MIT | Academy of Engineering (An Autonomous Institute)			COURSE SYLLABI (2019-2023)		
SCHOOL OF ELECTRICAL ENGINEERING			**W.E.F.**	**:**	2020-21
THIRD YEAR BACHLOR OF TECHNOLOGY			**COURSE NAME**	**:**	Deep Learning
			COURSE CODE	**:**	ET481
			COURSE CREDITS	**:**	03
RELEASE DATE	**:**	**01/07/2020**	**REVISION NO.**	**:**	1.0

TEACHING SCHEME:		**EVALUATION SCHEME:**					
LECTURE	**PRACTICAL**	**THEORY**			**PRACTICAL**	**PRESENTATION/ DEMONSTRATION**	**TOTAL**
		ICE	**ECE**	**IA**			
3	Nil	35	35	30	Nil	Nil	100

COURSE OBJECTIVES:

1. ET481.CEO.1: To illustrate the basic concepts and techniques of Deep Learning.
2. ET481.CEO.2: To explore Convolution Neural Network and Sequence Model.
3. ET481.CEO.3: To develop a deeper understanding of Deep Learning algorithms.
4. ET481.CEO.4: To implement Deep Learning algorithms for solving practical problems.

COURSE OUTCOMES:

The students after completion of the course will be able to

1. ET481.CO.1: Explain fundamentals of Neural Network and Deep Learning. [L2]
2. ET481.CO.2: Describe Convolution Neural Network. [L2]
3. ET481.CO.3: Explain Sequence Model and Encoder Decoder Model. [L2]
4. ET481.CO.4: Develop Deep Learning model for classification and object detection. [L3]
5. ET481.CO.5: Evaluate the performance of Deep Learning models. [L5]

THEORY:

Unit I	**Deep Learning Basics**	**9 Hours**

Introducing Neural Computation, Perceptron, Feedforward Neural Network, Gradient Descent, Backpropagation, Momentum, Stochastic GD, AdaGrad, RMSProp, Adam. Bias-Variance Tradeoff, Regularization, Early stopping, Dataset augmentation, Dropout. Better weight initialization methods, Batch Normalization. Difference between Classical Machine Learning and Deep Learning. Various activation functions, Deep Learning process. Deep Learning using Convolutional Neural Network (CNN). The importance of striding, dilation, pooling used in CNN.

Case Study: Image Classification using MLP and CNN.

Unit II	**Convolutional Neural Networks and Transfer Learning**	**9 Hours**

Convolutional Neural Networks, LeNet, AlexNet, VGGNet, Inception-V3, ResNet, Mobilenet. Visualizing Convolutional Neural Networks using Transfer Learning,

Case Study: Image Classification using Transfer Learning

Unit III	**Object Detection**	**6 Hours**

Object Detection Using Yolo, Object Detection Using Faster R-CNN, ROI-CNN, Mask R-CNN

Case Study: Object Detection on Image using Yolo.

Unit IV	**Sequence Model**	**8 Hours**

Introduction to Recurrent Neural Networks (RNN), Long Short-Term Memory (LSTMs), Gated Recurrent Units (GRUs), Vanishing and Exploding Gradients, Backpropagation through time (BPTT), Generative Adversarial Networks (GAN).

Case Study: Text Analysis

Unit V	Encoder Decoder Models	8 Hours

Introduction to Encoder Decoder Models, Denoising Autoencoders, Sparse Autoencoders

Case Study: Based on Sensor Data

TEXTBOOKS:

1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.10.
2. Daniel Graupe, Deep Learning Neural Networks: Design and Case Studies, WorldScientific Publishing Co., Inc., 2016.
3. Andreas C. Müller and Sarah Guido, “Introduction to Machine Learning with Python: A Guide for Data Scientists”, First Edition, O'Reilly Media, ISBN 978-14-4936-941-5

REFERENCES:

1. Raúl Rojas, Neural Networks: A Systematic Introduction, 1996
2. Christopher Bishop, Pattern Recognition and Machine Learning, 2007
3. Simon Haykin, Neural Networks: A comprehensive foundation, Prentice Hall International Inc. 1999, (ISBN: 0132733501).