



**BCA (Cloud Computing)
Detailed Syllabus**

Semester – II

3BCC2-DM-003-T

Database Concepts & RDBMS

Pre-requisites: Basic Knowledge of Excel

Course Category

L	T	P	C
3	0	0	3

Course Objective:

- To understand the basic concepts of database systems, data models, and database architecture.
- To apply relational algebra and relational calculus for performing database queries and operations.
- To use SQL, constraints, and views to create and manage databases effectively.
- To analyze transaction management and concurrency control for maintaining data consistency and recovery.
- To design databases using ER diagrams, relational schemas, and normalization techniques.

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Explain the basic concepts of database systems, models, and architecture.	L1
CO2: Use SQL commands, constraints, and views to manage data effectively.	L2
CO3: Examine transaction management and concurrency to ensure data consistency.	L3
CO4: Judge the efficiency of ER diagrams and normalization to pick the best design.	L3& L4
CO5: Build a complete database system using relational algebra and optimized schemas.	L4 & L5

**Level of Learning: Level 1 (L1) - Remember ; Level 2 (L2) – Understand; Level 3 (L3) –Applye; Level 4 (L4) –Analyze; Level 5 (L5) -Evaluate;.Level 6 (L6) -Create. Mention the highest level that will be attained in the Course Outcome.*

Articulation Matrix

(Program Articulation Matrix is formed by the strength of the correlation of COs with POs and PSOs.
The strength of correlation is indicated as 3 for substantial (high), 2 for moderate (medium) correlation, and 1 for slight (low) correlation)

CO/PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PSO 1	PSO 2
CO1	3	2	-	-	2	2	-	3	3	2	3	-
CO2	3	3	3	3	-	3	2	2	-	2	2	3
CO3	2	-	3	3	3	-	2	-	2	3	2	2
CO4	-	3	2	2	2	3	3	3	2	-	-	2
CO5	2	2	2	2	3	2	3	2	3	3	3	3

High-3 Medium-2 Low-1

Course Contents:

UNIT-I Introduction to Databases

Introduction to Databases, Transactions and Data Models, Database system, purpose of database system, view of data, relational databases, database architecture, Transaction management, The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction.

UNIT-II Database Design

Database design, ER Model, Constraints, ER-Diagrams, ERD Issues, weak entity sets, Codd's rules, Relational Schemas, UML Relational database model: Logical view of data, keys, integrity rules. Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).

UNIT-III Relational Algebra and Calculus

Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Calculus: Tuple relational calculus (TRC), Domain relational Calculus (DRC), computational capabilities.

UNIT-IV Constraints, Views and SQL

Constraints, Views and SQL Types of constraints, Integrity constraints. Views: Introduction to views, data independence, security, updates on views, comparison between tables. Views SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers. Database Language: SQL (DDL, DML, DCL), Query By Example(QBE).

UNIT-V Transaction management and Concurrency control

Transaction management: ACID properties, Transaction States, Types of Schedule, serializability, Precedence Graph, Recoverable Schedule, Cascade less Schedule. Concurrency control Protocol: Lock based concurrency control (2PL, Deadlocks), Timestamp based methods, Optimistic methods. Database recovery system.

Examination Scheme: Total – 100 marks

Components Continuous Internal Assessment*	External Assessment (EST #)	(A, Assignment I-V, MST-I & II #)
Weightage (%)	60	40

*A-Attendance; Assignment I-V (Class Assignment/Home Assignments/Case Discussions/Term Papers/Mini Project); Q-Quiz (5 Quizzes), MST-I, MST-II, EST. (# MST-I & II conducted at Department Level & EST (External Assessment) will be conducted by the CoE office at MU).

List of Books:**Textbook:**

1. **Database System Concepts**, Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, McGraw-Hill Education, 7th Edition, 2019.

