Programme Name	***B.Tech.***	***SEMESTER VII***
Course Code	**R5MC4301T**	
Course Title	**Open Elective II - Deep Learning**	

PREREQUISITIES

1. Basic Machine Learning and Data mining algorithms
2. Mathematical and statistical Foundations

COURSE OUTCOMES:

1. Demonstrate concepts, architectures and algorithms of Neural Networks to solve real world problems.
2. Identify deep feed-forward networks and different regularization techniques used in Deep Learning.
3. Identify challenges in Neural Network optimization and different optimizationalgorithms used in Deep learning models
4. Analyze deep learning algorithms which are more appropriate for varioustypes of learning tasks in various domains
5. Apply deep neural networks from building to training models
6. Analyse detection and recognition tasks using convolution/adversarial neural networks.

COURSE CONTENT:

ANN Algorithms:

Supervised Learning Network- McCulloch–Pitts Unit and Thresholding logic, LinearSeparability, Multi-layer Perceptron Networks, Back-Propagation Network, factorsaffecting Backpropagation Training, Unsupervised Learning Networks- MaxNet.Mexican Hat Net.

Deep Feed-forward Networks:

Introduction to Deep Learning, Learning XOR, Gradient-Based Learning, Hidden Units,Architecture Design, Other Architectural Considerations, Applications of Deep neural networks.

Regularization:

Regularization for Deep Learning - Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying andParameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods,Dropout.Regularized Linear Regression.

Optimization for Training Deep Models:

Need for Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, and Algorithms with Adaptive Learning Rates-AdaGrad, RMSProp, and Approximate Second-Order Methods-Newton's Method, Conjugate Gradients Method.

Convolutional Networks:

Motivation, Pooling, Convolutional layers, Additional layers, Residual Nets, Applications of deep learning, Application of CNN.

Recurrent and Recursive Nets:

Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs,Encoder -Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Application of RNN.

Recommended Reading:

1. Deep Learning, Ian Goodfellow, Yoshua Bengio and Aeron Courville, MIT Press,First Edition, 2016.
2. Deep Learning, A practitioner's approach, Adam Gibson and Josh Patterson, O'Reilly, First Edition, 2017.
3. Yoav Goldberg, A Primer on Neural Network Models for Natural Language Processing, 2015
4. Hands-On Learning with Scikit-Learn and Tensorflow, Aurelien Geron, O'Reilly, First Edition, 2017.
5. Deep Learning with Python, Francois Chollet, Manning Publications Co, First Edition, 2018.
6. Python Machine Learning by Example, Yuxi (Hayden) Liu, First Edition, 2017.
7. A Practical Guide to Training Restricted Boltzmann Machines(link is external), Geoffrey Hinton, 2010

Programme Name	***S.Y. M.C.A.***	***SEMESTER III***
Course Code	**R5MC6114L**	
Course Title	**Deep Learning Laboratory**	

PREREQUISITES:

Programming in Python, MatLab /other equivalent Languages

COURSE OUTCOMES:

1 Demonstrate Tensor flow/Keras deep-learning workstations.

2 Choose appropriate data preprocessing techniques to build neural network models.

3 Analyze different regularization and optimization techniques used in deep learning.

4 Build neural network models using deep learning algorithms-CNN and RNN to solve real world problems.

TITLES OF EXPERIMENTS

1. Study of Tensor flow /Keras -Importing Libraries and Modules.
2. Loading the dataset, Splitting dataset into training and testing data sets.
3. Implementation of Data preprocessing techniques.
4. Implementation of Artificial Neural Networks -McCulloch-Pitts neuron with ANDNOTfunction, single layer perceptron network, multi-layer perceptron network for an AND function,Back propagation Network for XOR function with Binary Input and Output
5. Implementation of Regularization Techniques.
6. Implementation and analysis of Deep Neural network algorithm: Convolutional neural network (CNN) - Object identification and classification, image recognition
7. Implementation and analysis of Deep Neural network algorithm: Recurrent neural network (RNN) - Character recognition and web traffic Image classification.

ASSESSMENT:

The distribution of (total 40) marks for ESE practical exam is as follows:

- Viva-voce: 20marks
- Practical/MCQ test: 20 marks