COURSE SCHEDULE – AT A GLANCE

Name of the Faculty : K VIJAY BABU

Name of the Course : DEEP LEARNING

Course Code : :21P61602

Branch : AIML

The Schedule for the whole Course is:

Unit	Description	Duration (Date)		Total No. of Periods
		From	To	
1	Fundamentals of Deep Learning: Artificial Intelligence, History of Machine learning: Probabilistic Modelling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, Fundamentals of Machine Learning: Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting	24/12/2024	16/01/2025	12
2	Introducing Deep Learning: Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks.	17/01/2025	11/02/2025	14
3	Neural Networks: Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification.	12/02/2025	07/03/2025	12
4	Convolutional Neural Networks: Nerual Network and Representation Learing, Convolutional Layers, Multichannel Convolution Operation, Recurrent Neural Networks: Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch.	11/03/2025	03/04/2025	14
5	Interactive Applications of Deep Learning: Machine Vision, Natural Language processing, Generative Adversial Networks, Deep Reinforcement Learning. Deep Learning Research: Autoencoders, Deep Generative Models: Boltzmann Machines Restricted Boltzmann Machines, Deep Belief Networks.	04/03/2025	29/03/2025	14

Total No. of Instructional periods available for the course: 66

LESSON PLAN

COURSE: OOAD

Unit No.	Topic	Plan		Actual		Teaching Methodology	Signature of the faculty
		No of hours	Date	No of hours	Date		
Unit-1	**Introduction to Deep Learning and Artificial Intelligence** Overview of Artificial Intelligence (AI) and its relationship to Deep Learning	1	23/12/24				
Unit-1	**History of Machine Learning** Evolution of machine learning, from early developments to the current state.	1	26/12/24				
Unit-1	**Probabilistic Modelling in Machine Learning** Basics of probabilistic models and their importance in machine learning.	1	27/12/24				
Unit-1	**Early Neural Networks** Exploration of the initial neural network architectures and their challenges.	1	28/12/24				
Unit-1	**Kernel Methods in Machine Learning** Understanding kernel methods and their role in pattern recognition and machine learning.	1	30/12/24				
Unit-1	**Decision Trees** Introduction to decision trees, how they work, and their use in classification and regression.	1	31/12/24				

Unit-1	**Random Forests** Explanation of random forests as an ensemble method to improve decision trees' performance.	1	02/01/25				
Unit-1	**Gradient Boosting Machines** Overview of gradient boosting and how it enhances predictive performance by combining weak learners.	1	03/01/25				
Unit-1	**Fundamentals of Machine Learning** Key concepts and terminologies in machine learning, including supervised and unsupervised learning.	1	04/01/25				
Unit-1	**The Four Branches of Machine Learning** Discussion of the four main branches: supervised learning, unsupervised learning, semi-supervised learning, and reinforcement learning.	1	06/01/25				
Unit-1	**Evaluating Machine Learning Models** Techniques for assessing the performance of machine learning models, including metrics and validation methods.	1	07/01/25				
Unit-1	**Overfitting and Underfitting** Explanation of overfitting and underfitting, their causes, and strategies to address these	1	08/01/25				

	issues in model training.						
Unit-2	**Introduction to Deep Learning** Overview of Deep Learning Applications and Impact of Deep Learning in various fields	1	16/01/25				
Unit-2	**Biological Vision Systems** How the human visual system works Key processes in biological vision (e.g., retina, brain processing)	1	17/01/25				
Unit-2	**Machine Vision Systems** Overview of how machines perceive images Technologies and algorithms used in machine vision	1	18/01/25				
Unit-2	**Biological vs. Machine Vision** Comparison of human visual processing with artificial systems Strengths and limitations of each system	1	20/01/25				
Unit-2	**Human Language Processing** Overview of how humans understand and use language, and the challenges involved.	1	21/01/25				
Unit-2	**Machine Language Processing** Introduction to how machines process language, including natural language	1	22/01/25				