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3. **Database Management Systems**, Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill Education, **3rd Edition**, 2014.
4. **Database Management Systems**, Rajiv Chopra, S. Chand Publishing, **5th Edition**, 2016.
5. **An Introduction to Database Systems**, C.J. Date, Pearson Education, **8th Edition**, 2006.

Important Websites:

1. NPTEL (IIT Course) https://onlinecourses.nptel.ac.in/noc26_cs23/preview
2. Javatpoint (DBMS Tutorial) <https://www.javatpoint.com/dbms-tutorial>
3. GeeksforGeeks (DBMS Notes) <https://www.geeksforgeeks.org/dbms/>
4. Instructor: Dr. Jennifer Widom (Stanford University) Introduction to Databases - <https://www.db-class.org/>
5. TutorialsPoint (DBMS): <https://www.tutorialspoint.com/dbms/index.htm>



**BCA (Cloud Computing)
Detailed Syllabus**

Semester – II

3BCC2-DC-002-T

Programming in C

Pre-requisites: Basic Computer Knowledge

Course Category

L	T	P	C
4	0	0	4

Course Objective:

- To understand the basic syntax of C, including variables, data types, and control structures for logic building.
- To apply modular programming concepts using functions and arrays to solve complex problems easily.
- To analyze various searching and sorting techniques to determine the most efficient method for data processing.
- To evaluate the use of pointers and structures for effective memory management and data organization.
- To create programs that can perform file operations and use preprocessor directives for real-world data storage.

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Able to understand the basic knowledge of computer fundamentals and its application in computers.	L1
CO2: Able to understand the basic knowledge of computer fundamentals and its application in computers.	L1 & L2
CO3: Able to design and develop various programming problems using C programming concepts.	L3
CO4: Able to Implement advance C programming concepts like functions, structures, and Union	L2 & L3
CO5: Able to understand the file handling using C Programming language.	L4 & L5

**Level of Learning: Level 1 (L1) - Remember ; Level 2 (L2) – Understand; Level 3 (L3) –Applye; Level 4 (L4) –Analyze; Level 5 (L5) -Evaluate;.Level 6 (L6) -Create. Mention the highest level that will be attained in the Course Outcome.*

Articulation Matrix

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The strength of correlation is indicated as 3 for substantial (high), 2 for moderate (medium) correlation, and 1 for slight (low) correlation)

CO/PO/PS O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PSO 1	PSO 2
CO1	3	-	-	-	-	2	1	-	-	2	3	-
CO2	3	-	2	-	-	1	-	-	-	2	2	-
CO3	3	2	1	3	-	2	-	-	2	2	3	3
CO4	2	-	3	3	-	2	-	1	2	2	1	3
CO5	2	-	2	2	2	1	2	1	-	3	2	3

High-3 Medium-2 Low-1

Course Contents:

UNIT-I: Fundamentals of C and Control Structures

Fundamentals of C programming and Control Structures: History, Structure of a C program,

C Conventions, Character Set, Identifiers, Keywords, Simple Data types, Modifiers, Variables, Constants, Operators, Operator precedence. Input and Output operation: Single character input and output, formatted input and output. Control Structures, Conditional statement and switch statement. Goto statement. Looping statement, break and continue, nested for statement.

UNIT-II: Arrays and Functions

Arrays and Functions: Introduction (One and multi-dimensional), Declaration of arrays, Initialization of arrays, processing with arrays. String manipulation, declaration of string arrays, string operations. Functions: Introduction, advantages of functions, Function definition, function call, Actual and formal arguments, local and global variables, function prototypes, types of functions, recursive functions, arrays and functions.

UNIT-III: Searching and Sorting

Searching and Sorting: selection sort, bubble sort, insertion sort, quick sort, merge sort
Searching: linear and binary search methods, comparison of sorting and searching methods.

UNIT-IV: Structures and Pointers

Structures and Pointers: Introduction to structures, Advantages of structures, accessing elements of a structure, nested structures, array of structures, functions and structures, Pointers: Introduction, pointer variable, pointer operator, pointer arithmetic, pointers and arrays, pointers and strings, array pointers, dynamic allocation.

