Teaching-Learning-Evaluation-Plan (TLEP)

Enhancing Education Through TLEP

Course Name: Big Data Analytics

Course Code: 25VMT2S304

Semester: III

Academic Year: 2025-2026

Teaching-Learning and Evaluation Plan

Prepared By

Faculty Name: Professor Smitha Shivaswamy

Designation: Assistant Professor

Department: CSIT

Course Information	
Course Title	Big Data Analytics
Course Code	25VMT2S304
Credits	4
4-Quaderant	120 hrs(eTutorial, eContent, Discussion Forum and Assessments)
CA: ESE	30: 70
Pass Marks (CA: UE)	40
Aggregate Pass Marks	40
ESE Question Paper Marks	20
Course Offered to	MCA (CSIT)
Semester	3
Course Facilitator	Professor Smitha Shivaswamy

Program Outcomes (POs)	
At the end of the programme, learners will be able to:	
PO1	Computational Knowledge: Apply foundational knowledge in mathematics and computing sciences for well-defined problems, in terms of conceptualizing the solution models and problem-solving strategies
PO2	Problem Analysis: Analyze complex application problem comprehensively from the formulation end to the implementation end.
PO3	Design and Development of Solutions: Identify problems from business scenarios and develop solutions using contemporary tools in Information technologies.
PO4	Investigation of Complex Computing Problems: Conduct systematic investigations for advanced computing application problems to generate/validate data sets, and derive evidence-based conclusions.
PO5	Innovation and Entrepreneurship: Demonstrate entrepreneurial thinking leveraging the digital technologies and applications to develop scalable, sustainable solutions

PO6	Societal & Environmental Concern: Demonstrate awareness and sensibility for professional ethics and responsible use of IT addressing the Environmental, Social, and Governance (ESG) aspects
PO7	Individual & Team Work: Demonstrate the ability to work effectively in virtual, cross-functional/multi-cultural team environments.
PO8	Communication Efficacy: Demonstrate effective communication and project management skills by utilizing digital tools.
PO9	Life-long Learning & Digital Fluency: Engage in continuous professional development and self-directed learning using online resources.

Course Objectives for *Big Data Analytics*:

1. To introduce the fundamental concepts, evolution, characteristics, and challenges of Big Data, enabling learners to understand modern data environments.
2. To develop skills in applying statistical methods, machine learning algorithms, and predictive/descriptive analytics techniques for deriving meaningful insights.
3. To equip students with the ability to design and implement scalable data processing pipelines using distributed computing frameworks such as Hadoop and Spark.
4. To provide knowledge of big data technologies, storage paradigms, governance, privacy, and security practices, ensuring compliance with ethical and legal standards.
5. To cultivate proficiency in communicating analytical results effectively through visualizations, reports, and presentations, while adapting to emerging tools and platforms such as NoSQL, NLP, and cloud-based deployments.

Syllabus

Course Title:	Big Data Analytics
Course Code	25VMT2S304
Semester/Academic	III / 2025-26
Batch	Jan 2025
Credits	4
Course Type	Core Course

Learning Hours	120
Faculty	Professor Smitha Shivaswamy

Course Description:

This course introduces the principles, tools, and practices of Big Data Analytics, focusing on predictive and descriptive modeling, distributed computing frameworks, such as Hadoop and Spark, and modern data storage paradigms including NoSQL and SQL-on-Hadoop. Learners gain practical skills in designing scalable data pipelines, applying machine learning and natural language processing methods, and ensuring data governance, privacy, and security. Emphasis is placed on deriving actionable insights and effectively communicating results through visualizations and reports to support informed decision-making in complex data environments.

Course Outcomes (COs):

CO1: Analyze and interpret large datasets using advanced data analytics techniques, demonstrating proficiency in applying statistical methods and machine learning algorithms to derive meaningful insights and predictions**.**

CO2: Design and implement scalable and efficient data processing pipelines using distributed computing frameworks such as Hadoop and Spark, showcasing the ability to manage and manipulate big data effectively.

CO3: Evaluate the performance and effectiveness of various big data technologies and platforms, demonstrating the ability to select and deploy appropriate tools and techniques to address specific data analysis requirements.

CO4: Develop and implement strategies for data governance, privacy, and security in compliance with legal and ethical standards, demonstrating an understanding of the importance of maintaining data integrity and confidentiality**.**

CO5: Communicate and present complex data analysis results and insights effectively to diverse stakeholders through clear and concise visualizations, reports, and presentations, facilitating informed decision-making and driving organizational outcomes.

