DEEP LEARNING

I Semester: CSE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
BCSC05	**Foundation**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	30	70	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		

I. COURSE OVERVIEW:

This course will discuss fundamental concepts in deep learning with emphasis on their applications to computer science. Topics include various search algorithms conventional neural networks, applications of deep learning to computer vision, applications of deep learning to NLP and analogy reasoning.

II. OBJECTIVES:

The students will try to learn:

I The complexity of Deep Learning algorithms and their limitations

II The Capable of performing experiments in Deep Learning using real-world data.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	Implement deep learning algorithms, understand neural networks and traverse the layers ofdata	**Apply**
CO 2	Learn topics such as convolutional neural networks, recurrent neural networks, training deepnetworks and high-level interfaces	**Apply**
CO 3	Understand applications of Deep Learning to Computer Vision	**Understand**
CO 4	Understand and analyze Applications of Deep Learning to NLP	**Understand**
CO 5	Analyze and implement deep learning networks in real time applications	**Analyze**

IV. SYLLABUS:

MODULE-I: INTRODUCTION (09)

Feed forward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation, the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout

MODULE-II: CONVOLUTIONAL NEURAL NETWORKS (08)

Architectures, convolution/pooling layers, Recurrent Neural Networks: LSTM, GRU, Encoder Decoder architectures. Deep Unsupervised Learning: Auto encoders, Variational Auto-encoders, Adversarial Generative Networks, Auto-encoder and DBM Attention and memory models, Dynamic Memory Models

MODULE-III: APPLICATIONS OF DEEP LEARNING TO COMPUTER VISION (10)

Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text withLSTM models, Attention Models for computer vision tasks

MODULE-IV: APPLICATIONS OF DEEP LEARNING TO NLP (09)

Introduction to NLP and Vector Space Model of Semantics, Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Wordsmodel (CBOW), Glove, Evaluations and Applications in word similarity.

MODULE-IV: APPLICATIONS OF DEEP LEARNING TO NLP (09)

Named Entity Recognition, Opinion Mining using Recurrent Neural Networks: Parsing and

Sentiment Analysis using Recursive Neural Networks: Sentence Classification using Convolutional Neural Networks, Dialogue Generation with LSTMs.

V. TEXT BOOKS:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

VI. REFERENCE BOOKS:

1. Bishop, C, M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.