UNIT-V: Files, Preprocessor, and Standard Library

Files, Preprocessor, standard library and header files: Files: Introduction, File data type, opening and closing a file, file functions (getc, putc, getw, putw, fscanf, fprintf, fread, fwrite, fgets, fputs, feof). Preprocessor: #define, #include, #undef, Conditional compilation directives, C standard library and header files: Header files, string functions, mathematical functions, Date and Time functions.

Examination Scheme: Total – 100 marks

Components Continuous Internal Assessment*	External Assessment (EST #)	(A, Assignment I-V, Q, MST-I & II #)
Weightage (%)	60	40

*A-Attendance; Assignment I-V (Class Assignment/Home Assignments/Case Discussions/Term Papers/Mini Project); Q-Quiz (5 Quizzes), MST-I, MST-II, EST. (# MST-I & II conducted at Department Level & EST (External Assessment) will be conducted by the CoE office at MU).

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Textbook:

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Reference Books:

1. Programming in ANSI C, E. Balagurusamy, McGraw Hill Education, 9th Edition, 2024.
2. Let Us C, Yashavant Kanetkar, BPB Publications, 21st Edition, 2025.
3. Computer Science: A Structured Programming Approach Using C, Behrouz A. Forouzan and Richard F. Gilberg, Cengage Learning, 4th Edition, 2023.
4. Programming with C (Schaum's Outlines), Byron Gottfried, McGraw Hill, 4th Edition, 2018.
5. The C Programming Language, Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall, 2nd Edition, 1988 (Classic Reference).

Important Websites:

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2. Javatpoint <https://www.javatpoint.com/c-programming-language-tutorial>
3. W3Schools <https://www.w3schools.com/c/>
4. GeeksforGeeks <https://www.geeksforgeeks.org/c-programming-language/>
5. Instructor: David J. Malan (Harvard University)- [CS50 2026 - C Programming Lecture](#)



**BCA (Cloud Computing)
Detailed Syllabus**

Semester – II

3BCC2-DC-001-T

Cloud Computing Concepts

Pre-requisites: Computer Fundamentals and OS

Course Category

L	T	P	C
4	0	0	4

Course Objective:

- To provide fundamental knowledge of cloud computing and various computing paradigms such as parallel, distributed, cluster, and grid computing.
- To understand cloud architecture, including service models (IaaS, PaaS, SaaS) and deployment models (public, private, hybrid, community).
- To introduce virtualization concepts and different types of virtualization techniques used in cloud environments.
- To familiarize students with major cloud platforms such as Amazon Web Services, Microsoft Azure, and Google Cloud Platform, along with core cloud services.
- To develop an understanding of cloud security, including threats, risk management, data protection, and compliance standards.

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Define and recall concepts of cloud computing and different computing paradigms such as parallel, distributed, cluster, and grid computing.	L1
CO2: Explain cloud computing characteristics, advantages, limitations, service models (IaaS, PaaS, SaaS), and deployment models.	L2
CO3: Apply virtualization concepts and identify appropriate virtualization techniques and hypervisors in cloud environments.	L2 & L3
CO4: Analyze and compare cloud platforms such as Amazon Web Services, Microsoft Azure, and Google Cloud Platform, including their compute, storage, and networking services.	L2 & L4
CO5: Evaluate cloud security threats, risks, and mitigation strategies including encryption, authentication, backup, and disaster recovery.	L2& L5

**Level of Learning: Level 1 (L1) - Remember & Understand; Level 2 (L2) – Apply; Level 3 (L3) – Analyze; Level 4 (L4) – Evaluate; Level 5 (L5) - Create. Mention the highest level that will be attained in the Course Outcome.*

Articulation Matrix

(Program Articulation Matrix is formed by the strength of the correlation of COs with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high), 2 for moderate (medium) correlation, and 1 for slight (low) correlation)

