

Branch Name:	Artificial Intelligence & Data Science
Program Code:	108
Course Name:	Deep Learning with Neural Network
Course Code:	1ET1080601
Pre-requisite Course:	Probability and statistics, Programming and data structures

Course Objective:

1. To organize synaptic connectivity as the basis of neural computation and learning
2. To learn the ideological basics of artificial neural networks
3. To learn the origins of artificial neural networks
4. To know some application of artificial neural networks
5. To identify the different structures of artificial neural networks

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	-	02	04	70	30	30	20	150

Subject Contents:

Sr. No.	Topic	Total Hrs.	Weightage %
1	Introduction to Deep learning: What is deep learning, Difference between deep learning and machine learning, Examples of deep learning, Types of deep learning, Applications of Deep learning, Advantages and disadvantages of deep learning	6	10
2	Deep learning algorithms: CNNs, LSTMs, RNNs, GANs, RBFNs, MLPs, SOMs, DBNs, RBMs	4	10
3	Fundamentals of Neural Networks What is Neural Network, Architecture of ANN, working of neural network, Types of ANN, Applications of ANN, ANN vs BNN	5	20

4	Convolutional Neural Network & Recurrent Neural Network Introduction of CNN, Architecture of CNN, Pros and cons of CNN, What is RNN, Types of RNN, Pros and cons of RNN, Applications of RNN	8	20
5	Back propagation Networks Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, backpropagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.	10	20
6	Neural Network Based Fuzzy Systems Neural Realization of Basic Fuzzy Logic Operators, Neural Network Based Fuzzy Logic Inference, Neural Network Driven Fuzzy Reasoning, Rule based Neural Fuzzy Modeling, Neural Fuzzy Relational Systems, NeuroFuzzy Controllers, Recent Applications.	10	20

List of Reference Books:

1. Deep Learning (Adaptive Computation and Machine Learning series) by Aaron Courville (Author), Ian Goodfellow (Author), YoshuaBengio (Author)
2. Neural Networks and Deep Learning by Charu C. Aggarwal
3. Neural Networks & Deep Learning by Pat Nakamoto

e-Resources (If any):

1. <https://www.knowledgehut.com/blog/data-science/types-of-neural-networks>
2. <https://www.geeksforgeeks.org/introduction-to-recurrent-neural-network/>

List of Suggested titles of Experiments (If Any):

1. Implementation of different activation functions to train Neural Network.
2. Implementation of different Learning Rules.
3. Design a neural network (NN) model with one hidden layer for classification problems
4. Implement a multilayer perceptron (MLP) model for prediction such as house prices.
5. Implementation of Adeline network for system identification.
6. Study about Pattern matching using different rules.
7. Design and implement a CNN for Image Classification
8. Implementation of Madeline network
9. Design RNN or its variant including LSTM or GRU
10. Implement an artificial neural network on GPUs
11. Implement any one of the project under the following title:
 - a) Project related to application of machine learning in healthcare.
 - b) Project related to application of machine learning in business analysis.
 - c) Project related to application of machine learning in sports analytics.
 - d) Project related to application of machine learning in Time Series Analysis & Forecasting.

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

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the context of neural networks and deep learning	2 Understanding
CLO2	Know how to use a neural network and the data needs of deep learning	2 Understanding
CLO3	Get knowledge of design and deployment of deep learning models for machine learning problems	4 Analyze
CLO4	Get knowledge and awareness of the different types of deep learning algorithms. i.e. CNNs, LSTMs, RNNs, GANs	3 Applying
CLO5	Learn depth understanding of the design consideration and architecture for Fuzzy Systems	2 Understanding 3 Applying

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	PSO3	PSO4
CLO1	H	M	M	L	L	M			L				H	L		
CLO2		L	M	H	L	L					L	L	M	L		
CLO3	L	M	M	L	M	H		M		L			M	L		
CLO4	M	M	M	L	M	H		M	L				M	L		
CLO5	M	L	L	L	M	H		M		L			H	L		

H: High, M: Medium, L: Low