

**PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY**

(Autonomous)

Kanuru, Vijayawada-520007

**Department of Computer Science and Engineering (Data Science)**

**III B Tech – II Semester**

**Deep Learning**

<b>Course Code</b>	23DS3601	<b>Year</b>	III	<b>Semester</b>	I
<b>Course Category</b>	PCC	<b>Branch</b>	CSE (Data Science)	<b>Course Type</b>	Theory
<b>Credits</b>	3	<b>L-T-P</b>	3-0-0	<b>Prerequisites</b>	Machine Learning
<b>Continuous Internal Evaluation</b>	30	<b>Semester End Evaluation</b>	70	<b>Total Marks</b>	100

**Course Outcomes**

<b>Upon Successful completion of course, the student will be able to</b>		
<b>CO1</b>	Describe the fundamental concepts, architectures, and applications of deep learning to understand their functioning and areas of use	<b>L2</b>
<b>CO2</b>	Apply convolutional neural networks (CNNs) and deep convolutional neural network architectures to solve computer vision tasks	<b>L3</b>
<b>CO3</b>	Use advanced optimization and regularization methods to effectively train deep neural networks, including RNNs, LSTMs, GRUs and GANs for sequential and generative tasks respectively	<b>L3</b>
<b>CO4</b>	Analyze the architectures and training mechanisms of CNNs, deep convolutional networks, gated neural networks, AutoEncoders (AEs), and GANs to evaluate their design and performance characteristics	<b>L4</b>

**Contribution of Course Outcomes towards achievement of Program Outcome & Strength of correlation (3: High, 2: Medium, 1: Low)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
<b>CO1</b>	2												
<b>CO2</b>	3										2	3	
<b>CO3</b>	3										2	3	
<b>CO4</b>		3									3		3

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**Syllabus**

<b>Unit No</b>	<b>Contents</b>	<b>MappedCO</b>
<b>I</b>	<b>Introduction to Deep Learning:</b> Overview of artificial neural networks, Deep neural networks, Differences between machine learning and deep learning, Deep Learning Architectures, Activation Functions, Loss Functions, Optimization Techniques, Overfitting, Underfitting, Regularization, Normalization, Applications of Deep Learning.	CO1
<b>II</b>	<b>Convolutional Neural Networks (CNNs):</b> Introduction to CNNs, Convolution Operation, Basic Convolution Function, Convolutional Layers, Filters, Pooling Operation, Pooling Layers, Padding, Stride, Sparse Connectivity and Weight Sharing, Fully Connected Layers, Training CNNs, Normalization and Dropout Hyperparameter Tuning, understanding LeNet Architecture, Training, Parameters Applications of CNN.	CO1, CO2, CO4
<b>III</b>	<b>Transfer Learning:</b> Introduction, What is Transfer Learning, advantages of Pretrained Models, different ways to Fine Tune the Model <b>Pre-trained Deep Convolutional Neural Networks:</b> AlexNet, VGGNet, GoogLeNet, ResNet, MobileNet Architectures.	CO1, CO2, CO4
<b>IV</b>	<b>Recurrent Neural Networks:</b> RNN, Bidirectional RNNs <b>Gated Neural Networks:</b> Long Short Term Memory(LSTM), Bi-LSTM, Gated Recurrent Units (GRUs)	CO1, CO3, CO4
<b>V</b>	<b>Unsupervised Learning:</b> Introduction to GANs, Generative Models, GAN Architecture (Generator and Discriminator), GAN Training and Optimization, Types of GANs, Autoencoders.	CO1, CO3, CO4

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**Department of Computer Science and Engineering (Data Science)****III B Tech – II Semester****Learning Resources****Text Books**

1. Deep Learning by Ian Goodfellow, Yoshua Bengio, Aaron Courville, First Edition 2016, MIT Press
2. Dive into Deep Learning, By Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola, First Edition, 2024, Cambridge University Press
3. Fundamentals of Deep Learning, Nithin Buduma, Nikhil Buduma, Joe Papa, 2nd Edition 2022 ,O'Reilly Media

**References**

1. Machine Learning, Tom M. Mitchell, First Edition, 2017, McGraw Hill Education
2. Machine Learning for Absolute Beginners, Oliver Theobald, Third Edition, 2024, Sanage Publishing House LLP
3. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, 2012, MIT Press

**E-Recourses and other Digital Material**

1. Deep Learning: <https://deeplearning.mit.edu/>
2. Deep Learning: <https://nptel.ac.in/courses/106106184>
3. Deep Learning <https://nptel.ac.in/courses/106105215>