CO1	neural networks, activation functions, loss functions, and optimization techniques.
CO2	Design, implement, and train basic neural network architectures, including feedforward networks, convolutional neural networks (CNNs), and recurrent neural networks (RNNs) using modern deep learning frameworks like TensorFlow or PyTorch.
CO3	Apply deep learning techniques to solve complex problems in various domains such as image classification, object detection, natural language processing, and time-series prediction.
CO4	Explore and implement advanced deep learning techniques such as transfer learning, generative adversarial networks (GANs), attention mechanisms, and transformers to address cutting-edge research and industry challenges.

S. NO	Contents	Contact Hours
UNIT 1	Overview of Artificial Intelligence, Machine Learning, and Deep Learning, History and evolution of deep learning, Applications of deep learning, Perceptron and multi-layer perceptron, Activation functions, Loss functions and their significance, Gradient Descent and Backpropagation, Neural Networks: Deep vs Shallow Networks, Training Deep Networks: Vanishing and Exploding Gradients, Techniques to mitigate gradient issues (Batch Normalization, Gradient Clipping), Optimization algorithms (SGD, Adam, RMSprop), Regularization techniques (L2, Dropout), and Weight Initialization	**16**

UNIT 2	Convolutional Neural Networks, and their significance in image processing, Convolution operations and feature maps. Pooling layers, CNN architectures: LeNet, AlexNet, VGG, ResNet, Inception, Transfer learning and fine-tuning pre-trained models, Object detection and segmentation (YOLO, SSD, Mask R-CNN), Introduction to Generative Adversarial Networks, Autoencoder. Variational Autoencoders.	**14**
UNIT 3	Recurrent Neural Networks (RNNs), Long Short-Term Memory (LSTM) networks, Gated Recurrent Unit (GRU), Attention Mechanisms and Transformers, Sequence-to-sequence models with attention, and applications in natural language processing.	**12**
	TOTAL	**42**