MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act,1956

COURSE CONTENT

DEEP LEARNING								
I Semester: CSE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
2515806	**Foundation**	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisites: A course on "Deep Learning"								

Course Overview:

Deep Learning is an advanced area of artificial intelligence that focuses on training neural networks to learn complex patterns from large datasets.
The course covers artificial neural networks, backpropagation, optimization techniques, and deep architectures such as CNNs, RNNs, and Transformers.
It emphasizes practical implementation using Python and popular frameworks like TensorFlow and PyTorch.

Course Objectives:

1. To understand the fundamentals of deep learning algorithms and neural network architectures.
2. To develop skills in training and optimizing deep neural networks using modern techniques.
3. To design and implement CNN, RNN, LSTM, and attention-based models for real-world applications.
4. To apply deep learning methods in computer vision, natural language processing, and sequence modelling tasks.
5. To analyze and evaluate deep learning models using real-world datasets and popular frameworks such as TensorFlow and PyTorch.

Course Outcomes: After Completion of the Course, Students should be able to

1. Apply feed-forward and backpropagation techniques in optimizing predictive models for real- time image or speech recognition.
2. Design convolutional, recurrent, and attention-based neural network architectures for image classification and LSTMs in sequence prediction.
3. Develop deep unsupervised learning models, including autoencoders, variational autoencoders, and GANs, in generating synthetic images or enhancing feature representation in medical imaging.
4. Analyze deep learning models for computer vision tasks in building automated video surveillance, self-driving car vision and captioning systems.
5. Evaluate word embeddings, sentiment analysis and dialogue generation in social media and intelligent text summarization.

UNIT - I:

Introduction: 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

UNIT - II:

Convolutional Neural Networks: 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

UNIT - III:

Applications of Deep Learning to Computer Vision: Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models, Attention Models for computer vision tasks

UNIT - IV:

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

UNIT - V:

Analogy reasoning: 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

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

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

ELECTRONIC RESOURCES:

1. https://www.deeplearning.net
2. https://www.deeplearningbook.org/
3. https://developers.google.com/machine-learning/crash-course/ml-intro
4. www.cs.toronto.edu/~fritz/absps/imagenet.pdf
5. https://neuralnetworksanddeeplearning.com/

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)