SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Information Technology	LP: IT22043 Rev. No: 00 Date: 21/01/2025
B.E/B.Tech/M.E/M.Tech : INT Regulation:2022 PG Specialisation : _____ Sub. Code / Sub. Name : IT22043 DEEP LEARNING AND ITS APPLICATION Unit : I	

Unit Syllabus: **Applied Math and Machine Learning Basics**

Linear Algebra - Norms, Singular Value Decomposition, The Moore-Penrose Pseudoinverse, Probability and Information Theory, Machine Learning Basics, Pearson Correlation.

Objective:

To understand the basics of linear algebra and machine learning.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to deep learning - Historical trends	1-ch. 1; pg. 1-26	BB/PPT/Matlab/ Google colab
2	Linear Algebra - Scalars, Vectors, Matrices and Tensor	1-ch. 2; pg. 29-36	BB/PPT/Matlab/ Google colab
3	Linear Algebra - Linear Dependence and Span	1-ch. 2; pg. 29-36	BB/PPT/Matlab/ Google colab
4	Norms, Eigendecomposition, Singular Value Decomposition	1-ch. 2; pg. 36-50	BB/PPT/Matlab/ Google colab
5	Moore-Penrose Pseudoinverse, Trace Operator, Determinant	1-ch. 2; pg. 36-50	BB/PPT/Matlab/ Google colab
6	Example: Principal Components Analysis	1-ch. 2; pg. 36-50	BB/PPT/Matlab/ Google colab
7	Probability and Information Theory - Marginal probability, Conditional probability, **Expectation, Variance and Covariance**	1-ch.3; pg. 51-77	BB/PPT/Matlab/ Google colab
8	Machine Learning Basics	1-ch.5; pg. 96-161	BB/PPT/Matlab/ Google colab
9	Pearson Correlation	1-ch.3; pg. 51-77	BB/PPT/Matlab/ Google colab

Content beyond syllabus covered (if any):

* Session duration: 50 minutes

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Sub. Code / Sub. Name: **IT22043 DEEP LEARNING AND ITS APPLICATION**

Unit : II

Unit Syllabus : **Introduction To Deep Networks: Modern Practices**

Deep Feedforward Networks, Regularization for Deep Learning, Optimization for Training Deep Models - Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates.

Objective:

To learn feed forward deep networks

Session No *	Topics to be covered	Ref	Teaching Aids
10	Deep Feedforward Networks - Learning XOR	1-ch.6; pg. 164-223	BB/PPT/Matlab/ Google colab
11	Gradient-Based Learning , Hidden Units, Architecture Design, Backpropogation	1-ch.6; pg. 164-223	BB/PPT/Matlab/ Google colab
12	Regularization for Deep Learning- Parameter Norm Penalties, Dataset Augmentation	1-ch.7; pg. 224-270	BB/PPT/Matlab/ Google colab
13	Semi-Supervised Learning, Multitask Learning, Early Stopping,	1-ch.7; pg. 224-270	BB/PPT/Matlab/ Google colab
14	Parameter Tying and Parameter Sharing, Adversarial Training	1-ch.7; pg. 224-270	BB/PPT/Matlab/ Google colab
15	Optimization for Training Deep Models	1-ch.8; pg. 271-325	BB/PPT/Matlab/ Google colab
16	**Challenges in Neural Network Optimization**	1-ch.8; pg. 271-325	BB/PPT/Matlab/ Google colab
17	Basic Algorithms, Parameter Initialization Strategies	1-ch.8; pg. 271-325	BB/PPT/Matlab/ Google colab
18	Algorithms with Adaptive Learning Rates	1-ch.8; pg. 271-325	BB/PPT/Matlab/ Google colab

Content beyond syllabus covered (if any):

* Session duration: 50 mins

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Sub. Code / Sub. Name: **IT22043 DEEP LEARNING AND ITS APPLICATION**

Unit : III

Unit Syllabus : **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:

