SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Electronics and Communication Engineering	LP: EC22056 Rev. No: 00 Date: 20/1/2025
B.E/~~B.Tech/M.E/M.Tech~~ : **ECE** Regulation:**2022** PG Specialisation : **NA** Sub. Code / Sub. Name : **EC22056 DEEP LEARNING FOR COMPUTER VISION** **Unit** : **I - FUNDAMENTALS OF MACHINE LEARNING**	

Unit Syllabus: Linear models (SVMs and Perceptron, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates

Objective: To understand the theoretical foundations of machine learning models.

Session No	Topics to be covered	Ref	Teaching Aids
1	Introduction to Machine Learning and deep learning	1,2,3	PPT
2	Intro to Neural Nets	1,2,3	PPT
3	Exploring shallow networks and their capabilities.	1,2,3	PPT
4	Understanding loss functions and their role in training. Common loss functions:	1,2	PPT
5	Conceptual overview of backpropagation. Mathematical derivation of weight updates using chain rule.	1,2,3	PPT
6	Stochastic gradient descent	1,23	PPT
7	Universal Function Approximation	1,2,4	PPT
8	Tuning hyperparameters: learning rate, momentum, and weight decay	1,2,4	PPT
9	Summary and Tutorials	1,2	PPT
Content beyond syllabus covered (if any): Nil			

* Session duration: 50 minutes

Sub. Code / Sub. Name: **EC22056 DEEP LEARNING FOR COMPUTER VISION**

Unit : II - DEEP LEARNING ARCHITECTURE

Unit Syllabus History of Deep Learning- A Probabilistic Theory of Deep Learning Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks Convolutional Networks- Generative Adversarial Networks (GAN), Semi supervised Learning.

Objective: To illustrate the different working principles of deep learning architectures.

Session No *	Topics to be covered	Ref	Teaching Aids
10	History of Deep Learning	1,2	PPT
11	A Probabilistic Theory of Deep Learning	1,3	PPT
12	Backpropagation and regularization	1,2	PPT/ICT
13	Batch normalization	1,2,3	PPT/ICT
	FAT 1		-
14	VC Dimension and Neural Nets	3	PPT
15	Deep Vs Shallow Networks	3.4	PPT
16	Convolutional Networks	1,2	PPT
17	Generative Adversarial Networks (GAN)	1,2,4	PPT/ICT
18	Semisupervised Learning	5,6	PPT
Content beyond syllabus covered (if any): Nil			

* Session duration: 50 mins

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Unit : III - DIMENSIONALITY REDUCTION

Unit Syllabus : Linear (PCA, LDA) and manifolds, metric learning - Autoencoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization.

Objective: To analyze on how to reduce the dimensions of high resolution data.

Session No *	Topics to be covered	Ref	Teaching Aids
19	Linear (PCA, LDA) and manifolds	1,2,6	PPT
20	Metric learning	1,2,6	PPT
21	Autoencoders and dimensionality reduction in networks	1,2,5	PPT
22	Introduction to Convnet	1,2	PPT/ICT
23	Architectures- AlexNet,VGG	1,2,6	PPT
24	Inception and ResNet architectures	1,2,6	PPT
25	Training a Convnet	1,2	PPT
26	Weights initialization	1,2	PPT
27	Batch normalization, hyperparameter optimization	1,2	PPT
	FAT-2	-	-

Content beyond syllabus covered (if any): Nil

* Session duration: 50 mins

Sub. Code / Sub. Name: EC22056 DEEP LEARNING FOR COMPUTER VISION
Unit : IV - OPTIMIZATION AND GENERALIZATION

Unit Syllabus: Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience

Objective: To evaluate the generalizability of the optimized deep networks**.**

Session No *	Topics to be covered	Ref	Teaching Aids
28	Optimization in deep learning	1,2,6	PPT
29	Non-convex optimization for deep networks	1,2,6	PPT
30	Stochastic Optimization	1,2,6	PPT
31	Generalization in neural networks	1,2	PPT
32	Spatial Transformer Networks	1	PPT
33	Recurrent networks, LSTM	1,2,6	PPT
34	Recurrent Neural Network Language Models- Word-Level RNNs	1,2	PPT/ICT
35	Deep Reinforcement Learning	1,4,5	PPT
36	Computational & Artificial Neuroscience	1,4,5	PPT
37	Large-Scale Deep Learning	6	PPT
Content beyond syllabus covered (if any): Large-Scale Deep Learning			

* Session duration: 50 mins

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Unit : V - APPLICATIONS AND CASE STUDY

Unit Syllabus : Imagenet- Detection-Audio Wave Net-Natural Language Processing Word2Vec - Joint Detection BioInformatics- Face Recognition- Scene Understanding Gathering Image Captions

Objective: To apply optimized deep networks for appropriate real-time applications

Session No *	Topics to be covered	Ref	Teaching Aids
38	Imagenet	1,2,6	PPT
39	Detection-Audio Wave Net	1,2,6	PPT
40	Natural Language Processing	1,2,5	PPT
41	Word2Vec, Joint Detection	2,6	PPT
42	BioInformatics	1,2,6	PPT
43	Face Recognition	1,2	PPT
44	Scene Understanding	1,2	PPT
45	Gathering Image Captions	1,2	PPT
46	Summary and tutorials	1,2	PPT
	FAT-3	-	-

Content beyond syllabus covered (if any): NIL

* Session duration: 50 mins

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REFERENCES:

1. Aggarwal, Charu C, Neural networks and deep learning, Springer, 2018
2. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning", MIT 2017
3. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
4. Mohamad H. Hassoun, Fundamentals of Artificial Neural Networks, The MIT Press 2013.
5. Michael Nielsen, Neural Networks and Deep Learning, Determination Press,2015.
6. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013
7. Deep Learning for Computer Vision - Course(nptel.ac.in)

	Prepared by	Approved by
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Date	20/01/2025	20/01/2025
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