



Department of <b><u>INFORMATION TECHNOLOGY</u></b>		LP: IT16008 Rev. No: 00 Date:23/07/2021
B.E/B.Tech/M.E/M.Tech	: IT Regulation: 2016	
PG Specialisation	: -	
Sub. Code / Sub. Name	: IT16008 – Deep Learning(Elective)	
Unit	: I	

**Unit Syllabus****UNIT I APPLIED MATH AND MACHINE LEARNING BASICS**

Linear Algebra - Norms, Singular Value Decomposition, the Moore-Penrose Pseudo inverse, Probability and Information Theory, Machine Learning Basics.

**Objective:**

Students are given an overview of basics of linear algebra and machine learning algorithms.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Linear Algebra – scalars, vectors, matrices, tensors, special kind of matrices.	T1,CH 2 (Pg 29-35)	LCD / ONLINE
2	Norms- Eigen value decomposition	T1,CH 2(Pg 37-40)	LCD / ONLINE
3	Singular Value Decomposition and problems	T1,CH2 (Pg 41-43)	LCD / ONLINE
4	Moore-Penrose Pseudo inverse and problems	T1,CH2(Pg 43-46)	LCD / ONLINE
5	Probability and Information Theory- marginal, conditional and chain rule	T2,CH 3(Pg 52-58)	LCD / ONLINE
6	Information Theory – Structured probabilistic models	T2,CH3(Pg 71-73)	LCD / ONLINE
7	Machine Learning Basics – learning algorithm, hyperparameters, validation sets	T2,CH4 (Pg 96-118)	LCD / ONLINE
8	Supervised and unsupervised learning algorithms	T2,CH4(Pg 137-149)	LCD / ONLINE
9	Building ML algorithm and challenges motivating deep learning	T2,CH4(Pg 151-153)	LCD / ONLINE
<b>Content beyond syllabus covered (if any):</b>			

\* Session duration: 50 minutes



**Sub. Code / Sub. Name: IT16008 –DEEP LEARNING**  
**Unit : II**

**Unit Syllabus:****UNIT II INTRODUCTION TO DEEP NETWORKS: MODERN PRACTICES**

Deep Feed forward Networks, Regularization for Deep Learning, optimization for Training Deep Models.

**Objective**

Students acquire the knowledge about the deep networks and optimization of models.

Session No *	Topics to be covered	Ref	Teaching Aids
10	Deep Feed forward Networks –learning XOR, gradient based learning	T1,CH6(Pg 164-172)	LCD / ONLINE
11	Hidden units and architecture design	T1,CH6(Pg 187-200)	LCD / ONLINE
12	Back propagation and other differentiation algorithms	T1,CH6(Pg 200-220)	LCD / ONLINE
13	Regularization for Deep Learning	T1,CH7(Pg 224-235)	LCD / ONLINE
14	Sparse representation, bagging, ensemble methods, drop out and adversarial	T1,CH7(Pg 251-265)	LCD / ONLINE
15	Dataset augmentation, multitask learning, early stopping, parameter tuning	T1,CH7(Pg 236-249)	LCD / ONLINE
16	Optimization for Training Deep Models	T1,CH8(Pg 271-279)	LCD / ONLINE
17	Basic algorithm, parameter initialization strategies	T1,CH8(Pg 290-302)	LCD / ONLINE
18	Adaptive learning rate, approximate second order methods and meta algorithms	T1,CH8(Pg 302-313)	LCD / ONLINE
<b>CONTINUOUS ASSESSMENT TEST – I</b>			
<b>Content beyond syllabus covered (if any):</b>			

\* Session duration: 50 mins



**Sub. Code / Sub. Name: IT16008 –DEEP LEARNING**  
**Unit : III**

**Unit Syllabus:****UNIT III MODERN PRACTICES**

Convolutional Networks, Sequence Modeling, recurrent and recursive Nets, Practical methodology, Linear Factor Models, Autoencoders, Representation Learning, Monte Carlo methods, Confronting the partition function.

**Objective**

Students acquire the knowledge about the concepts and implementation of Convolutional Neural Networks and Recurrent Neural Networks for handling image and text datasets.

Session No *	Topics to be covered	Ref	Teaching Aids
19	Convolutional Networks – pooling and variants of convolution function	T1,CH9(Pg 326-352)	LCD / ONLINE
20	Sequence Modeling – Bidirectional RNN	T1,CH10(Pg 367-388)	LCD / ONLINE
21	Recurrent and recursive Nets	T1,CH10(Pg 394-399)	LCD / ONLINE
22	Practical methodology – baseline model, gathering data and hyperparameters	T1,CH11(Pg 416-435)	LCD / ONLINE
23	Linear Factor Models – PCA, ICA and sparse coding	T1,CH13(Pg 482-496)	LCD / ONLINE
24	Autoencoders – Stochastic, denoising and contractive encoders	T1,CH14(Pg 499-518)	LCD / ONLINE
25	Representation Learning – Transfer learning	T1,CH15(Pg 524-552)	LCD / ONLINE
26	Monte Carlo methods – Gibbs Sampling	T1,CH17(Pg 587-597)	LCD / ONLINE
27	Confronting the partition function- loglikelihood gradient	T1,CH18(Pg 603-628)	LCD / ONLINE

