



# School of Computer Science & IT Devi Ahilya Vishwavidyalaya

## SYLLABUS

### M.Sc (Computer Science) 2 years

#### Program Educational Objectives (PEOs)

- PEO 1:** Equip students with a strong foundation of computer science, emphasizing the application of theoretical and practical knowledge to design, develop, and implement efficient software solutions.
- PEO 2:** Imbibe effective research, academic, team building and communication skills, to conduct impactful work in computer science domains.
- PEO 3:** Enable continuous professional growth in emerging trends, tools, and technologies, to build successful careers in industry, academia, or entrepreneurship.

#### Program Specific Outcomes (PSOs)

- PSO 1:** Apply advanced knowledge in core areas of computer science, such as algorithms, database, software engineering, compiler design, networking and data science to analyse, design, and develop robust computing solutions.
- PSO 2:** Empower students to innovate in technology-driven domains, contributing to the creation of solutions to address complex computing challenges with professional ethics and social responsibilities.

## II - SEMESTER

# CS-4209: DATA STRUCTURES USING C++

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## Course Outcomes (COs):

- CO1:** Understand data structure and their applications in solving Real World Problems.
- CO2:** Understand sorting algorithms through various algorithms techniques.
- CO3:** Evaluate algorithms and data structures in terms of space and time complexity.
- CO4:** Exposure to recursion and its applications in solving Real World problems.
- CO5:** Utilize data structures to algorithmically create effective software that can handle the intricacies of real-world applications.
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## Course Contents

### UNIT-I

**No. of Hours: 8**

Introduction to Data Structure: Concepts of Data and Information, Classification of Data structures, Abstract Data Types, Data structures operations. Algorithms, Algorithm complexity notations like big Oh, Theta, and Omega. Time Complexity, Big –Oh -notation, Running Times, Best Case, Worst Case, Average Case, Factors depends on running time. Implementation aspects: Memory representation. Static and Dynamic implementations. Examples and real life applications, Data Structures: Arrays, Address calculation in a single and multi dimensional array, Sparse Matrices, Pointer & Structure.

### UNIT-II

**No. of Hours: 8**

Stacks, Queues and Lists Definition, Array based implementation of stacks, Linked List based implementation of stacks, Examples : Infix, postfix, prefix representation, Applications : Mathematical expression Evaluation Definition: Queues & Lists: Array based implementation of Queues / Lists, Linked List implementation of Queues / Lists, Circular implementation of Queues and Singly linked Lists, Straight / circular implementation of doubly linked Queues / Lists, Priority queues , Applications.

### UNIT-III

**No. of Hours: 8**

Trees & Graphs Definition of trees and Binary trees, Properties of Binary trees and Implementation, Binary Traversal; pre-order, post-order, in-order traversal, Binary Search Trees, Implementations, Threaded trees, AVL Trees, Implementations , Balanced multi way search trees, Applications Definition of Undirected and Directed Graphs and Networks, The Array based implementation of graphs, Adjacency matrix, path matrix implementation, The Linked List representation of graphs, Shortest path Algorithm, Graph Traversal –Breadth first Traversal, Depth first Traversal, Connectivity of graphs; Connected components of graphs, Weighted Graphs, Applications.

### UNIT-IV

**No. of Hours: 8**

Introduction to Recursion, Divide and Conquer Algorithm, Evaluating time Complexity. Straight Sequential Search, Binary Search, non –recursive Algorithms, recursive Algorithms, Indexed Sequential Search. Definition, Hash function, Collision Resolution Techniques, Hashing Applications.

#### **UNIT-V**

**No. of Hours: 8**

Sorting Algorithms Introduction, Sorting by exchange, selection, insertions, Bubble sort, Selection sort, Insertion sort, Efficiency of algorithms, Shell sort, Performance of shell sort, Merge sort, Merging of sorted arrays, The merge sort Algorithms, Quick sort Algorithm, Analysis of Quick sort, Picking a Pivot, A partitioning strategy, Heap sort, Heap Construction, Heap sort, bottom –up, Top –down Heap sort approach, Radix sort.

#### **Text Books:**

- 1.Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub, 6thEdition.
- 2.How to Program C++ by Paul Deitel , Harvey Deitel, Prentice Hall; 8 edition.

#### **Reference Books:**

- 1.Theory & Problems of Data Structures by Jr. Seymour Lipschetz, Schaum’soutline by TMH 2006,Special Indian Edition.
- 2.Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.
- 3.Fundamentals of Data structures by Ellis Horowitz & Sartaj Sahni, Pub, 1983,AW, 1st Edition.
- 4.Data Structures and Program Design in C By Robert Kruse, PHI, 2nd Edition.

#### **Online Resources:**

# CS-4209: DATA STRUCTURES USING C++ - PRACTICAL

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## Course Outcomes (COs):

- CO1:** Develop proficiency in C++ programming and object-oriented concepts for implementing data structures.
- CO2:** Understand and classify various data structures and their operations for computational efficiency.
- CO3:** Apply stack, queue, linked list, tree, and graph algorithms to solve real-world problems.
- CO4:** Analyze the time and space complexity of algorithms for informed decision-making in programming.
- CO5:** Implement searching, sorting, and hashing techniques to design efficient applications.
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## Course Contents

### UNIT-I

**No. of Hours: 8**

Programs to demonstrate basic C++ concepts: data types, control structures, loops, and functions. Implementations of classes and objects. Demonstrate constructors and destructors using examples like student records or bank accounts. Implement basic operations on arrays: insertion, deletion, traversal, and searching. Address calculation for elements in 1D and 2D arrays. Implementation of sparse matrices with addition and transposition operations.

### UNIT-II

**No. of Hours: 8**

Stack Implementation: Array-based and linked-list-based implementation of stacks. Applications: Infix to Postfix conversion, Postfix evaluation.

Queue Implementation: Programs to implement linear queues and circular queues using arrays and linked lists. Double-ended queue (Deque) implementation.

Linked Lists: Create, traverse, and perform operations (insert, delete) on singly linked lists and doubly linked lists. Circular implementation of singly and doubly linked lists.

### UNIT-III

**No. of Hours: 8**

Tree Implementation: Binary tree creation, traversal (Inorder, Preorder, Postorder), and searching. Programs for binary search tree (BST) insertion, deletion, and traversal. Implementation of AVL trees with insertion and rotation.

Graph Implementation: Representing graphs using adjacency matrices and adjacency lists. Implement breadth-first search (BFS) and depth-first search (DFS) for graph traversal. Shortest path algorithm: Dijkstra's Algorithm or Bellman-Ford Algorithm.

### UNIT-IV

**No. of Hours: 8**

Time Complexity: Write programs to analyze time complexity for sorting, searching, and recursion-based problems. Demonstrate the concept of Big-O notation with examples.

Searching Algorithms: Implement sequential and binary search (iterative and recursive).

**UNIT-V****No. of Hours: 8**

Basic Sorting: Implement exchange sorting (Bubble Sort), selection sorting, and insertion sorting. Analyze the time complexity of the implemented algorithms.

Advanced Sorting: Programs for Merge Sort, Quick Sort (with pivot selection and partitioning strategies), and Heap Sort.

**Text Books:**

- 1.Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub, 6thEdition.
- 2.How to Program C++ by Paul Deitel , Harvey Deitel, Prentice Hall; 8 edition.

**Reference Books:**

- 1.Theory & Problems of Data Structures by Jr. Seymour Lipschetz, Schaum'soutline by TMH 2006,Special Indian Edition.
- 2.Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.
- 3.Fundamentals of Data structures by Ellis Horowitz & Sartaj Sahni, Pub, 1983,AW, 1st Edition.
- 4.Data Structures and Program Design in C By Robert Kruse, PHI, 2nd Edition.

**Online Resources:**

# CS-4305: SOFTWARE ENGINEERING

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## Course Outcomes (COs):

**CO1:** Understand the applications of software engineering processes and models.

**CO2:** Inculcate ability to plan, schedule and estimate software projects.

**CO3:** Develop skills for analysis and design of software projects using structured and object-oriented approaches.

**CO4:** Apply testing and quality assurance mechanisms to produce and reliable system.

**CO5:** Ability to develop software systems using software engineering approaches.

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## Course Contents

### UNIT-I

**No. of Hours: 8**

Introduction to Software Engineering and Software Processes: Software, Software Classifications and Characteristics, Software Crisis. What is Software Engineering? System Engineering Vs. Software Engineering, Software Engineering Challenges. Software Processes: Process model, Elements and Characteristics of Process model, Process Classification, Software Development Processes: SDLC, Waterfall, Iterative Waterfall, Prototyping, Incremental, Spiral, RAD, Agile Software Development: Principles, Practices & Methods; RUP process, Component-Based Development model etc.