Course Topics

Unit 1: Big Data and Analytics

Introduction to Big Data, Types of Digital Data, 3Vs of Big Data Challenges with Big Data, Applications of Big Data, Analytics Process, Analytical Model Requirements, Types of Data Sources, Sampling, Types of Data Elements, Visual Data Exploration, Exploratory Statistical Analysis, Internet of Things (IOT) and Big Data, Edge Computing in Big Data Processing.

Learning Outcome:

Comprehend the concept of Big Data, including its evolution, characteristics (3Vs), and challenges, enabling students to comprehend the scale and complexity of modern data environments.

Identify and classify different types of digital data and data sources, demonstrating the ability to recognize the diversity of data sources and their relevance in various domains and applications.

Unit 2: Predictive Analytics

Target Definition, Linear Regression, Logistic Regression, Decision Trees, Neural Networks, Support Vector Machines. Ensemble Learning Techniques: Boosting, Bagging, and Stacking for Model Aggregation.

Learning Outcome:

Comprehend the principles and applications of linear regression and logistic regression in predictive modeling, including how to interpret model coefficients and evaluate model performance.

Gain proficiency in building decision tree models and neural network architectures for classification and regression tasks, including feature selection, tree pruning, and network tuning.

Unit 3: Descriptive Analytics and Survival Analysis

Association Rules, Sequence Rules, Segmentation, Survival Analysis Measurements, Kaplan-Meier Analysis, Parametric Survival Analysis, and Proportional Hazards Regression.

Learning Outcome:

Gain proficiency in mining association and sequence rules from transactional data, including identifying frequent item sets, generating association rules, and interpreting sequential patterns.

Comprehend how to assess the goodness-of-fit of survival models, interpret hazard ratios, and validate model assumptions using diagnostic plots and statistical tests to ensure the reliability of survival analysis results.

Unit 4: Data Storage and Processing Paradigms

Comparing and Contrasting Hadoop with Relational Databases, NoSQL data stores, CID versus BASE data stores, Structured data storage and Processing in Hadoop.

Learning Outcome:

Comprehend and identify Hadoop's scalability and flexibility in comparison to NoSQL data stores.

Articulate the Consistency, Isolation, Durability (CID) in relational databases and Basically Available, Soft state, Eventually consistent (BASE) in NoSQL.

Unit 5: Hadoop

Data, Data Storage and Analysis, GridComputing, A Brief History of Hadoop, Apache Hadoop, and Hadoop Ecosystem. Integration with Data Lakes and Data Warehouses, Security, and Governance in Hadoop.

Learning Outcome:

Acquire proficiency in the concept of Hadoop's distributed file system (HDFS) with traditional relational database management systems (RDBMS) and grid computing approaches, evaluating their suitability for different types of data storage and analysis tasks.

Participants will gain familiarity with the components and tools within the Hadoop ecosystem, including Hadoop Distributed File System (HDFS), MapReduce, YARN, Hive, Pig, HBase, and others, understanding their respective roles in data processing and analysis.

Unit 6: MapReduce

Introduction to MapReduce, Components of MapReduce, MapReduce Workflow, Writing MapReduce Programs, Input and Output Formats, MapReduce Optimization Techniques, Handling Joins and Aggregations, MapReduce Libraries and Frameworks.

Learning Outcome:

Comprehend and gain a solid understanding of the MapReduce programming model, its components, and how it facilitates distributed data processing in Hadoop clusters.

Acquire proficiency in practical skills in analyzing large datasets using Hadoop MapReduce, including writing MapReduce programs, executing jobs on Hadoop clusters, and optimizing job performance.

Unit 7: The Hadoop Distributed File System

The Design of HDFS, HDFS Concepts, Blocks, Name Nodes and Data Nodes, The Command Line Interface, Hadoop File System Interface, The Java Interface, Data Flow.

Learning Outcome:

Comprehend the architecture and design considerations of the Hadoop Distributed File System.Acquire proficiency in key HDFS concepts such as blocks, name nodes, and data nodes.

Unit 8: YARN

Anatomy of a YARN Application Run, YARN compared to MapReduce 1, Scheduling in YARN, Framework for Processing Data in Hadoop: YARN and MapReduce, Running Applications before Hadoop 2, launching a MapReduce application, scouting out the YARN architecture, and Launching a YARN- based application.

Learning Outcome:

Comprehend the architecture of YARN, including its components such as ResourceManager and NodeManagers, and their roles in resource management and job execution.