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3	1	2	1	-	-	1	-	-	1	3	1
CO2	3	2	2	1	-	-	1	-	-	1	3	1
CO3	3	1	3	2	1	1	2	-	-	1	3	2
CO4	3	2	3	3	2	2	3	-	1	1	3	3
CO5	3	2	3	3	2	1	2	-	-		3	2

High-3 Medium-2 Low-1

Course Contents:

Unit-I: Cloud Computing Basics

Different Computing Paradigms- Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing etc., Comparison of various Computing Technologies; Cloud Computing Basics- What is Cloud Computing? History, Characteristic Features, Advantages and Disadvantages, and Applications of Cloud computing

Unit-II : Cloud Architecture

Cloud Architecture: Cloud Service Models- Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS), Comparison of different Service Models; Cloud Deployment Models- Public Cloud; Private Cloud, Hybrid Cloud, Community Cloud; Cloud Computing Architecture- Layered Architecture of Cloud, Cloud Stakeholders

Unit –III: Virtualization

Virtualization : Full Virtualization, Para virtualization, Hardware-Assisted Virtualization, Hypervisor, OS Virtualization, Server Virtualization, Memory Virtualization, Storage Virtualization, Network Virtualization, Application Virtualization, Processor Virtualization, Memory Virtualization, Storage Virtualization, Network Virtualization, Data Virtualization, Application Virtualization, Hypervisors, Types of Hypervisors, Security Issues and Recommendations

Unit-IV: Cloud Service Providers and Cloud Services Management

Overview of Cloud Service Providers, Introduction to major platforms (AWS basics, Microsoft Azure basics, Google Cloud basics), Compute Services, Storage Services (Object storage, Block storage, File storage), Cloud Networking (VPC, subnet), Content Delivery Networks (CDN basics), Identity and Access Management, Billing and Pricing Models (Pay-as-you-go), SLA , Case studies of cloud usage

Unit-V: Cloud Security

Cloud Security Concepts, Threats and Attacks (Data breach, DDoS, insider threats), Data Security (Encryption – at rest, in transit), Authentication and Authorization, Multi-factor Authentication (MFA), Risk Management in Cloud, Compliance and Legal Issues (Data protection laws basics), Backup and Disaster Recovery (Replication, failover), Business Continuity Planning, Monitoring and Logging, Common Standards: The Open Cloud Consortium, The Distributed Management Task Force

Examination Scheme: Total – 100 marks

Components	External Assessment (EST #)	(A, Assignment I-V, Q, MST-I & II #)
Weightage (%)	60	40

*A-Attendance; Assignment-I (Class Assignment/Home Assignments/Case Discussions/Term Papers/Mini Project); Assignment-II (Application, Research & Problem based Project); Q-Quiz (5 Quizzes), MST-I, MST-II, EST. (# MST-I & II conducted at Department Level & EST (External Assessment) will be conducted by the CoE office at MU).

Textbook:

- Cloud Computing: Principles and Paradigms – Rajkumar Buyya, James Broberg, Wiley.

Reference Books:

- Mastering Cloud Computing – Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Morgan
- Cloud Computing: A Practical Approach – Anthony T. Velte, McGraw-Hill.
- Cloud Security and Privacy – Tim Mather, O'Reilly.

Important Websites:

- <https://docs.aws.amazon.com/>
- https://onlinecourses.nptel.ac.in/noc26_cs55/



**BCA (Cloud Computing)
Detailed Syllabus**

Semester – II

3BCC2-DM-003-P

Database Concepts & RDBMS Lab

Pre-requisites: Basic Knowledge of Data

Course Category

L	T	P	C
0	0	2	1

Course Objective:

- To understand the basic concepts of database systems, data models, and database architecture.
- To apply relational algebra and relational calculus for performing database queries and operations.
- To use SQL, constraints, and views to create and manage databases effectively.
- To analyze transaction management and concurrency control for maintaining data consistency and recovery.
- To design databases using ER diagrams, relational schemas, and normalization techniques.

