DEEP LEARNING

Course Code	23CS3701	Year	IV	Semester	I
Course Category	PCC	Branch	CSE	Course Type	Theory
Credits	3	L – T – P	3-0-0	Prerequisites	Machine Learning
Continuous Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes		
Upon successful completion of the course, the student will be able to:		
CO1	Understand the fundamental concepts, architectures, and applications of deep learning.	L2
CO2	Apply the CNN and Deep Networks to analyze various architectures to solve Computer Vision Tasks.	L3
CO3	Apply Recurrent Neural Networks (RNNs) and Generative Adversarial Networks (GANs) to solve natural language processing and image-to-image translation tasks	L3
CO4	Analyze the performance of deep learning architectures, including CNNs, RNNs and GANs for various tasks in computer vision, natural language processing and generative modeling.	L4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2										1		2	
CO3										1		2	
CO4		2								1		1	
Avg.	3	2								1		2.5	

Syllabus

Unit No	CONTENTS	Mapped CO
1	**Fundamentals of Deep Networks** – Biological and Machine Vision, Human and Machine Language, Introduction to Deep Learning, Anatomy of Neural Network, Artificial Neural Networks. **Common Architectural Principles of Deep Networks**: Parameters, Layers, Activation Functions, Loss Functions, Hyperparameters, how deep learning works, Types of Deep Learning, Applications of Deep Learning.	CO1
2	**Building Blocks of Deep Networks –** Boltzmann Machine, Restricted Boltzmann Machine, Autoencoders, Variational Autoencoders. **Major Architectures of Deep Networks:** Deep Belief Networks, Generative Adversarial Networks.	CO1, CO2, CO4
3	**Convolutional Networks (CNNs) –** Motivation, the Convolution Operation, Convolutional Layers, Pooling, Structured Outputs, LeNet, AlexNet, VGG Net.	CO1, CO2, CO4
4	**Recurrent Neural Networks:** Why RNN, Architecture of RNN, Types of RNN,	CO1, CO3,

	Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, and the Long Short-Term Memory - Gated Recurrent Units, Bidirectional LSTMs, and Bidirectional RNNs. **Optimization Algorithms:** Optimization and Deep Learning, Adagrad,adam.	**CO4**
5	Recent Trends of Deep Learning: What are Transformer Models, Architecture of Transformers. **Applications:** Computer Vision, Speech Recognition, Natural Language Processing.	**CO1, CO3, CO4**

Learning Resources

Text Books

1. Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courvile, MIT Press, 2016
2. Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications, ISBN: 9781617294433
3. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821
4. Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492041412

Reference Books

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

E-Resources & other digital material

1. Swayam NPTEL: Deep Learning: https://onlinecourses.nptel.ac.in/noc22_cs22/preview'
2. https://www.datacamp.com/tutorial/how-transformers-work
3. https://d2l.ai/index.html