Class:- **Final Year B. Tech**	Semester:-**VII**
Course Code :- **CI403**	Course Name :- **Neural Network and Deep Learning**

L	T	P	Credits
3	--	--	3

Course Description:

Neural networks provide a model of computation drastically different from traditional computers. Typically, neural networks are not explicitly programmed to perform a given task; rather, they learn to do the task from examples of desired input/output behavior. The networks automatically generalize their processing knowledge into previously unseen situations, and they perform well even when the input is noisy, incomplete or inaccurate. These properties are well-suited for modeling tasks in ill-structured domains such as face recognition, speech recognition and motor control. Deep learning is a class of machine learning algorithms which enables computers to learn from examples. Deep learning techniques have been used successfully for variety of applications, including: automatic speech recognition, image recognition, natural language processing, drug discovery, and recommendation systems.

Course Outcomes:

After successful completion of the course, students will be able to,

1. Describe the fundamentals of artificial neural networks.
2. Apply the backpropagation algorithm to calculate weight gradients in a Single layer feed forward neural network.
3. Formalize the problem and solve it by using a Multi layer feed forward neural network.
4. Illustrate the fundamental issues and challenges of Deep learning.
5. Design the various deep neural network systems.
6. Implement various Deep learning algorithms in a range of real-world applications.

Prerequisite:

1. Basics of Machine Learning

Rajarambapu Institute of Technology Information Technology Department 415 414 Rajaramnagar

Course Content		
Unit No	**Description**	**Hrs**
1.	**Introduction to Artificial Neural Networks** History of neural network research, characteristics of neural networks terminology, models of neuron Mc Culloch – Pitts model, Perceptron, Adaline model, Basic learning laws, Topology of neural network architecture, different activation functions, softmax cross entropy loss function.	05
2.	**Single Layer Feed Forward Networks** Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model, selection of tuning, Parameters in BPN, Numbers of hidden nodes, learning.	07
3.	**Multi Layer Feed Forward Networks** Least mean square algorithm, Learning curves, Learning rates, Perceptron, The XOR problem, Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.	06
4.	**Introduction to Deep Learning** Introduction, Reasons to go Deep, DeepNet, Deep Learning Platform, Deep Feed Forward network, regularizations, Training deep models, dropouts, Deep Belief Network, Deep Learning	05
5.	**Convolutional and Recurrent Neural Network** Convolution operation, Max pooling, Power of CNNs: abstraction across layers, what each convolution layer sees? Reusing popular CNNS & fine-tuning. Why Recurrent Networks, LSTMs & GRU, Examples of simple RNNs, Complex recurrent neural networks: Overfitting in RNNs, Multi-layer RNNs, Multi-directional RNNs, Libraries Theano, Caffe and Tensor Flow.	07
6.	**Neural Network and Deep Learning Applications** Applications on computer vision, classifications, predication, Engineering and real world.	06

Rajarambapu Institute of Technology Information Technology Department 415 414 Rajaramnagar

References -

Text Books:

1. Yegnanarayana, B., "Artificial Neural Networks", PHI Learning Pvt. Ltd, First edition.
2. Bishop, C.M., "Pattern Recognition and Machine Learning", Springer, First edition.

Reference Books:

1. Kevin L. Priddy, Paul E. Keller – "Artificial neural networks: An Introduction", SPIE Press, First edition.
2. Goodfellow, I., Bengio,Y., and Courville, A., "Deep Learning", MIT Press, First edition.
3. Satish Kumar, "Neural Networks: A Classroom Approach", Tata McGraw-Hill Education, First edition.