Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
AI19541	FUNDAMENTALS OF DEEP LEARNING	PC	3	0	2	4

Objectives:	
●	To introduce the different activation functions.
●	To familiarize various Training Techniques.
●	To learn about Convolutional Neural Network.
●	To introduce the different models of Deep Learning.
●	To familiarize generative deep learning.

UNIT-I	INTRODUCTION TO DEEP LEARNING	9
Perceptrons to Neural Networks - Activation Function - Calculating Multidimensional Arrays - Implementing a Three-Layer Neural Network - Designing the Output Layer - Identity Function and Softmax Function - Handwritten Digit Recognition. Neural Network Training: Learning from Data – Loss Function. CHAPTER – 3 & 4 (T1)		
UNIT-II	**TRAINING TECHNIQUES**	**9**
Numerical Differentiation – Gradient – Implementing a Training Algorithm - Stochastic Gradient Descent – Momentum – AdaGrad – Adam – Initial Weight Values – Regularization – Validating Hyper parameters. CHAPTER – 4 & 6 (T1)		
UNIT-III	**CONVOLUTIONAL NEURAL NETWORKS**	**9**
Overall Architecture – The convolution layer – The pooling layer – Implementing the Convolution and Pooling Layers – Implementing a CNN – Visualizing a CNN – Typical CNNs. CHAPTER – 7 (T1)		
UNIT-IV	**ACCELERATING DEEP LEARNING MODELS**	**9**
Making a Network Deeper – ImageNet – VGG – GoogLeNet – ResNet – Accelerating Deep Learning – Practical Uses of Deep Learning – The Future of Deep Learning. CHAPTER – 8 (T1)		
UNIT-V	**GENERATIVE DEEP LEARNING AND BEST PRACTICES**	**9**
Generative deep learning: Text generation – Deep dream – Neural style transfer – Generating images with variational autoencoders – Introduction to Generative Adversarial Networks. **Best practices for the real world:** Hyperparameter optimization - Model ensembling - Scaling up model training. CHAPTER – 12 & 13 (T2)		
	Contact Hours : 45	

List of Experiments				
1.	Implement handwritten digits classification.			
2.	Implement classification model using ImageNet database.			
3.	Study of different frameworks on deep learning (Tensor flow, Keras, PyTorch).			
4.	Implement basic convolutional neural network model for classification using Dogs vs. Cats dataset.			
5.	Implement VGG-16 model for classification using Dogs vs. Cats dataset.			
6.	Implement object recognition using YOLO.			
7.	Implement time series analysis for temperature forecasting using jena weather dataset.			
8.	Implement text processing model using TextVectorization layer for IMDB movie reviews dataset.			
9.	Generate MNIST image using generative adversarial networks.			
	Contact Hours	**:**	**30**	
	Total Contact Hours	**:**	**75**	

Course Outcomes:	
On completion of the course, the students will be able to	
●	Explain the basic concepts of activation function.
●	Apply various training techniques.
●	Implement convolutional neural network.
●	Develop different Deep Learning models.
●	Construct deep generative model for various applications.

Text Books:	
1	Koki Saitoh, “Deep Learning from the Basics - Python and Deep Learning: Theory and Implementation”, 2021 Packt Publishing.
2	François Chollet, “Deep Learning with Python” Second Edition, Manning (ISBN 9781617296864).

Reference Books:	
1	Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Interscience, 2000.
2	Satish Kumar, "Neural Networks, A Classroom Approach", Tata McGraw -Hill, 2007.
3	Michael Nielsen, "Neural Networks and Deep Learning", Determination Press, 2015.

Web link:

1. **https://www.manning.com/books/deep-learning-with-python-second-edition**

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
AI19541.1	3	3	2	2	1	-	-	1	-	-	-	1	3	3	1
AI19541.2	3	3	2	2	2	-	-	2	-	-	-	1	3	3	2
AI19541.3	3	3	3	2	2	-	-	2	-	-	-	1	3	3	1
AI19541.4	3	3	3	2	3	1	1	2	1	1	-	1	3	3	3
AI19541.5	3	3	3	2	3	1	1	2	1	1	-	1	3	3	3
Average	3	3	2.6	2	2.2	1	1	1.8	1	1	-	1	3	3	2

Correlation levels 1, 2 or 3 are as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)
No correlation: "-"