To understand convolutional networks and sequence modeling

To study probabilistic models and auto encoders

Session No *	Topics to be covered	Ref	Teaching Aids
19	Convolutional Networks - Convolution operation, pooling	1-ch.9; pg. 326-366	BB/PPT/Matlab/ Google colab
20	Sequence Modeling: Recurrent and Recursive Nets	1-ch.9; pg. 367-417	BB/PPT/Matlab/ Google colab
21	Linear Factor Models	1-ch.13; pg. 485-498	BB/PPT/Matlab/ Google colab
22	Autoencoders	1-ch.14; pg. 499-523	BB/PPT/Matlab/ Google colab
23	Representation Learning	1-ch.15; pg. 524-554	BB/PPT/Matlab/ Google colab
24	Monte Carlo methods	1-ch.17; pg. 587-602	BB/PPT/Matlab/ Google colab
25	Confronting the Partition Function	1-ch.17; pg. 603-628	BB/PPT/Matlab/ Google colab
26	**Demo on CNN, RNN**		BB/PPT/Matlab/ Google colab
27	Demo on Autoencoders		BB/PPT/Matlab/ Google colab

Content beyond syllabus covered (if any):

* Session duration: 50 mins

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Sub. Code / Sub. Name: **IT22043 DEEP LEARNING AND ITS APPLICATION**

Unit : IV

Unit Syllabus : **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:

To expose the students to various deep generative models

Session No *	Topics to be covered	Ref	Teaching Aids
28	Approximate Inference	1-ch.20; pg. 693-728	BB/PPT/Matlab/ Google colab
29	Deep Generative Models	1-ch.20; pg. 693-728	BB/PPT/Matlab/ Google colab
30	Boltzmann Machines, Restricted Boltzmann Machines	1-ch.20; pg. 693-728	BB/PPT/Matlab/ Google colab
31	Deep Belief Networks, Deep Boltzmann Machines, Convolutional Boltzmann Machines	1-ch.20; pg. 693-728	BB/PPT/Matlab/ Google colab
32	Back-Propagation through Random Operations, Directed Generative	1-ch.20; pg. 693-728	BB/PPT/Matlab/ Google colab
33	Generative Stochastic Networks, Evaluating Generative Models	1-ch.20; pg. 693-728	BB/PPT/Matlab/ Google colab
34	Demo on Deep Generative Models	1-ch.20; pg. 693-728	BB/PPT/Matlab/ Google colab
35	**Demo on** Boltzmann Machines		BB/PPT/Matlab/ Google colab
36	Demo on Deep Belief Networks		BB/PPT/Matlab/ Google colab

Content beyond syllabus covered (if any):

* Session duration: 50 mins

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Sub. Code / Sub. Name: **IT22043 DEEP LEARNING AND ITS APPLICATION**

Unit : V

Unit Syllabus : **Deep Learning Applications**

Object Recognition and Computer Vision,Natural Language Processing, Deep Reinforcement Learning for Vision-Based Environments in Robotics Applications, Selected Applications in Information Retrieval

Objective:

To implement the various applications of deep learning

Session No *	Topics to be covered	Ref	Teaching Aids
37	Object Recognition and Computer Vision	1-ch.12; pg. 438-480	BB/PPT/Matlab/ Google colab
38	Object Recognition and Computer Vision	1-ch.12; pg. 438-480	BB/PPT/Matlab/ Google colab
39	Natural Language Processing	1-ch.12; pg. 438-480	BB/PPT/Matlab/ Google colab
40	Natural Language Processing	1-ch.12; pg. 438-480	BB/PPT/Matlab/ Google colab
41	Deep Reinforcement Learning for Vision-Based Environments in Robotics Applications	1-ch.12; pg. 438-480	BB/PPT/Matlab/ Google colab
42	Deep Reinforcement Learning for Vision-Based Environments in Robotics Applications	1-ch.12; pg. 438-480	BB/PPT/Matlab/ Google colab
43	Deep Reinforcement Learning for Vision-Based Environments in Robotics Applications	1-ch.12; pg. 438-480	BB/PPT/Matlab/ Google colab
44	Selected Applications in Information Retrieval	1-ch.12; pg. 438-480	BB/PPT/Matlab/ Google colab
45	Selected Applications in Information Retrieval	1-ch.12; pg. 438-480	BB/PPT/Matlab/ Google colab

Content beyond syllabus covered (if any):

* Session duration: 50 mins

Sub Code / Sub Name: **IT22043 DEEP LEARNING AND ITS APPLICATION**

REFERENCES:

1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, —Deep Learning‖, MIT Press, 2016.
2. Gopal M, —Deep Learning Core Concepts, Methods and Applications‖, 1st Edition, Pearson, 2022.
3. Li Deng, Dong Yu, —Deep Learning: Methods and Applications‖, Now publishers, 2014.
4. 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.

	Prepared by	Approved by
Signature		
Name	Dr.N.Devi	Dr.V.Vidhya
Designation	Associate Professor	HOD/INT
Date	21/01/25	21/01/25
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