

Semester: V(Global Elective-B)		
Artificial Neural Networks & Deep Learning		
Course Code: 16G5B05		CIE Marks: 100
Credits: L:T:P:S: 4:0:0:0		SEE Marks: 100
Hours: 46		SEE Duration: 3Hrs
Course Learning Objectives: The students will be able to		
1	Define what is Neural Network and model a Neuron and Express both Artificial Intelligence and Neural Network	
2	Analyze ANN learning, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning and Boltzmann learning	
3	Implement Simple perception, Perception learning algorithm, Modified Perception learning algorithm, and Adaptive linear combiner, Continuous perception, learning in continuous perception.	
4	Analyze the limitation of Single layer Perceptron and Develop MLP with 2 hidden layers, Develop Delta learning rule of the output layer and Multilayer feed forward neural network with continuous perceptions,	

UNIT-I	
Introduction to Neural Networks: Neural Network, Human Brain, Models of Neuron, Neural networks viewed as directed graphs, Biological Neural Network, Artificial neuron, Artificial Neural Network architecture, ANN learning, analysis and applications, Historical notes.	08 Hrs
UNIT-II	
Learning Processes: Introduction, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit assignment problem, Learning with and without teacher, learning tasks, Memory and Adaptation.	10 Hrs
UNIT-III	
Single layer Perception: Introduction, Pattern Recognition, Linear classifier, Simple perception, Perception learning algorithm, Modified Perception learning algorithm, Adaptive linear combiner, Continuous perception, Learning in continuous perception. Limitation of Perception.	10 Hrs
UNIT-IV	
Multi-Layer Perceptron Networks: Introduction, MLP with 2 hidden layers, Simple layer of a MLP, Delta learning rule of the output layer, Multilayer feed forward neural network with continuous perceptions, Generalized delta learning rule, Back propagation algorithm	10 Hrs
UNIT-V	
Introduction to Deep learning: Neuro architectures as necessary building blocks for the DL techniques, Deep Learning & Neocognitron, Deep Convolutional Neural Networks, Recurrent Neural Networks (RNN), feature extraction, Deep Belief Networks, Restricted Boltzman Machines, Autoencoders, Training of Deep neural Networks, Applications and examples(Google, image/speech recognition)	08 Hrs

Course Outcomes: After completing the course, the students will be able to	
CO1:	Model Neuron and Neural Network, and to analyze ANN learning, and its applications.
CO2:	Perform Pattern Recognition, Linear classification.
CO3:	Develop different single layer/multiple layer Perception learning algorithms

CO4:	Design of another class of layered networks using deep learning principles.
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Reference Books	
1.	Simon Haykins, “Neural Network- A Comprehensive Foundation”, Pearson Prentice Hall, 2nd Edition, 1999. ISBN-13: 978-0-13-147139-9/ISBN-10: 0-13-147139-2
2.	Zurada and Jacek M, “Introduction to Artificial Neural Systems”, West Publishing Company, 1992, ISBN: 9780534954604
3.	Vojislav Kecman,”Learning & Soft Computing”, Pearson Education, 1st Edition, 2004, ISBN:0-262-11255-8
4.	M T Hagan, H B Demoth, M Beale, “Neural Networks Design”, Thomson Learning, 2002. ISBN-10: 0-9717321-1-6/ ISBN-13: 978-0-9717321-1-7

Continuous Internal Evaluation (CIE) (Theory – 100 Marks)	
Evaluation method	Marks
Quiz -1	10
Test -1	50
Quiz -2	10
Test-2	50
Quiz -3	10
Test -3	50
Assignment	10
Final Evaluation	Quiz 10+10+10=30; Test 50+50+50=150, Reduced to 60, Assignment 10

Note:

- All the three tests and quiz are compulsory
- Individual faculty may adopt various methods for conducting effective quizzes and evaluate the same. The frequency of quizzes may be more than three also.

Semester End Evaluation Theory (100 Marks)	
Part- –A	20
Objective type questions	
Part –B	
There should be five questions from five units. Each question should be for maximum of 16 Marks.	
The UNIT-1, UNIT-4 and UNIT-5 should not have any choice.	
The UNIT-2 and UNIT-3 should have an internal choice.	
Both the questions should be of the same complexity in terms of COs and Bloom’s taxonomy level.	80
Total	100

	What		To whom	Frequency of conduction	Max Marks	Evidence	Contribution to Course Outcome		
Direct Assessment Methods	C I E	Quiz	Students	Three	30	Answer Scripts	80%	100%	90%
		Test		Two	60/50				
		Assignment/Self-study		2 phases	10/20	Reports / Record Books			
	S E E	Semester End Examination		End of every semester Consisting of Part-A and Part-B	100	Answer Scripts	20%		
Indirect Assessment methods	Course End Survey		Students	End of course		Questionnaire Based on COs	10%		

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	1	-	1
CO2	3	2	2	1	-	-	-	-	-	1	-	1
CO3	3	3	2	2	2	-	-	-	-	1	-	1
CO4	3	3	3	3	2	-	-	-	-	1	-	1

Low-1 Medium-2 High-3