Course Code & Name	26CAPC8002 Data Science with Deep Learning		
Teaching Hours /week (L: T:P: R)	3:1:0:0	Credits	4
CIE Marks	40	ESE Marks	60
Course Type	Theory(PCC)	Exam Hours	3
Prerequisites (if any)	-		

Course Objectives:

1. To teach different machine learning algorithms for classification
2. To enable the learner to apply the various algorithms of supervised learning in real world contexts
3. To impart the knowledge on deep learning architectures

Course Outcomes (CO)

At the end of the course students should be able to:

CO#	Course Outcome	Bloom's Knowledge Level (KL)
CO 1	Introduce the concepts of feed-forward and deep network architectures.	K2
CO 2	Design and develop single-layer and multi-layer feed-forward deep learning models and evaluate the impact of hyper-parameter tuning on their performance.	K3
CO 3	Design and evaluate Decision Tree–based machine learning models for classification and regression in data science applications.	K3
CO 4	Develop deep neural network solutions for real-world problems and assess their performance.	K3

Note: *K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	2	1	2	-	-	1	1
CO 2	3	3	3	3	1	-	2	1
CO 3	3	3	2	3	1	-	1	1

CO 4	3	3	3	3	2	1	-	-

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), - : No Correlation*

Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE)

Attendance	Assignment/ Micro-project	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
8	**12**	**10**	**10**	**40 Marks**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions.

PART A	PART B	TOTAL
■ 2 Questions from each module. ■ Total of 8 Questions, each carrying 3 marks **(8x3 =24 marks)**	■ Each question carries 9 marks. ■ Two questions will be given from each module, out of which 1 question should be answered. ■ Each question can have a maximum of 3 subdivisions. **(4x9 = 36 marks)**	**60 Marks**

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Introduction to data science, Data science classification, Data science process – Prior knowledge, Data preparation, Modelling, Application, Data exploration - Data sets, Introduction to machine learning: How machines learn - Data storage, Abstraction, Generalisation, Evaluation, Machine learning in practice - Types of machine learning algorithms. Lazy learning.	**12**

2	**Classification using SVM** Hyperplane and Decision Boundary, Margin and Maximum Margin Classifier, Support Vectors and Their Role, Hard Margin SVM, Soft Margin SVM, Kernel Functions in SVM, Linear Kernel, Polynomial Kernel, Radial Basis Function (RBF) Kernel, Sigmoid Kernel, Kernel Trick Concept. Performance Evaluation Metrics, Confusion Matrix, Accuracy, Precision, Recall, F1-Score, Advantages and Limitations of SVM **Regression methods:** Concept of regression, Simple linear regression, Ordinary least squares estimation, Correlations, Multiple linear regression	**12**
3	**Neural network learning:** Artificial neurons, Activation functions, Network topology,Training neural networks with back propagation. Feed forward neural networks, deep networks, regularizing a deep network, model exploration, and hyper parameter tuning.	**12**
4	**Convolution Neural Networks:** Introduction to convolution neural networks: stacking, striding and pooling, applications like image, and text classification ,Sequence Modeling: Recurrent Nets: Unfolding computational graphs, recurrent neural networks (RNNs), bidirectional RNNs, encoder-decoder sequence to sequence architectures,LSTM	**12**

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Data Science Concepts and Practice, Morgan	Vijay Kotu, Bala Deshpande,	Kaufmann Publishers	2018
2	Machine Learning with R, Second edition,	Brett Lantz,	PackT publishing	2015

3	Fundamentals of Deep Learning	Bunduma, N.	2017	O Reily
4	Deep Learning and Neural Networks	Heaton, J.	2015	Heaton Research Inc.

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Introduction to Data Mining,	Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong,	Pearson	2016.
2	Data mining Concepts and techniques, Morgan	iawei Han, Micheline Kamber and Jian Pei	Kaufmann Publishers	2012
3	Machine Learning in action, 2012	Peter Harrington,	Dreamtech publishers	2012

Web References/ Video Links (NPTEL, SWAYAM…)	
Sl.No	**Link ID**
1	https://www.coursera.org/learn/machine-learning
2	https://www.coursera.org/learn/data-scientists-tools

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain the architecture and working of a Feed-Forward Neural Network with a neat diagram.
2. Differentiate between shallow neural networks and deep neural networks.
3. Describe the role of activation functions in deep network architectures.

Course Outcome 2 (CO2):

1. Compare Single-Layer Perceptron and Multi-Layer Perceptron with suitable examples.
2. Explain the concept of hyper-parameter tuning in deep learning. Discuss common tuning parameters.
3. Describe the backpropagation algorithm used in multi-layer feed-forward networks.

Course Outcome 3 (CO3):

1. Explain the basic concepts of Machine Learning and its types used in data science.
2. Describe the construction of a Decision Tree for classification problems.
3. Differentiate between Decision Tree Classification and Decision Tree Regression.

Course Outcome 4 (CO4):

1. Explain the structure and working of Deep Neural Networks (DNNs).
2. Discuss the applications of deep learning models in real-world problem solving.
3. Describe how deep neural networks are used in image recognition and natural language processing.

Model Question Paper

Reg No.:_____ Name:_____

FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY

MCA S2 (R,S) Examination ……2026 (2026 Scheme)

Course Code: 26CAPC8002

Course Name: Data Science with Deep Learning

Max. Marks: 60 Duration: 3 Hours

PART A

	Answer all questions, each carries 3 marks.	***CO***	Marks
1	Explain Data science classification	CO1	(3)
2	Explain Modelling process and the role of training and test datasets	CO1	(3)
3	Explain Neural network topology	CO2	(3)

4	Explain tree pruning	CO1	(3)
5	Explain OLS regression	CO3	(3)
6	Define entropy and information gain	CO3	(3)
7	Demonstrate the use of autoencoders in handwriting recognition with Mnist dataset	CO4	(3)
8	What is Bidirectional RNN	CO4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module I

9	Explain the steps in data science process	(9)

OR

10	Explain the different types of learning	(9)

Module II

11	Explain C5.0 algorithm	(9)

OR

12	Explain separate and conquer strategy with an example	(9)

Module III

13	Explain the gradient descent algorithm highlighting the significance.	(9)

OR

14	Explain the architecture of CNN Model	(9)

Module IV

15	Explain the importance of LSTM model with an example use case.	(9)

OR

16	How do GANs handle new and unseen data	(9)

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