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Explain the basic concepts of database systems, models, and architecture.	L1
CO2: Use SQL commands, constraints, and views to manage data effectively.	L2
CO3: Examine transaction management and concurrency to ensure data consistency.	L3
CO4: Judge the efficiency of ER diagrams and normalization to pick the best design.	L3& L4
CO5: Build a complete database system using relational algebra and optimized schemas.	L4 & L5

**Level of Learning: Level 1 (L1) - Remember ; Level 2 (L2) – Understand; Level 3 (L3) –Apply; Level 4 (L4) –Analyze; Level 5 (L5) -Evaluate;.Level 6 (L6) -Create. Mention the highest level that will be attained in the Course Outcome.*

Articulation Matrix

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CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 0	PSO 1	PSO 2
CO1	3	2	1	1	-	-	2	1	-	2	2	1
CO2	3	2	2	2	1	2	2	1	1	2	3	2
CO3	3	2	2	1	1	-	2	-	-	2	3	2
CO4	3	2	3	3	2	2	2	1	1	2	2	3
CO5	3	2	3	2	2	2	3	2	2	3	2	3

High-3 Medium-2 Low-1

List of Experiments:

1. Installation & Exploration: Install MySQL/Oracle and explore the SQL*Plus or Workbench interface.
2. Table Creation: Create Department (DeptID, DeptName) and Employee (EmpID, Name, Salary, DeptID) with Primary Key and Foreign Key.
3. Alter Table: Use ALTER command to add Date_of_Birth column and modify Salary datatype to NUMBER(10,2).
4. Constraints: Create Project table with CHECK constraint on Status ('Pending', 'Active', 'Completed').
5. Data Entry: Insert 10 records into Employee table (including cases with same department and NULL salary).
6. Update Query: Update salary by 15% for employees who have been working for more than 5 years.
7. Delete Query: Delete records from Project table where status is 'Completed' and end date is older than 1 year.
8. Pattern Matching: Find employees whose name has 'a' as the second character and ends with 'n' (using LIKE).
9. Aggregate Functions: Retrieve total count of employees, maximum salary, and average salary.
10. Group By & Having: Group employees by DeptID but only show departments having more than 3 employees.
11. Set Operations: Retrieve unique cities using UNION from Branches and Clients tables.
12. Inner Join: Display Employee Name and their corresponding Department Name using JOIN.
13. Outer Join: List all departments, including those that currently have no employees (using LEFT/RIGHT JOIN).
14. Views: Create a view High_Earners for employees earning more than 75,000.
15. Indexing: Create a Unique Index on the Email column and study how it affects query speed.

16. DCL Commands: GRANT SELECT and INSERT permissions to a user, then REVOKE the INSERT permission.
17. TCL Commands: Perform a transaction using SAVEPOINT and ROLLBACK to demonstrate data recovery.

Examination Scheme: Total – 100 marks

Components Continuous Internal Assessment*	External Assessment (EST #)	(A, LR, MST-I & II #)
Weightage (%)	50	50

*A-Attendance; Lab Record Submission, MST-I, MST-II, EST. (# MST-I & II conducted at Department Level & EST (External Assessment) will be conducted by the CoE office at MU).

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5. TutorialsPoint (DBMS): <https://www.tutorialspoint.com/dbms/index.htm>



**BCA (Cloud Computing)
Detailed Syllabus**

Semester – II

3BCC2-DC-002--P

Programming in C Lab

Pre-requisites: Basic Knowledge of Computer

Course Category

L	T	P	C
0	0	4	2

Course Objective:

- To understand the basic syntax of C, including variables, data types, and control structures for logic building.
- To apply modular programming concepts using functions and arrays to solve complex problems easily.
- To analyze various searching and sorting techniques to determine the most efficient method for data processing.
- To evaluate the use of pointers and structures for effective memory management and data organization.
- To create programs that can perform file operations and use preprocessor directives for real-world data storage.

