



B. Tech.

Semester VI

**MACHINE LEARNING WITH CLOUD
COMPUTING
CE5026**

Effective from June-2023

Syllabus version: 1.00

Subject Code	Subject Title	Teaching Scheme			
		Hours		Credits	
		Theory	Practical	Theory	Practical
CE5026	Machine Learning with Cloud Computing	3	2	3	1

Subject Code	Subject Title	Theory Examination Marks		Practical Examination Marks	Total Marks
		Internal	External	CIE	
CE5026	Machine Learning with Cloud Computing	40	60	50	150

Objectives of the course:

- To understand the basic concepts of cloud computing and machine learning.
- To understand the working of machine learning algorithms embedded with the cloud.

Course outcomes:

Upon completion of the course, the student shall be able to,

- CO1: Understand the basics of the basic concepts of cloud computing and machine learning.
- CO2: Understand the working of cloud-based machine learning methods.
- CO3: Analyse the algorithm and methods of machine learning.
- CO4: Analyse the cloud programming with Spark.
- CO5: Know the functioning of TensorFlow.
- CO6: Understand the basic concepts of other cloud machine learning platforms.

Sr. No.	Topics	Hours
Unit – I		
1	Introduction of Cloud Computing: Roots of cloud computing, Key characteristics of cloud computing, Various cloud stakeholders, Pain points in cloud computing, AI and ML in cloud, Recent trends in cloud computing.	6
Unit – II		
2	Types of Cloud based Machine Learning (ML) Services: Machine learning methods, Introduction of supervised and unsupervised learning methods, Supervised learning methods,	9

	Unsupervised learning methods.	
Unit – III		
3	Machine Learning in Cloud: Benefits and Limitations Cloud architecture and infrastructure design, Dynamic development, and Cloud services examples, Introduction to machine learning with SageMaker on AWS, Amazon SageMaker algorithms, Integrating Amazon SageMaker with your applications.	8
Unit – IV		
4	Cloud Programming with Spark: Data storage, Data cleaning, Model training, Model testing, Model deployment and integration, Model monitoring and feedback.	8
Unit – V		
5	TensorFlow: Declaring tensors, Working with matrices, Declaring operations, Data Sources, Implementation functions, Batch training, Data Scientists – Develop ML models using code.	8
Unit – VI		
6	Cloud Machine Learning Platform: Machine learning platforms – Alteryx analytics, H2O.ai, KNIME analytics platform, RapidMiner, Databricks Unified analytics platform, Microsoft Azure machine learning studio, Google’s analytics platform, IBM Watson, Recent trends in cloud based ML services.	6

Sr. No.	Machine Learning with Cloud Computing(Practicals)	Hours
1	a. Introduction about Data, Types of data. b. Necessity of data cleaning. c. Introduction about Panda. d. How to read file in pandas. e. How to create data frame. f. How to clean Data by using pandas. i) Cleaning Data, ii)Cleaning Empty Cells, iii)Cleaning Wrong Format, iv)Cleaning Wrong Data v)Removing Duplicates.	4
2	a. Introduction about different charts (Linechart, Barchart, Histogram, Scatterplot, Piecharts, Barchart). b. Introduction about Matplotlib. c. Plotting of different types of charts by using csv file in Matplotlib. d. Find out the mean, median, mode. e. Find out Standard Deviation.	4

3	Display the training and testing set.	2
4	Import Scipy and perform linear regression.	2
5	Create and display decision tree.	2
6	Python implementation for k fold cross-validation.	2
7	Case study for fraud detection by using unsupervised learning algorithm.	2
8	a. Study about AWS Sage maker. b. Study about notebooks on sagemaker. c. implement XG boost algorithm on sag maker.	4
9	a. Study about spark and Spark Mlib. b. Case studies in spark Mlib.	2
10	Classification and regression in Spark MLib.	2
11	Study about TensorFlow. Installation, Digit classification using MNIST dataset.	2
12	a. How to create and deploy machine learning model in Azure machine learning. b. Deployment of ML model in Google cloud.	2

Text books:

1. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing", Elsevier.
2. K. Hwang, "Cloud Computing for Machine Learning and Cognitive Applications", MIT Press, 2017.
3. Pramod Gupta and Naresh K. Sehgal, "Introduction to Machine Learning in the Cloud with Python – Concepts and Practice", Springer.

Reference Material:

1. R.O.Duda, P.E.Hart and D.G.Strok, "Pattern Classification", 2nd Edition, John Wiley & Sons Pvt. Ltd, 2001.
2. M.R.Karim and M.M.Kaysar, "Large Scale Machine Learning with Spark", Packt Publishing 2016.
3. N.McClure, "TensorFlow Machine Learning Cookbook", Packt Publishing Limited, 2017

Course objectives and Course outcomes mapping:

- To understand the basic concepts of cloud computing and machine learning:CO1, CO2, and CO3
- To understand the working of machine learning algorithms embedded with the cloud: CO4, CO5, and CO6

Course units and Course outcomes mapping:

Unit No.	Unit Name	Course Outcomes					
		CO1	CO2	CO3	CO4	CO5	CO6
1	Introduction of Cloud Computing	✓					

2	Cloud Infrastructure (AWS and GCP)		✓				
3	Cloud Infrastructure (Aneka and Azure)			✓			
4	Resource Management				✓		
5	Cloud Storage					✓	
6	Advance Technology in Cloud						✓

Programme outcomes:

- PO 1: Engineering knowledge: An ability to apply knowledge of mathematics, science, and engineering.
- PO 2: Problem analysis: An ability to identify, formulates, and solves engineering problems.
- PO 3: Design/development of solutions: An ability to design a system, component, or process to meet desired needs within realistic constraints.
- PO 4: Conduct investigations of complex problems: An ability to use the techniques, skills, and modern engineering tools necessary for solving engineering problems.
- PO 5: Modern tool usage: The broad education and understanding of new engineering techniques necessary to solve engineering problems.
- PO 6: The engineer and society: Achieve professional success with an understanding and appreciation of ethical behavior, social responsibility, and diversity, both as individuals and in team environments.
- PO 7: Environment and sustainability: Articulate a comprehensive world view that integrates diverse approaches to sustainability.
- PO 8: Ethics: Identify and demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work.
- PO 9: Individual and team work: An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give/receive clear instructions.
- PO 11: Project management and finance: An ability to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: A recognition of the need for, and an ability to engage in life-long learning.

Programme outcomes and Course outcomes mapping:

Programme Outcomes	Course Outcomes					
	C01	C02	C03	C04	C05	C06
P01	✓	✓	✓			
P02				✓	✓	
P03	✓	✓	✓			
P04				✓		
P05						✓
P06				✓		✓
P07	✓	✓	✓			
P08						✓
P09					✓	✓
P010			✓	✓		
P011		✓			✓	
P012						✓