

Branch Name:	Artificial Intelligence and Data Science
Program Code:	ET108
Semester/Year:	Semester VII/ Fourth Year
Course Name:	Open Elective – II : Deep Learning
Course Code:	2ET1080781T
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:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCE		SEE		CCE		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

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	7	15
2	Back propagation Networks: Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, back propagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.	9	20
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	7	15
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	Deep learning algorithms: CNNs, LSTMs, RNNs, GANs, RBFNs, MLPs, SOMs, DBNs, RBMs	5	10

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, Neuro Fuzzy Controllers, Recent Applications.	9	20
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List of Reference Books:

1. Deep Learning (Adaptive Computation and Machine Learning series) by Aaron Courville (Author), Ian Good fellow (Author), Yoshua Bengio (Author) 2016.
2. Neural Networks and Deep Learning by Charu C. Aggarwal 2023.
3. Neural Networks & Deep Learning by Pat Nakamoto 2018.
4. Nikhil Buduma, “Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithm”, O’Reilly, 2017.
5. Ian Good fellow, Yoshua Bengio and Aaron Courville, “Deep Learning”, MIT Press, 2016.
6. Aurélien Géron, “Hands-On Machine Learning with Scikit- Learn and TensorFlow”, O’Reilly, 2017.
7. Nikhil Ketkar, “Deep Learning with Python: A Hands-on Introduction”, Apress, 2017.

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/>

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

CLO	Description	Bloom’s Taxonomy Level
CLO1	Understand comprehend the key concepts of deep learning algorithms	1. Remembering 2. Understanding
CLO2	Learn working and applications of neural network	2 Understanding 5. Evaluate
CLO3	Learn back propagation network	4. Analyze
CLO4	Learn Implement Fuzzy Logic	2 Understanding 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	PSO3	PSO4
CLO1					L	H						H	H	M	L	
CLO2	H		M	M	L					L		M		M	L	
CLO3		M	L		L									H		L
CLO4	H	M			L			L					L		M	H

H: High, M: Medium, L: Low