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Able to understand the basic knowledge of computer fundamentals and its application in computers.	L1
CO2: Able to understand the basic knowledge of computer fundamentals and its application in computers.	L1 & L2
CO3: Able to design and develop various programming problems using C programming concepts.	L3
CO4: Able to Implement advance C programming concepts like functions, structures, and Union	L2 & L3
CO5: Able to understand the file handling using C Programming language.	L3 & L4

**Level of Learning: Level 1 (L1) - Remember ; Level 2 (L2) – Understand; Level 3 (L3) –Applye; Level 4 (L4) –Analyze; Level 5 (L5) -Evaluate;.Level 6 (L6) -Create. Mention the highest level that will be attained in the Course Outcome.*

Articulation Matrix

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CO3	3	2	1	3	-	2	-	-	2	2	3	3
CO4	2	-	3	3	-	2	-	1	2	2	1	3
CO5	2	-	2	2	2	1	2	1	-	3	2	3

High-3 Medium-2 Low-1

List of Experiments:

1. Print your name and college on the screen using basic output statements.
2. Take two numbers from the user and find their sum and difference using + and – operators.
3. Take radius as input and calculate the area of a circle ($\pi \times r \times r$).
4. Input a number and check whether it is Even or Odd using the modulus (%) operator.
5. Input temperature in Celsius and convert it into Fahrenheit using formula.
6. Input a character and check whether it is a Vowel or Consonant using a switch case.
7. Use a loop to print numbers from 1 to 100 that are divisible by 2.
8. Input a number and display its multiplication table (like 5×1 to 5×10).
9. Swap two variables with or without using a third variable.
10. Use #define to declare constant PI and calculate area of circle.
11. Print Fibonacci series up to 10 terms using logic (0,1,1,2,3...).
12. Input a number and check if it is a Palindrome (same forward and backward).
13. Input a number and check if it is a Prime number using a loop.
14. Store numbers in an array and search a given number (Linear Search).
15. Input 10 numbers and find the largest and smallest value.
16. Take two matrices and perform addition of matrices.
17. Input a string and reverse it manually (without using built-in function).
18. Create two functions: one for taking input and another for calculation/output.
19. Use structure to store student details like name, roll number, and marks.
20. Use pointers to calculate the sum of elements in an array.
21. Multiply two matrices using proper nested loop logic.
22. Perform Binary Search on a sorted array to find an element faster.
23. Sort an array using Bubble Sort technique step by step.
24. Solve Tower of Hanoi problem using recursion (function calling itself).
25. Use dynamic memory allocation (malloc, calloc) to store data at runtime.
26. Create a program to filter students who scored above a certain mark.
27. Read data from one file and write (copy) it into another file.
28. Build a simple Student Record System to save and retrieve student data from files.

Examination Scheme: Total – 100 marks

Components Continuous Internal Assessment*	External Assessment (EST #)	(A, LR, MST-I & II #)
Weightage (%)	50	50

*A-Attendance; Lab Record Submission, MST-I, MST-II, EST. (# MST-I & II conducted at Department Level & EST (External Assessment) will be conducted by the CoE office at MU).

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3. W3Schools <https://www.w3schools.com/c/>
4. GeeksforGeeks <https://www.geeksforgeeks.org/c-programming-language/>
5. **Instructor:** David J. Malan (Harvard University)- [CS50 2026 - C Programming Lecture](#)



**BCA (Cloud Computing)
Detailed Syllabus**

Semester – II

3BCC2-DC-001-P

Cloud Computing Concepts Lab

Pre-requisites: Computer Fundamentals and OS

Course Category

L	T	P	C
0	0	4	2

Course Objective:

- To provide fundamental knowledge of cloud computing and various computing paradigms such as parallel, distributed, cluster, and grid computing.
- To understand cloud architecture, including service models (IaaS, PaaS, SaaS) and deployment models (public, private, hybrid, community).
- To introduce virtualization concepts and different types of virtualization techniques used in cloud environments.
- To familiarize students with major cloud platforms such as Amazon Web Services, Microsoft Azure, and Google Cloud Platform, along with core cloud services.
- To develop an understanding of cloud security, including threats, risk management, data protection, and compliance standards.

