Course Name: DS-313,**Artificial Neural Networks & Deep Learning**

Credit Hours: 2-1

Contact Hours: 2-3

Pre-requisites: OOP

Course Introduction:

In this course, students will delve into the intricate world of artificial intelligence, particularly focusing on neural networks. They will begin by comprehending the fundamental principles underlying neural networks. Subsequently, they will explore various deep learning algorithms, gaining an understanding of their suitability for diverse learning tasks across different domains. Students will then apply their knowledge to real-world scenarios, particularly honing their skills in using artificial neural networks for classification problems. The course will culminate in an in-depth analysis of various deep networks and their respective learning laws, allowing students to differentiate and assess their functionalities and applications. Through these objectives, students will develop a strong grasp of advanced artificial intelligence concepts and their practical applications.

CLO No	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Understand the fundamentals of neural networks in AI	C2 (Understand)
CLO-2	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.	C2 (Understand)
CLO-3	Apply ANN for classification Problems	C3 (Apply)
CLO-4	Differentiate between different Deep Networks and their learning laws	C4 (Analyze)

Course Plan:

Introduction to Artificial Neural Network (ANN), Perceptron, loss minimization, Backpropagation, Gradient Descent, Implementation ANN using PyTorch, The Boltzmann machines, Backpropagation Networks, Feedforward Networks, Introduction to Deep Learning, Convolutional Neural Network, Visual Recognition, Filtering, Conv and Pooling Layers, fully connected layer, Training Neural Networks, Sequence Modeling, LSTM, Natural Language Processing, word embedding (word2vec), Neural Machine Translation, Seq2seq and attention, Object Detection and Segmentation, Semantic Segmentation, Instance Segmentation, Generative Adversarial Networks, Autoencoder

#	Weekly Distribution of Course Contents

Week-1	Introduction to Artificial Neural Network (ANN), Perceptron, loss minimization,
Week-2	Backpropagation, Gradient Descent,
Week-3	Implementation ANN
Week-4	The Boltzmann machines,
Week-5	Backpropagation Networks, Feedforward Networks,
Week-6	Introduction to Deep Learning,
Week-7	Convolutional Neural Network, Visual Recognition, Filtering, Conv and Pooling Layers, fully connected layer,
Week-8	Training Neural Networks,
Week-9	Sequence Modeling,
Week-10	LSTM,
Week-11	Natural Language Processing, word embedding (word2vec),
Week-12	Neural Machine Translation, Seq2seq and attention,
Week-13	Object Detection and Segmentation,
Week-14	Semantic Segmentation, Instance Segmentation,
Week-15	Generative Adversarial Networks,
Week-16	Autoencoder

Reference Materials:

1. Neural Network Design, 2nd Edition, Martin T. Hagan, Howard, B. Demuth, Mark Hudson Beale and Orlando De Jesus, Publisher: Martin Hagan; 2 edition (September 1, 2014), ISBN-10: 0971732116.
2. Fundamentals of Artificial Neural Networks, Mohammad Hassoun, Publisher: A Bradford Book (January 1, 2003), ISBN-10: 026251467.
3. Deep Learning by Ian Good Fellow, Y Bengio, G Hinton, 2016 MIT Press
4. Deep learning with Python by F Chollet, 2017