**Content beyond syllabus covered (if any):**

\* Session duration: 50 mins



**Sub. Code / Sub. Name: IT16008 –DEEP LEARNING**  
**Unit : IV**

**Unit Syllabus:****UNIT IV INTRODUCTION TO DEEP GENERATIVE MODELS**

Approximate Inference, Deep Generative Models - Boltzmann Machines, Restricted Boltzmann Machines, Deep Belief Networks, Deep Boltzmann Machines, Convolutional Boltzmann Machines, Back-Propagation through Random Operations, Directed Generative Nets, Generative Stochastic Networks, Evaluating Generative Models.

**Objective**

Students acquire the knowledge about the different types of deep generative models with case studies.

<b>Session No *</b>	<b>Topics to be covered</b>	<b>Ref</b>	<b>Teaching Aids</b>
28	Approximate Inference Introduction	T1,CH20(Pg 651-653)	LCD / ONLINE
29	Deep Generative Models - Boltzmann Machines, Restricted Boltzmann Machines	T1,CH20(Pg 653-673)	LCD / ONLINE
30	Deep Belief Networks	T1,CH20(Pg 653-660)	LCD / ONLINE
31	Deep Boltzmann Machines	T1,CH20(Pg 660-673)	LCD / ONLINE
32	Convolutional Boltzmann Machines	T1,CH20(Pg 679-683)	LCD / ONLINE
33	Back-Propagation through Random Operations	T1,CH20(Pg 684-688)	LCD / ONLINE
34	Directed Generative Nets	T1,CH20(Pg 688-707)	LCD / ONLINE
35	Generative Stochastic Networks	T1,CH20(Pg 707-712)	LCD / ONLINE
36	Evaluating Generative Models	T1,CH20(Pg 713-716)	LCD / ONLINE
<b>CONTINUOUS ASSESSMENT TEST – II</b>			
<b>Content beyond syllabus covered (if any):</b>			

\* Session duration: 50 mins



Unit Syllabus:

### UNIT V DEEP LEARNING FRAMEWORK AND APPLICATIONS

Introduction to TensorFlow, MXNET, TORCH, Applications of Deep Learning – TEXT, IMAGE, SPEECH.

#### Objective

To apply different deep learning framework and to learn about various models in text, image and speech applications.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Introduction to TensorFlow	Internet	LCD / ONLINE
38	MXNET	Internet	LCD / ONLINE
39	TORCH	Internet	LCD / ONLINE
40	Applications of Deep Learning	Internet	LCD / ONLINE
41	Text applications	Internet	LCD / ONLINE
42	Speech applications	Internet	LCD / ONLINE
43	Image applications	Internet	LCD / ONLINE
44	Implementation of case studies using various models	Internet	LCD / ONLINE
45	Summary	Internet	LCD / ONLINE
<b>CONTINUOUS ASSESSMENT TEST – III</b>			
<b>Content beyond syllabus covered (if any): Cloud security algorithms</b>			

\* Session duration: 50 mins



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Course Outcome 1: Understand basics for linear algebra.

Course Outcome 2: Learn the machine learning algorithms.

Course Outcome 3 Learn programming models for deep networks

Course Outcome 4: Learn programming models for modern practices.

Course Outcome 5: Explore about deep generative models.

Course Outcome 6: Learn about various deep learning frameworks and its applications.

### Mapping CO – PO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	X	X		X		X		X	X	X	X	X
CO2	X	X		X	X		X		X	X		X
CO3	X		X	X		X			X	X		X
CO4	X	X		X	X		X		X	X		X
CO5	X		X	X	X	X	X	X	X	X	X	X
CO6	X	X	X	X	X	X	X		X	X	X	X

A – Strong ; B – Moderate; C - weak

### TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio and Aaron Courville,||Deep Learning||, MIT Press, 2016.

### REFERENCES:



1. Li Deng, Dong Yu, —Deep Learning: Methods and Applications||, Now publishers, 2014.

2. Special Issue on deep learning for speech and language processing, IEEE Transaction on Audio, Speech and Language Processing, vol. 20, iss. 1, pp. 7 – 54, 2012.



## SRI VENKATESWARA COLLEGE OF ENGINEERING

## COURSE DELIVERY PLAN - THEORY

	Prepared by	Approved by
Signature		
Name	Ms. D. Jayanthi, AP/IT	Dr. V. Vidhya HoD/IT
Date	23/07/2021	23/07/2021
Remarks *:		
Remarks *:		

\* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD