SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

Year: B. Tech IV (Semester VII)

Subject Name: Deep Learning **Subject Code:** BTCO14708
Type of course: Professional Elective V
Prerequisite (if any): Probability and Statistics, Machine Learning

List of Courses where this course will be prerequisite: --

Rationale: Deep learning has varied applications in today's world ranging from Object detection to Natural Language Processing. This course aims to give a detailed insight into Artificial Neural Networks, Deep Neural Networks and its types. The course gives an in-depth exploration of Convolutional Neural Networks, Recurrent Neural Networks, Generative Adversarial Networks and their applications and Transfer Learning.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	0	3	60	25	15	0	0	100

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Content	Total Hrs
1	Deep Neural Network : Multilayer Perceptrons (MLPs), Feedforward Neural Networks, Gradient Descent (GD), Backpropagation, Loss functions., Deep Learning and its Architectures, Activation Functions and Hyper parameter Tuning	12
2	Convolutional Neural Network (CNN) and its Variants: Foundations of CNN - Convolution, Striding, Padding, Pooling. Understanding and visualizing CNNs. LeNet, AlexNet, VGGNet, GoogleNet, ResNet, MobileNet; Case Study - Image Classification	13

3	Improving Deep Neural Network: Overfitting, Under-fitting, Bias vs Variance Tradeoff, Saddle point problem in neural networks, Regularization: L1 regularization, L2 regularization, Batch Normalization, Early stopping, Dropout, Pruning	5
4	Transfer Learning: Pre-trained layers, freezing the layers, fine tuning layers; Case Study - Face Recognition	5
5	Recurrent Neural Network (RNN) : Sequence modeling using RNN, Long Short Term Memory (LSTM), Bidirectional LSTMs	5
6	Deep Generative Models: Generative Modeling with DL, Unsupervised Learning with Deep Network, Autoencoders, Generative Adversarial Network	5

Suggested Specification table with Marks (Theory): (For B. Tech. only)

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	20	20	10	0	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

Sr No	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication / Publication Edition
1	Fundamentals of Deep Learning	Nikhil Buduma	O-Reilly	Latest Edition
2	Deep Learning	Goodfellow, I.,Bengio.Y., Courville, A.,	MIT Press,	

3	Neural Networks - A ClassRoom Approach	Satish Kumar	Tata McGraw-Hill	
4	Neural Networks and Learning Machines	Simon. Haykin	Prentice Hall of India	
5	Deep Learning Using Python	S Lovelyn Rose, L Ashok Kumar, D Karthika Renuka	Wiley	

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Discuss the basic building blocks of Deep Neural Network to construct models	25
CO-2	Demonstrate Convolutional Neural Network models for real world applications	27
CO-3	Analyzing various optimization techniques for improving deep neural networks	12
CO-4	Apply transfer learning concept for deep neural networks	12
CO-5	Implement sequence models for text analysis	12
CO-6	Apply deep generative models for various applications	12

List of Open learning website:

- Deep Learning Part 1 (IITM) by Prof. Sudarshan Iyengar & Prof. Mitesh M. Khapra | IIT Madras : https://onlinecourses.nptel.ac.in/noc19_cs85