	processing (NLP) methods.						
Unit-2	**Biological Neural Networks** Structure and function of neurons in the human brain Basic concepts of how biological neural networks process information						
Unit-2	**Artificial Neural Networks (ANNs)** Basic principles of artificial neural networks and how they model the human brain.	1	23/01/25				
Unit-2	**Neural Network Architectures** Exploring different types of neural network architectures (e.g., feedforward, convolutional, recurrent).	1	24/01/25				
Unit-2	**Training Deep Networks** Understanding the process of training deep neural networks, including forward and backward propagation.	1	25/01/25				
Unit-2	**Optimization in Deep Learning** Techniques used to optimize the learning process in deep networks, such as gradient descent and its variants.	1	27/01/25				
Unit-2	**Challenges in Training Deep Networks** Common issues faced during training, such as vanishing	1	28/01/25				

	gradients, and ways to address them.						
Unit-2	**Improving Deep Networks: Regularization Techniques** Overview of techniques such as dropout, L2 regularization, data augmentation How regularization prevents overfitting and improves performance	1	29/01/25				
Unit-2	**Advanced Techniques in Deep Learning** Transfer learning and fine-tuning State-of-the-art architectures (e.g., GANs, transformers, attention mechanisms)	1	30/01/25				
Unit-3	**Introduction to Neural Networks** Basic concepts and history of neural networks Overview of how neural networks mimic the brain's functioning	1	01/02/25				
Unit-3	**Anatomy of a Neural Network** Structure of a neural network (neurons, layers, weights, biases) Feedforward and backpropagation processes	1	03/02/25				
Unit-3	**Types of Neural Networks** Different neural network architectures (e.g., CNN, RNN, MLP)	1	04/02/25				

	Applications and use cases for each type						
Unit-3	**Introduction to Keras** Overview of Keras as a high-level deep learning API Features and advantages of using Keras for building neural networks	1	05/02/25				
Unit-3	**Introduction to TensorFlow** Overview of TensorFlow as an open-source machine learning library Key features and use cases of TensorFlow in deep learning	1	06/02/25				
Unit-3	**Introduction to Theano** Overview of Theano for numerical computation Theano's role in neural network training and its comparison to TensorFlow and Keras	1	07/02/25				
Unit-3	**Introduction to CNTK (Microsoft Cognitive Toolkit)** Overview of CNTK as a deep learning framework Comparison with other frameworks like TensorFlow and Keras	1	10/02/25				
Unit-3	**Setting up a Deep Learning Workstation** Hardware and software requirements for deep learning Setting up the environment (e.g.,	1	11/02/25				

	installing TensorFlow, Keras, GPU setup)						
Unit-3	**Classifying Movie Reviews: Binary Classification** Overview of binary classification tasks Building a binary classification model using neural networks (e.g., positive vs. negative sentiment)	1	12/02/25				
Unit-3	**Preparing the Data for Binary Classification** Text preprocessing for movie reviews Techniques like tokenization, vectorization, and padding	1	13/02/25				
Unit-3	**Classifying Newswires: Multiclass Classification** Introduction to multiclass classification problems Example of classifying news articles into multiple categories (e.g., sports, politics, technology)	1	14/02/25				
Unit-3	**Building a Multiclass** Classification Model Developing a neural network for multiclass classification tasks Key considerations: loss functions, activation functions, and performance metrics	1	15/02/25				

Unit-4	**Introduction to Convolutional Neural Networks (CNNs)** Overview of CNNs and their importance in deep learning Differences between CNNs and traditional neural networks	1	19/02/25				
Unit-4	**Neural Networks and Representation Learning** Introduction to representation learning in neural networks How neural networks learn features and representations from data	1	20/02/25				
Unit-4	**Convolutional Layers in Neural Networks** Explanation of convolutional layers and their role in CNNs How convolutions help in feature extraction from images	1	21/02/25				
Unit-4	**Stride and Padding in Convolutional Layers** Concepts of stride and padding in convolutional operations How these techniques affect the output dimensions	1	22/02/25				
Unit-4	**Multichannel Convolution Operation** Introduction to multichannel convolutions (e.g., RGB image processing) How	1	04/03/25				

	multiple channels (such as color **channels) are processed in a CNN**						
Unit-4	**Pooling Layers in CNNs** The role of pooling layers (max pooling, average pooling) How pooling reduces dimensionality and retains important features	1	05/03/25				
Unit-4	**Fully Connected Layers in CNNs** Explanation of fully connected layers in CNNs and Their role in classification tasks after feature extraction by convolutional layers	1	06/03/25				
Unit-4	**Introduction to Recurrent Neural Networks (RNNs)** Overview of RNNs and their applications in sequential data processing and Key differences between RNNs and CNNs	1	07/03/25				
Unit-4	**RNN Architecture and Working** How RNNs process sequences and maintain state across time steps and Explaining the vanishing gradient problem in RNNs.	1	10/03/25				
Unit-4	**RNN Code Example** Step-by-step implementation of a simple RNN in	1	11/03/25				