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Recall basic concepts of cloud computing, virtualization, AWS services, and cloud storage platforms.	L1
CO2: Explain the working of AWS components such as EC2, S3, EBS, AMI, Security Groups, and virtualization software.	L2
CO3: Perform practical tasks including launching EC2 instances, configuring storage, connecting through RDP/SSH, and hosting static websites.	L3
CO4: Compare different cloud services, operating systems, storage options, and networking/security configurations in AWS. .	L4
CO5: Assess resource utilization, storage management policies, and deployment methods for efficient cloud infrastructure management.	L5

**Level of Learning: Level 1 (L1) - Remember; Level 2 (L2) Understand; Level 3 (L3) – Apply; Level 4 (L4) – Analyze; Level 5 (L5) – Evaluate; Level 6 (L6) - Create. Mention the highest level that will be attained in the Course Outcome.*

Articulation Matrix

(Program Articulation Matrix is formed by the strength of the correlation of COs with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high), 2 for moderate (medium) correlation, and 1 for slight (low) correlation)

CO/PO/PSO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PSO 1	PSO 2
CO1	3	1	2	1	–	–	1	–	–	1	3	1
CO2	3	2	2	1	–	–	1	–	–	1	3	1
CO3	3	1	3	2	1	1	2	–	–	1	3	2
CO4	3	2	3	3	2	2	3	–	1	1	3	3
CO5	3	2	3	3	2	1	2				3	2

High-3 Medium-2 Low-1

List of Experiments

1. Experiment with Cloud Storage (e.g., Google Drive, Dropbox)
2. Creating a Simple Document on a Cloud-Based Application (e.g., Google Docs)
3. Download and Install Virtual Machine(Virtual Box, VMware) and other software
4. Install different operating systems using virtualization software
5. Creating an AWS Free Tier Account
6. Exploring AWS Management Console
7. Understanding AWS Regions and Availability Zones
8. Launching an EC2 Instance of Windows connect using RDP
9. Launching an EC2 Instance of Linux and connect using SSH
10. Creating and Configuring Security Groups
11. Deploying a Simple Web Application on EC2
12. Configure Elastic IP with EC2
13. Configure user data for EC2 instance initialization
14. Creating and Attaching EBS Volumes
15. Attach one EBS volume to multiple EC2 instances
16. Creating an Custom Amazon Machine Image (AMI)
17. Launching an EC2 Instance from an AMI
18. Creating an Amazon S3 Bucket and Uploading and Downloading Files in S3
19. Set up lifecycle policies for automatic file management
20. Hosting a Static Website Using Amazon S3

Examination Scheme: Total – 100 marks

Components Continuous Internal Assessment*	External Assessment (EST #)	(A, LR, MST-I & II #)
Weightage (%)	50	50

*A-Attendance; Lab Record Submission, MST-I, MST-II, EST. (# MST-I & II conducted at Department Level & EST (External Assessment) will be conducted by the CoE office at MU).

Textbook:

1. Cloud Computing: Principles and Paradigms – Rajkumar Buyya, James Broberg, Wiley.

Reference Books:

1. Mastering Cloud Computing – Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Morgan
2. Cloud Computing: A Practical Approach – Anthony T. Velte, McGraw-Hill.
3. Cloud Security and Privacy – Tim Mather, O'Reilly.

Important Websites:

1. <https://docs.aws.amazon.com/>
2. https://onlinecourses.nptel.ac.in/noc26_cs55/