Learners will grasp the concepts of resource allocation, scheduling, and tracking within a Hadoop cluster using YARN, enabling efficient utilization of cluster resources.

Unit 9: Pig: Hadoop Programming

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin, Error Handling and Debugging in Pig, Integration with other Hadoop Ecosystem Components.

Learning Outcome:

Comprehend the components and interactions within Pig's architecture.

Acquire the proficiently to navigate the flow of Pig Latin applications, from data loading to result storage.

Unit 10: Native SQL Access to Hadoop Data:

Introduction to SQL on Hadoop, Apache Hive, HiveQL Basics, Data Types and Schemas in Hive, Query Optimization in Hive, Advanced Hive Features, Apache Impala, SQL Access through Other Tools, Performance Tuning and Best Practices.

Learning Outcome:

Identify the importance of SQL as a querying language for analyzing large-scale distributed data stored in Hadoop environments.

Comprehend and analyze how SQL access to Hadoop data entails, including its role in enabling traditional relational database operations on Hadoop datasets.

Unit 11: Applying Structure to Hadoop Data with Hive

Saying Hello to Hive, Getting Started with Apache Hive, Examining the Hive Clients, working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works.

Learning Outcome:

Articulate the significance of Apache Hive as a data warehousing and querying tool for structured data in Hadoop environments.

Comprehend and analyze how to set up and configure Apache Hive, interact with Hive through different clients, and execute basic commands.

Unit 12: NoSQL Databases

MongoDB, CouchDB, Cassandra, Redis, Big Table, HBase, Hyper Table, Comparison of NoSQL Databases, Data Modeling in NoSQL Databases.

Learning Outcome:

Identify and compare MongoDB, CouchDB, Cassandra, Redis, Big Table, HBase, and Hyper Table, understanding their unique features and use cases.

Comprehend and grasp data modeling concepts specific to NoSQL databases, such as schema flexibility and denormalization.

Unit 13: Deploying Hadoop

Working with Hadoop Cluster Components, Hadoop Cluster Configurations, Alternate

Deployment Form Factors, Virtualized servers, and Cloud deployments.

Learning Outcome:

Comprehend and identify the roles and functionalities of key components in a Hadoop cluster, including Namenode, Datanode, ResourceManager, and NodeManager.

Acquire proficiency in configuring various settings and parameters of a Hadoop cluster, such as memory allocation, replication factor, and block size, to optimize performance and resource utilization.

Unit 14: Servers and Processing

Big Data Platforms on Cloud, Server Provisioning and Management, Data Processing Frameworks, Distributed Computing Concepts, Containerization and Orchestration, Serverless Computing, Monitoring and Performance Optimization, Data Security and Compliance.

Learning Outcome:

Comprehend and gain knowledge to develop and deploy scalable web applications using Google App Engine.

Articulate deploy and scale applications effortlessly using AWS Elastic Beanstalk's managed infrastructure.

Unit 15: NLP and Machine Learning

Introduction to Natural Language Processing (NLP), Text Preprocessing Techniques, Text Representation, Sentiment Analysis, Named Entity Recognition (NER), Topic Modeling, Text Classification, Deep Learning for NLP, Case Studies and Applications.

Learning Outcome:

Acquire proficiency in the concept of utilizing the Natural Language Toolkit (NLTK), OpenNLP, and Boilerpipe for text processing tasks.

Weekly TLEP

The TLEP for online courses will be articulated as a weekly plan instead of a topic-wise plan. This facilitates the specification of the learning goals and tasks for the learner on a weekly timeline, while mapping the various learning elements/tasks as belonging to one of the Four Quadrants of Online Learning.

Quadrant 1:	e-Tutorial
Quadrant 2:	e-Content
Quadrant 3:	Discussions & Collaborative Learning
Quadrant 4:	Assessments

Important Note on Following the Plan: *Please go through the tasks indicated in the four quadrants, preferably, in the order of the numbers stated against each task.*

	Theory	Application	Practice
Week 0	28-03-2026 To 03-04-2026		**Orientation Session**
Quadrant 1 e-Tutorial	5. Attend the Orientation Session. 9. Watch the recording of the Orientation Session.		
Quadrant 2 e-Content	1. Ensure that you can log in to your LMS account. 2. Locate the course "Big Data Analytics" 3. Read this document carefully before the session. 4. Browse the learning resources available for the course on the LMS from a top-level navigational perspective. 6. Read the materials before attending the week-1.		
Quadrant 3 Discussions	**7. Visit the Discussion Forum on the LMS and get familiar with the format of discussions.**		

Quadrant 4 Assessments	8. Take a pre-assessment for the course to get to know your level of preparation.

