Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Second Year Master of Engineering (Computer Engineering)

(Semester-III)

(With effect from: Academic Year 2018-19)

Subject Code: MECE-303-N-A	**Subject Title:** Neural Networks
Pre-requisite	

Teaching Scheme (Credits and Hours)

Teaching Scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**Mid Sem Exam**	**CIA**	**Practical**	**Total**
Hours	**Hours**	**Hours**	**Hours**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
04	00	02	06	05	03	70	30	20	30	150

Learning Objectives:

- The main objective of Neural Network Techniques to Improve Data Analysis Solutions is to strengthen the dialogue between the statistics and soft computing research communities in order to cross-pollinate both fields and generate mutual improvement activities.
- Also introduce the neural networks for classification, regression and to give design methodologies for artificial neural networks;

Outline of the Course:

Sr. No	**Title of the Unit**	**Minimum Hours**
1	Introduction to Artificial Intelligence System	07
2	Fundamentals of Neural Networks	10
3	Neural Network Architecture	10
4	Back propagation Networks	08
5	Associative Memory	10
6	Adaptive Resonance Theory	08
7	Introduction about Fuzzy set theory	05
8	Fuzzy Systems	06
	Total	**64**

Total hours (Theory): 64
Total hours (Lab): 32
Total hours: 96

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Detailed Syllabus:

Sr. No	Topic	Lecture Hours	Weightage (%)
1	**Introduction to Artificial Intelligence System:** Neural Network, Fuzzy logic, Genetic Algorithm.	05	08
2	**Fundamentals of Neural Networks:** What is Neural Network, Model of Artificial Neuron, Learning rules and various activation functions.	10	16
3	**Neural Network Architecture:** Single layer Feed-forward networks. Multilayer Feed-forward networks. Recurrent Networks.	08	12
4	**Back propagation Networks:** Back Propagation networks, Architecture of Back-propagation(BP) Networks, Back-propagation Learning, Variation of Standard Back propagation algorithms.	08	12
5	**Associative Memory:** Autocorrelators, Heterocorrelators, Wang et al's Multiple Training Encoding Strategy, Exponential BAM, Associative Memory for Real coded pattern pairs, Applications.	10	16
6	**Adaptive Resonance Theory:** Cluster Structure, Vector Quantization, Classical ART Network, Simplified ART Architecture,ART1 and ART2 Architecture and algorithms, Applications, Sensitivities of ordering of data.	07	11
7	**Introduction about Fuzzy set theory:** Fuzzy versus Crisp, Crisp and fuzzy sets, Crisp and Fuzzy relations.	05	08
8	**Fuzzy Systems:** Crisp Logic, Predicate Logic, Fuzzy logic, Fuzzy rule based system, Defuzzification Methods, Applications.	06	09
9	**Integration of Neural Network, Fuzzy logic and Genetic Algorithm:** Hybrid system. Neural Networks, Fuzzy logic, and Genetic Algorithm Hybrids.	05	08
	Total	64	100

Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

Learning Outcome:

On successful completion of this course, student will be able to

- Obtain the fundamentals and types of neural networks. The student will have a broad knowledge in developing the different algorithms for neural networks.
- Analyze neural controllers
- Have a broad knowledge in Fuzzy logic principles and will be able to determine different methods of Deffuzification.

Reference Books:

1. Bishop, C. M. Neural Networks for Pattern Recognition. Oxford University Press. 1995.
2. Neural Networks,Fuzzy Logic and Genetic Algorithms, by S.Rajasekaran and G.A. Vijayalakshmi Pai.
3. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee, PHI.
4. Build_Neural_Network_With_MS_Excel_sample by Joe choong.

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List of experiments:

Sr. No.	Name of Experiment
1	Create a perceptron with appropriate no. of inputs and outputs. Train it using fixed increment learning algorithm until no change in weights is required. Output the final weights.
2	Create a simple ADALINE network with appropriate no. of input and output nodes. Train it using delta learning rule until no change in weights is required. Output the final weights.
3	Train the autocorrelator by given patterns: A1=(-1,1,-1,1), A2=(1,1,1,-1), A3=(-1, -1, -1,1). Test it using patterns: Ax=(-1,1,-1,1), Ay=(1,1,1,1), Az=(-1,-1,-1,-1).
4	Train the hetrocorrelator using multiple training encoding strategy for given patterns: A_1=(000111001) B_1=(010000111), A_2=(111001110) B_2=(100000001), A_3=(110110101) B_3(101001010). Test it using pattern A_2.
5	Implement Linear/Logistic regression
6	Implementation of Naïve Bayes/SVM/SGD/SVM classifier on text and image
7	To Implement Convolution Neural network for Text classification or Image Classification
8	To study Word Embedding techniques : Word2vec,doc2vec,Glove