Course Type	Course Code	Name of the Course	L	T	P	Credits
DP	NCSC517	Deep Learning Lab	0	0	3	1.5

Course Objective

This course is designed to help the students in developing skills for building deep network models and also to give them practical exposure to the state-of-the-art deep learning techniques for solving variants of real-world problems. The students are expected to use Python for the implementation purpose.

Learning Outcomes

Upon successful completion of this practical course, the students would be able to:

1. learn the key principles of deep learning;
2. identify the deep learning algorithms for different types of learning tasks in various domains;
3. implement deep learning algorithms and solve real-world problems.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introductory concepts of Python programming to represent mathematical building blocks of deep leaning (vector, matrix, tensor, etc.), and understanding numerical computations on these	3	The students would be practically exposed to the mathematical building blocks of deep learning
2	Understanding basic Machine Learning concepts: Handling dataset, model training/testing/validation, optimization, evaluation, plot generation	3	The students would acquire basic and practical knowledge of machine learning from data
3	Implementation of Linear Regression and Logistic Regression Models	3	The students would gain experience in developing regression and classification models from scratch
4	Building neural network (NN) using Keras/ Tensorflow /PyTorch, Training NN, Exploring NN with respect to binary and multiclass classification tasks	6	The students would acquire practical experience in building as well as effectively training neural network
5	Implementing Convolutional Neural Networks (CNNs) using Tensorflow and PyTorch	3	The students would learn to build and train convolutional neural networks
6	Convolutional Neural Network (CNN) Interpretation/Visualization	3	This unit would further help clarify the working principles of CNN
7	Exploring RCNN and YOLO for Object Detection Task	3	The students would acquire practical experience in using deep learning models for computer vision tasks
8	Recurrent Neural Network (RNN) using Tensorflow/Keras	3	The students would learn to build and train recurrent neural networks to learn from sequential data
9	Implementation of Sequence-to-Sequence Learning	3	The students would gain practical experience in using RNN for NLP task
10	Exploring unsupervised, generative deep learning models (Implementing Autoencoder and its variants using Keras,	6	The students would learn to implement and use unsupervised, generative deep learning

	Generative Adversarial Network (GAN) implementation using Tensorflow, etc.)		models
11	Implementing GNN using PyTorch Geometric	3	The students would be exposed to deep learning from graph structured data
12	Examination	3	
Total		**42**	

Text Books:

- Deep Learning, Ian Goodfellow and YoshuaBengio and Aaron Courville, MIT Press, 2016.
- Deep Learning with Python by Francois Chollet, Manning Publications (2nd Edition)

Reference Books:

- Neural Networks for Pattern Recognition - Christopher Bishop - Clarendon Press 1st Edition 1996
- Neural Networks and Learning Machines - Simon Haykin, Pearson Education; 3rd Edition 2016
- Deep Learning with PyTorch by Thomas Viehmann et al., Manning Publications