**RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

**New Scheme Based On AICTE Flexible Curricula**

**Artificial Intelligence and Data Science, VI-Semester**

## AD-601Deep Learning

Course Outcomes: After completion of the course students will be able to

**CO1: Understanding the basics concepts of deep learning.**
**CO2: Emphasizing knowledge of various deep learning algorithms.**
**CO3: Understanding of CNN and RNN to model real world applications.**
**CO4: Understanding of Deep Generative Models to model real world applications**
**CO5: Understanding the various challenges involved in designing deep learning algorithms for varied applications**

### Unit-I: Introduction to Deep Learning

Introduction to Deep Learning: Basics: Biological Neuron, Idea of computational units, McCulloch–Pitts Neural Model, Linear Perceptron, Perceptron Learning, Feed Forward and Back Propagation Networks.

### Unit-II: Feedforward Networks

Feedforward Networks: Multilayer Perceptron, Gradient Descent, Backpropagation, Empirical Risk Minimization, regularization, auto encoders.

### Unit-III: Convolutional Networks

Convolutional Networks: The Convolution Operation, Variants of the Basic Convolution Function, Structured Outputs, Efficient Convolution Algorithms, Random or Unsupervised Features, LeNet, AlexNet

### Unit-IV: Recurrent Neural Networks

Recurrent Neural Networks: Bidirectional RNNs, Deep Recurrent Networks Recursive Neural Networks, The Long Short-Term Memory and Other Gated RNNs

### Unit-V: Deep Generative Models

Deep Generative Models: Boltzmann Machines, Restricted Boltzmann Machines, Introduction to MCMC and Gibbs Sampling, Gradient computations in RBMs, Deep Belief Networks, Deep Boltzmann Machines

### APPLICATIONS

Image Processing, Speech Recognition, Natural Language Processing

REFERENCES


1. Ian Goodfellow, YoshuaBengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
2. Francois Chollet, “Deep Learning with Python”, Manning; Second Edition, 2021.

3. Navin Kumar Manaswi “Deep Learning with Applications Using Python”, Apress,2018.
4. Nikhil Buduma, “Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms”, O’Reilly publications,2017.

LAB Experiments-

1. Write a Program to implement Linear Perceptron.
2. Write a Program to implement Multi-Layer Perceptron.
3. Write a Program to implementAutoencoders.
4. Write a Program to implement basic Convolutional Neural Network for Image Classification.
5. Write a Program to implement LeNet for image classification
6. Write a Program to implement AlexNet for image classification
7. Write a Program to implement RNN for text classification
8. Write a Program to implement LSTM for text prediction.
9. Write a Program to implementBoltzmann Machines for any real world classification problem.
10. Write a Program to implement restricted Boltzmann Machines for any real world classification problem.