	Python or a deep learning framework Training an RNN for a basic task (e.g., text generation, sequence prediction)						
Unit-4	**Introduction to PyTorch** Overview of PyTorch and its role in deep learning Key features of PyTorch (e.g., dynamic computation graphs, tensor operations)	1	12/03/25				
Unit-4	**PyTorch Tensors: Deep Learning with PyTorch** Explanation of tensors in PyTorch and how they are used for data representation Operations that can be performed on PyTorch tensors (e.g., addition, multiplication, reshaping)	1	13/03/25				
Unit-5	**Introduction to Interactive Applications of Deep Learning** Overview of deep learning applications in interactive systems Key areas where deep learning is transforming industries (e.g., healthcare,	1	15/03/25				

	entertainment, robotics)						
Unit-5	**Machine Vision in Deep Learning** Role of deep learning in computer vision tasks (e.g., image classification, object detection) Applications of machine vision in industries like healthcare, automotive, and security	1	17/03/25				
Unit-5	**Deep Learning for Object Recognition** Overview of object detection and recognition using deep learning Popular algorithms and architectures for object recognition (e.g., CNNs, YOLO)	1	18/03/25				
Unit-5	**Natural Language Processing (NLP) in Deep Learning** How deep learning is revolutionizing NLP tasks (e.g., translation, sentiment analysis, summarization) Introduction to recurrent neural networks (RNNs) and transformers in NLP	1	19/03/25				

Unit-5	**Text Generation and Language Models** Deep learning models for text generation (e.g., GPT, LSTM) Training language models and their applications in chatbots and virtual assistants	1	20/03/25				
Unit-5	**Generative Adversarial Networks (GANs)** Introduction to GANs and their architecture (generator vs. discriminator) Applications of GANs in generating realistic images, art, and video content	1	21/03/25				
Unit-5	**Training GANs: Challenges and Techniques** Common challenges in training GANs (e.g., mode collapse, convergence issues) Techniques to improve GAN training (e.g., Wasserstein GANs, gradient penalties)	1	22/03/25				
Unit-5	**Deep Reinforcement Learning: Introduction** Overview of reinforcement learning and its applications &How deep learning is used to solve complex	1	24/03/25				

	reinforcement learning problems						
Unit-5	**Deep Q-Learning and Policy Gradients** Concepts of Q-learning and policy gradients in deep reinforcement learning Key algorithms for training reinforcement learning agents (e.g., Deep Q-Networks)	1	25/03/25				
Unit-5	**Applications of Deep Reinforcement Learning** Real-world applications of deep reinforcement learning (e.g., robotics, game playing, self-driving cars) Case study of AlphaGo and other landmark achievements in reinforcement learning	1	26/03/25				
Unit-5	**Introduction to Deep Learning Research: Autoencoders** Overview of autoencoders and their use in unsupervised learning Applications of autoencoders in anomaly detection,	1	27/03/25				

	data compression, and noise reduction						
Unit-5	**Deep Generative Models: Boltzmann Machines** Explanation of Boltzmann machines and their role in probabilistic deep learning Contrast with other generative models and their limitations	1	28/03/25				
Unit-5	**Restricted Boltzmann Machines (RBMs)** Overview of Restricted Boltzmann Machines and their architecture Applications of RBMs in collaborative filtering, dimensionality reduction, and feature learning	1					
Unit-5	**Deep Belief Networks (DBNs)** Introduction to Deep Belief Networks and their structure How DBNs combine multiple RBMs for deep learning and their historical importance in training deep networks	1					

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

Reference Books:

1. Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc.,ISBN: 9781492041412
2. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
3. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013 4. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

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