Week 1	04-04-2026 To 10-04-2026	**Big Data Analytics**
Quadrant 1 e-Tutorial	2. Watch the Asynchronous Videos of "**Unit 1: Big Data Analytics**". 3. Attend the live session #1: **Big Data Analytics.**	
Quadrant 2 e-Content	1. Read the eLM on "**Unit 1: Big Data Analytics**".	
Quadrant 3 Discussions	6. Participate in collaborative learning by discussing the topics on the discussion forum*	
Quadrant 4 Assessments	5. Take the self-Assessment for **Unit 1:** "**Big Data Analytics**". 7. the role of Big Data Analytics in the industry.	

Week 2	11-04-2026 To 17-04-2026	**Predictive Analytics**
Quadrant 1 e-Tutorial	**2. Attend the live session #2 on Predictive Analytics.** **5. Attempt to answer the questions for Practice #2**	
Quadrant 2 e-Content	3. Read the eLM on "**Unit 2: Predictive Analytics**". 5. Watch this open-source video lecture on https://youtu.be/z9XAXXGwUzM?si=74Sbs9xNLa22X4Fe	
Quadrant 3 Discussions	6. Participate in collaborative learning by discussing the topics on the discussion forum.	
Quadrant 4 Assessments	1. Follow the additional learning plan to improve your understanding, based on the pre-assessment report. 4. Take the self/formative assessment for U2: "**Predictive Analytics**".	

Week 3	18-04-2026 To 24-04-2026	**Descriptive Analytics and Survival Analysis**
Quadrant 1 e-Tutorial	2. Attend the live session #3: "**Descriptive Analytics and Survival Analysis**". 5. Attempt to answer the questions for Practice #3	
Quadrant 2 e-Content	3. Read the eLM on "**Unit 3: Descriptive Analytics and Survival Analysis**".	

Quadrant 3 Discussions	6. Elaborate Different types of Descriptive Analytics & Survival Analysis techniques. 7.Take the formative assessment for l"U3: Descriptive Analytics & Survival Analysis"
Quadrant 4 Assessments	1. Participate in collaborative learning by discussing the topics on the discussion forum. 2. Discuss Descriptive Analytics & Survival Analysis

Week 4	25-04-2026 To 01-05-2026	**Data Storage & Processing Paradigms**
Quadrant 1 e-Tutorial	2. Attend the live session #4 on "**Data Storage & Processing Paradigms**". 5. Attempt to answer the questions for Practice #4	
Quadrant 2 e-Content	3. Read the eLM on "**Unit 4: Data Storage & Processing Paradigms** ".	
Quadrant 3 Discussions	6. Analyze Data Storage Techniques 7. Take the formative assessment for "U4: Data Storage & Processing Paradigms".	
Quadrant 4 Assessments	1. Follow the additional learning plan to improve your understanding, based on the pre-assessment report. 4. Discuss different types of Data Storage Process.	

Week 5	02-05-2026 To 08-05-2026	**Hadoop**
Quadrant 1 e-Tutorial	2. Attend the live session #5: " **Hadoop**" 5. Attempt to answer the questions for Practice #5	
Quadrant 2 e-Content	3. Read the eLM on "**Unit 5: Hadoop**" 7. Watch this open-source video lecture on https://youtu.be/YAzzGal41hA?si=ho1ZV0A58QVW-Ls4	
Quadrant 3 Discussions	6. Participate in collaborative learning by discussing the topics on the discussion forum.	
Quadrant 4 Assessments	1. Follow the additional learning plan to improve your understanding, based on the pre-assessment report. 4. Take the self/formative assessment for "U5: Hadoop"	

Week 6	09-05-2026 To 15-05-2026	**Map Reduce**
Quadrant 1 e-Tutorial	2. Attend the live session #6: **Map Reduce** 5. Attempt to answer the questions for Practice #6	
Quadrant 2 e-Content	3. Read the eLM on **Unit 6:** "**Map Reduce**"	
Quadrant 3 Discussions	6. Participate in collaborative learning by discussing the topics on the discussion forum. 7. Watch this open-source video lecture on https://youtu.be/czSnUmc_RJk?si=3ynCrS5l6KBzMRep	
Quadrant 4 Assessments	1. Follow the additional learning plan to improve your understanding, based on the pre-assessment report. 4. Take the self/formative assessment for U6: "Map Reduce"	

