COURSE TITLE	**DEEP LEARNING**
COURSE CODE	**05MD0303**
COURSE CREDITS	**5**

Course Outcomes: After completion of this course, student will be able to:

1. Students have basic understanding of machine learning and deep learning.
2. Students are able to apply mathematical aspects of neural network and basic programming with Keras.
3. Students are able to apply deep learning concepts for computer vision, text and sequences
4. Students are able to implement Keras and Keras APIs.
5. Students have understanding of advanced concepts of deep learning with limitations and future aspects of deep learning.

Pre-requisite of course: Knowledge of programming, statistics and linear algebra.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Fundamentals of Machine learning** Four branches, Evaluating ML models, Data preprocessing, feature engineering and feature learning, overfitting and underfitting, Universal workflow of ML, AI – ML and DL, Before deep learning, Why deep learning?	8
2	**Mathematical building blocks** First look at NN, Data representation for NN, Tensor operations, Gradient based optimization, Anatomy of NN, Introduction to Keras, Setting up deep learning workstation,, Binary classification example, , Multiclass classification example, Regression example	10
3	**Deep learning for computer vision, Deep learning for text and sequences** Intro. to convnets, Training a convnet, Using pretrained convnet, , Visualizing what convnets learn, Working with text data, understading Recurrent NN (RNN), Advanced use of RNN, Sequence processing with convnets	14
4	**Advanced deep learning practices** The Keras functional API, , Inspecting and monitoring deep learning models using Keras callbacks and Tensorboard, Getting the most out of model	8

Contents : Unit	Topics	Contact Hours
5	**Generative deep learning** Text generation with LSTM, DeepDream, Neural style transfer, Generating images with variational autoencoders, Intro. to generative adversarial networks. , Limitations of deep learning, future of deep learning.	8
Total Hours		**48**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Unit 1** Introduction to Tensor flow /Keras -Importing Libraries and Modules., Introduction to Tensor flow /Keras -Importing Libraries and Modules., Loading the dataset, Splitting dataset into training and testing data sets., Loading the dataset, Splitting dataset into training and testing data sets., Practical's based on data preprocessing techniques: a. Handling Missing Data b. Encoding techniques, Practical's based on data preprocessing techniques: a. Handling Missing Data b. Encoding techniques	5
2	**Unit 2** Hands on practical with Exploratory Data Analysis on different dataset., Hands on practical with Exploratory Data Analysis on different dataset., Implementation of Artificial Neural Networks - McCulloch-Pitts neuron with ANDNOT function, single layer perceptron network, multi-layer perceptron network for an AND function,, Back propagation Network for XOR function with Binary Input and Output., Practicals based on writing a python script for exploring Neural Networks for both, Regression and Classification Model and their evaluation.	5
3	**Unit 3** Practicals to learn about cross validation, gradient descent to understand performance optimization., Implementation of Regularization Techniques., Implementation and analysis of Deep Neural network algorithm: Convolutional neural network (CNN) - Object identification and classification, image recognition., Implementation and analysis of Deep Neural network algorithm: Recurrent neural network (RNN) - Character recognition and web traffic Image classification.	5
Total Hours		**15**

Textbook :

1 Deep learning with Python, Francois Chollet, Manning, 1stE

References:

1 Deep learning, Deep learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press, 1stE

References:

2 Deep learning with PyTorch, Deep learning with PyTorch, Eli Stevens, Luca Antiga, Thomas Viehmann, Manning, 1stE

3 Dive into Deep Learning, Dive into Deep Learning, ston Zhang, Zachary C. Lipton, Mu Li, Alexander J. Smola, Cambridge University press, 1stE

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking
10.00	10.00	30.00	20.00	20.00	10.00

Instructional Method:

1 Board Work

2 PPT

3 Videos

Supplementary Resources:

1 https://www.geeksforgeeks.org › deep-learning-tutorial

2 https://www.kaggle.com/learn/intro-to-deep-learning

3 https://www.datacamp.com/tutorial/tutorial-deep-learning-tutorial

4 https://www.tutorialspoint.com/tensorflow/tensorflow_machine_learning_deep_learning.htm