:	CS201
Course Code	4CS2010308P
Course Title	Deep Learning Practical
Pre-requisite Course:	It is essential to have a solid foundation in programming, mathematics and basic machine learning concepts.

Course Objective:

1. To understand the fundamentals of neural networks and deep learning models.
2. To analyze different deep learning architectures used in real-world AI applications.
3. To develop deep learning models for image, text, and sequential data analysis.
4. To apply modern deep learning techniques including transformers and generative models.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
	-	4	2	-	-	25	25	50

Suggested Practical / Lab Work (Deep Learning)

Section A: Fundamentals & Neural Networks

Practical 1 (a) Installation and setup of Python Deep Learning environment

(b) Libraries: NumPy, Pandas, TensorFlow / PyTorch

Practical 2 : Implementation of Perceptron for simple classification

Practical 3 : Build a Multi-Layer Perceptron (MLP) for : Digit classification (MNIST dataset)

Section B: Training & Optimization

Practical 4 : Implement Gradient Descent (basic simulation)

Practical 5 : (a) Compare optimizers: SGD vs Adam (b) Analyze training performance

Practical 6 : Apply Regularization Techniques: Dropout, Batch Normalization

Section C: Convolutional Neural Networks

Practical 7 : Build a CNN model for image classification

Practical 8 : Experiment with: Different kernel sizes, Pooling techniques

Practical 9 : Use pre-trained model (Transfer Learning): Example: ResNet / VGG
(using TensorFlow/Keras)

Section D: Sequence Models & NLP

Practical 10 : Implement RNN / LSTM for: Text classification or sentiment analysis

Practical 11 : Word Embedding implementation: Using pre-trained embeddings
(Word2Vec / GloVe)

Practical 12: Build a simple Attention-based model

Section E: Transformers & LLMs

Practical 13: Use Transformer model (HuggingFace): Text classification or summarization

Practical 14 : Work with pre-trained LLM (GPT/BERT): Text generation / Question answering

Practical 15: Basic Prompt Engineering: Experiment with prompts and analyze outputs

Section F: Advanced Deep Learning & Generative AI

Practical 16 :Implement Autoencoder for dimensionality reduction

Practical 17 :Build a simple GAN model: Generate images (e.g., MNIST digits)

Practical 18 : Case Study / Mini Project: Any one: Image classification, Chatbot using LLM , Text generation system

Software / Tools

- Python 3.x
- TensorFlow (Keras) / PyTorch
- NumPy, Pandas, Matplotlib
- OpenCV
- NLTK / SpaCy
- Hugging Face Transformers

Platform

- Jupyter Notebook / JupyterLab
- Google Colab

Version Control (Optional)

- GitHub

Text Book (Practical / Lab)

1. Géron, A., *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*, 3rd Edition, O'Reilly Media, 2022.

Reference Books (Practical / Lab)

1. Stevens, E., Antiga, L., & Viehmann, T., *Deep Learning with PyTorch*, Manning Publications, 2020.
2. Koul, A., Ganju, S., & Kasam, M., *Practical Deep Learning for Cloud, Mobile, and Edge*, O'Reilly Media, 2019.
3. Pointer, I., *Programming PyTorch for Deep Learning*, O'Reilly Media, 2019.
4. Raschka, S., Liu, Y., & Mirjalili, V., *Machine Learning with PyTorch and Scikit-Learn*, Packt Publishing, 2022.
5. Foster, D., *Generative Deep Learning*, 2nd Edition, O'Reilly Media, 2023.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Explain the fundamental concepts of neural networks, deep learning architectures, and activation functions.	2.Understand
CLO2	Apply training techniques, optimization algorithms, and regularization methods to build deep learning models.	3.Apply
CLO3	Analyze convolutional neural networks (CNNs) for solving image-based problems.	4.Analyze
CLO4	Implement sequence models and transformer-based architectures for natural language processing tasks.	3.Apply
CLO5	Evaluate advanced deep learning models including GANs, Autoencoders, and Large Language Models (LLMs) for real-world applications with ethical considerations.	5.Evaluate

Mapping of CLOs with POs & PSOs :

Course Learning Outcomes	Program Outcomes(POs)												Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CLO1	H	M	-	-	L	-	L	-	-	-	-	-	L	-
CLO2	H	H	M	M	M	-	L	-	-	-	-	-	M	L
CLO3	H	H	H	M	M	-	L	-	-	-	L	L	M	L
CLO4	H	H	H	M	M	-	L	-	-	L	L	M	H	M
CLO5	H	H	H	H	M	L	M	L	L	L	M	M	H	H

H:High, M:Medium, L:Low