Week 7	16-05-2026 To 22-05-2026	**The Hadoop Distributed File System**
Quadrant 1 e-Tutorial	2. Attend the live session #7: **The Hadoop Distributed File System** 5. Attempt to answer the questions for Practice #7	
Quadrant 2 e-Content	3. Read the eLM on **Unit 7:** "***The Hadoop Distributed File System"***	
Quadrant 3 Discussions	6. Participate in collaborative learning by discussing the topics on the discussion forum. 7. Watch this open-source video lecture on https://youtu.be/PIryj2ODZN0?si=0-fIBMBiuNu3bh9l	
Quadrant 4 Assessments	1. Follow the additional learning plan to improve your understanding, based on the pre-assessment report. 4. Take the self/formative assessment for Unit7: "**The Hadoop Distributed File System"**	

Week 8	23-05-2026 To 29-05-2026	**Yarn**
Quadrant 1 e-Tutorial	2. Attend the live session #8: ***Yarn*** 5. Attempt to answer the questions for Practice #8	
Quadrant 2 e-Content	3. Read the eLM on **Unit 8:** "***Yarn"***	

Quadrant 3 Discussions	6. Participate in collaborative learning by discussing the topics on the discussion forum. 7. Watch this open-source video lecture on https://youtu.be/WfEbt4mtSws?si=I8_lSs7thO58zQEl
Quadrant 4 Assessments	1. Follow the additional learning plan to improve your understanding, based on the pre-assessment report. 4. Take the self/formative assessment for U8: "Yarn**"**

Week 9	30-05-2026 To 05-06-2026	**Pig: Hadoop Programming**
Quadrant 1 e-Tutorial	5. Attend the live session #9: **Pig: Hadoop Programming** 5. Attempt to answer the questions for Practice #9	
Quadrant 2 e-Content	3. Read the eLM on **Unit 9:** "***Pig: Hadoop Programming* "**	
Quadrant 3 Discussions	6. Participate in collaborative learning by discussing the topics on the discussion forum. 7. Watch this open-source video lecture on https://youtu.be/YAzzGal41hA?si=vqu2VgM8ahzBSY4Y	
Quadrant 4 Assessments	1. Follow the additional learning plan to improve your understanding, based on the pre-assessment report. 4. Take the self/formative assessment for U9: " **Pig: Hadoop Programming "**	

Week 10	06-06-2026 To 12-06-2026	**Native SQL Access to Hadoop Data & Applying Structure to Hadoop Data**
Quadrant 1 e-Tutorial	2. Attend the live session #10: "**Native SQL Access to Hadoop Data & Applying Structure to Hadoop Data"** 5. Attempt to answer the questions for Practice #10	
Quadrant 2 e-Content	*3. Read the eLM on* ***Unit 10: "Native SQL Access to Hadoop Data"*** *and* **Unit 11: "Applying Structure to Hadoop Data"**	
Quadrant 3 Discussions	6. Participate in collaborative learning by discussing the topics on the discussion forum.	
Quadrant 4 Assessments	1. Follow the additional learning plan to improve your understanding, based on the pre-assessment report. 4. Take the self/formative assessment for U10: "Native SQL Access to Hadoop Data" and U11 : "Applying Structure to Hadoop Data"	

Week 11	13-06-2026 To 19-06-2026	**No SQL Databases & Deploying Hadoop**
Quadrant 1 e-Tutorial	2. Attend the live session #11: "**No SQL Databases & Deploying Hadoop"** 5. Attempt to answer the questions for Practice #11	
Quadrant 2 e-Content	3. Read the eLM on **Unit 12: "No SQL Databases**" & **Unit 13**: "**Deploying Hadoop"**	
Quadrant 3 Discussions	6. Participate in collaborative learning by discussing the topics on the discussion forum.	
Quadrant 4 Assessments	1. Follow the additional learning plan to improve your understanding, based on the pre-assessment report. 4. Take the self/formative assessment for Unit 12: "No SQL Databases" & Unit 13: "Deploying Hadoop"	

