Year: B. Tech III (Semester VI)

Subject Name: Deep Learning and Neural Network **Subject Code:** BTEA19652
Type of course: Minor (Group: Artificial Intelligence and Machine Learning)

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	2	4	60	25	15	30	20	150

CA1: Continuous Assessment (assignments / projects / open book tests / closed book tests) CA2: Sincerity in attending classes / class tests / timely submissions of assignments / self-learning attitude / solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work / Quality of work submitted / Active participation in lab sessions / viva on practical skills learned in course.

Contents:

Sr. No.	Contents	Total Hours
1.	**Introduction to Artificial Neural Network:** Biological Neuron, Artificial neurons, Computational models of neurons, Structure of neural networks, Boolean Functions using McCulloch-Pitts neuron, Non-linear separability, perceptron, perceptron learning algorithm, Multilayer Perceptrons, Feed forward Neural Networks, Backpropagation, Gradient Descent (GD), Activation Functions, Loss functions.	10
2.	**Deep Neural Network** : Deep Learning and its Architectures, Difficulty of training DNNs,, Hyper parameter Tuning, Bias vs Variance Tradeoff, Saddle point problem in neural networks, Regularization: L1 regularization, L2 regularization, Batch Normalization, Early stopping, Dropout, Pruning; Optimization Techniques - Batch Optimization, Momentum Based GD, Stochastic GD, RMSProp, Adam Optimizer	12
3.	**Convolutional Neural Network (CNN)**: Introduction to CNN- Convolution, Striding, Padding, Pooling,, Understanding and visualizing CNNs. LeNet, AlexNet, VGGNet, GoogleNet, ResNet, MobileNet; Appplication - Image Classification	8
4.	**Recurrent Neural Network (RNN)** : Sequence modelling using RNN, Long Short Term Memory (LSTM), Bidirectional LSTMs, Application: Natural language Processing	7
5.	**Unsupervised Deep Learning Models:** Self-Organizing Maps (SOMs), Boltzmann Machines, AutoEncoders	04
6.	Creating and deploying deep neural networks using tensor flow and keras.	05

Suggested Specification table with Marks (Theory): (For B. Tech only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	25	15	5	-	-

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (Revised Bloom's Taxonomy)

Reference Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN
1	Deep Learning for Dummies	John Paul Mueller, Luca Massaron	John Wiley & Sons.
2	Deep Learning, A Practitioner's Approach	Adam Gibson, Josh Patterson	O'Reilly Publisher Media.
3	Neural Networks for Pattern Recognition	Christopher M. Bishop	Oxford
4	Neural Smithing: Supervised Learning in Feedforward Artificial Neural Networks	Russell Reed, Robert J MarksII	Bradford Book Publishers

Note: Students should refer to the latest editions of books

Course Outcomes (CO):

Sr. No.	CO statements	Marks % weightage
CO-1	Discuss building block to construct Neural network architecture.	25%
CO-2	Select appropriate deep learning algorithms for various types of learning tasks and analyze various optimization techniques for improving deep neural networks.	30%
CO-3	Demonstrate Convolutional Neural Network models and Recurrent Neural Network for real world applications.	30%
CO-4	Discuss unsupervised deep learning model and create deep neural network model.	15%

List of Open learning website:

Nptel Deep Learning Part-1: https://nptel.ac.in/courses/106106184

Lab Work:

1. Introduction to Kaggle and how it can be used to enhance visibility.
2. Build general features to build a model for text analytics.
3. Build and deploy your own deep neural network on a website using tensor flow.