Week 12	20-06-2026 To 26-06-2026	**Servers & Processing and NLP & Machine Learning**
Quadrant 1 e-Tutorial	2. Attend the live session #12: "**Servers & Processing and NLP & Machine Learning"** 5. Attempt to answer the questions for Practice #12	
Quadrant 2 e-Content	3. Read the eLM on **Unit 14: "Servers & Processing"** and **Unit 15**:"**NLP & Machine Learning"**	
Quadrant 3 Discussions	6. Participate in collaborative learning by discussing the topics on the discussion forum.	
Quadrant 4 Assessments	1. Follow the additional learning plan to improve your understanding, based on the pre-assessment report. 4. Take the self/formative assessment for **Unit 14: "Servers & Processing"** and **Unit 15**:"**NLP & Machine Learning"**	

Week 13	27-06-2026 To 03-07-2026	**Revision**

Week 14	04-07-2026 To 10-07-2026	**Doubt Clarification Sessions -I**
Quadrant 1 e-Tutorial	1. Live session to address specific queries of learners	
Quadrant 2 e-Content	2. Revise the eLMs and other Learning materials	

Quadrant 3 Discussions	3. Participate in collaborative learning on preparing for the summative assessment.
Quadrant 4 Assessments	4. Attempt self-assessments of all the modules.

Week 15	11-07-2026 To 17-07-2026	**Doubt Clarification Sessions -II**
Quadrant 1 e-Tutorial	1. Live session to address specific queries of learners	
Quadrant 2 e-Content	2. Revise the eLMs and other Learning materials	
Quadrant 3 Discussions	3. Participate in collaborative learning on preparing for the summative assessment.	
Quadrant 4 Assessments	4. Attempt self-assessments of all the modules.	

Discussion forum Topics: 19

1. What are the main steps in the Big Data analytics process?
2. What are key challenges in managing Big Data?
3. Compare decision trees and neural networks in terms of interpretability and performance
4. In what scenarios would linear regression fail, and logistic regression be more appropriate?
5. Why is segmentation important in analytics?
6. How can structured data be stored and processed in Hadoop?
7. How does grid computing differ from traditional centralized computing?
8. How do the Mapper and Reducer differ in function?
9. How does the Hadoop FileSystem API differ from the CLI?
10. How does YARN improve upon MapReduce 1?
11. What makes Pig's architecture suitable for big data processing?
12. What advanced features does Hive offer?
13. What are the different Hive clients available, and when would you use each?
14. Why is MongoDB considered a document-oriented database?
15. How does virtualization affect Hadoop performance compared to running on physical servers?
16. What factors determine whether an organization uses pseudo-distributed, fully distributed, or high-availability clusters?
17. How have deep learning models transformed NLP compared to traditional approaches?
18. WWhat are key challenges in managing Big Data?

Evaluation Plan

SNO	Assessment Item	Date	Weightage	Remarks
1	Continuous Assessment 1		15%	MCQs
2	Continuous Assessment 2		15%	MCQs
3	Continuous Assessment 3		15%	MCQs
4	Final Examination		70%	MCQs and Descriptive
	Total		100%	

[$] The best scores in 2 out of the 3 assessments for a total of 30% will be taken as part of the final assessment for grading.

Session Plan

Session No.	Module No.	Topic	Pedagogy	CO
1	1	Computer Basics, Algorithm, Flowcharts	Lecture + Activity	CO1
2	1	Data Types, Operators, Compilation	Hands-on	CO2
3	2	Control Structures, Loops	Problem-solving Task	CO3
4	2	Functions, Scope, Storage Classes	Lab Demonstration	CO4
5	2	Arrays and Strings	Coding Practice	CO5
6	3	Pointers, Structures	Group Task	CO2
7	3	Dynamic Memory, File Handling	Assignment	CO3
8	4	Error Handling (Shell, Tic-Tac)	Lecture	CO4
9	4	Real-Time Data Logger	Demo and Q&A	CO5
10	5	CLI Tools, Network Programs	Discussion	CO3

11	5	Compression, DB Files, Automation	Discussion	CO4
12	5	Working with file compression and encryption tools	Lecture	CO5
13		**Revision Session**		
14		**Doubt Clarification Sessions -I**		
15		**Doubt Clarification Sessions -II**		

Assessment Rubrics

Assessment Component	Weight	Description	Evaluation Criteria
Formative 1	15 %	Short quiz on Modules 1 and 2 concepts (MCQs)	• Accuracy of answers
Formative 2	15 %	Short quiz on Modules 3 and 4 concepts (MCQs)	• Accuracy of answers
Formative 3	15 %	Short quiz on Modules 1 to 5 concepts (MCQs)	• Accuracy of answers
End-Semester Exam	70 %	Descriptive + MCQs covering full syllabus	• Conceptual understanding and Accuracy of answers