### UNIT-II

**No. of Hours: 8**

Project Management and Planning: Project management essentials, Project success and failures, Project Life Cycle, Project team structure and organization, Software Configuration Management, Risk Management. Project planning activities: Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques, Staffing and Personnel Planning, Project Scheduling and Miscellaneous Plans.

### UNIT-III

**No. of Hours: 8**

Requirements Engineering: Software Requirements, Requirements Engineering Process, Requirements Elicitation. Requirements Analysis: Structured Analysis, Object-oriented Analysis. Requirements Specification, Requirements Validation, and Requirements Management.

### UNIT-IV

**No. of Hours: 8**

Software Design and Coding: Software Design Process, Characteristics of a Good Design, Design Principles, Modular Design (Coupling and Cohesion). Software Architecture. Design Methodologies: Function-oriented Design (Structured Design Methodology in brief). Object-oriented Design using UML, Logical Design.

### UNIT-V

**No. of Hours: 8**

Software Testing, Quality and Maintenance: Testing Fundamentals, Test Planning, Black-Box and White-Box Testing strategy, Levels of Testing, Debugging Approaches. Quality Concept, Quality

Factors, Verification and Validation, Quality Assurance Activities, Quality Standards: Capability Maturity Model (CMM). Software Reliability, Software Maintenance and Reengineering.

**Text Books:**

1. Software Engineering: Concepts & Practices- Ugrasen Suman, Cengage Learning, 2nd Edition.
2. Fundamentals of Software Engineering- Rajib Mall, PHI, New Delhi.
3. Object Oriented Analysis and Design Using UML, Ugrasen Suman et al, Cengage Learning.

**Reference Books:**

1. An Integrated Approach to Software Engineering - Pankaj Jalote, Narosa Publishing House.
2. Software Engineering - A practitioner's approach - R. S. Pressman, Tata McGraw-Hill International Editions, New York.

**Online Resources:**

1. [https://onlinecourses.nptel.ac.in/noc21\\_cs65/preview](https://onlinecourses.nptel.ac.in/noc21_cs65/preview)
2. <http://www.rspa.com/spi/>
3. <https://sei.cmu.edu/>
4. <https://dl.acm.org/journal/tosem>

# CS-4405: DATABASE MANAGEMENT SYSTEM

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## Course Outcomes (COs):

**CO1:** Conceptual Clarity on database systems and their evolution.

**CO2:** Theoretical foundation of query languages through relational algebra.

**CO3:** Understand the database design issues from E-R model to Normalization.

**CO4:** Proficiency in SQL, PLSQL and NoSQL through Case Studies/Real Life Problems.

**CO5:** Exposure to advance topics like transaction management, concurrency control and physical data storage.

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## Course Contents

### UNIT-I

**No. of Hours: 8**

Introduction and Relational Model: Advantages of DBMS approach, various views of data, data independence, schema & sub-schema, primary concept of data models, database languages, transaction management, database administrator & user, data dictionary, database structure & architectures. Relational Model: Domains, relation, kind of relation, Relational databases, Various types of keys: candidate, primary, alternate & foreign keys, relational algebra with fundamental and extended operations, modification of database.

### UNIT-II

**No. of Hours: 12**

ER Model and SQL: Basic concept, design issues, mapping constraint, keys, ER diagram, weak & strong entity-sets, specialization & generalization, aggregation, inheritance, design of ER schema, Reduction of ER Schema to tables. SQL: Basic structure of SQL, Set operation, Aggregate functions, Null values, Nested Sub queries, derived relations, views, Modification of database, join relation, Domain, relation & keys, DDL in SQL, integrity rules, Domain rules, Attributes rules, assertion, integrity & SQL. Query Optimization. PL/SQL: Programming concepts, stored procedure, function, packages and triggers. Database connectivity with ODBC/JDBC 9.

### UNIT-III

**No. of Hours: 6**

Functional Dependencies: Basic definitions, Trivial & non trivial dependencies, closure set of dependencies & of attributes, Irreducible set of dependencies, FD diagram. Normalization: Introduction to normalization, non loss decomposition, First, second and third normal forms, dependency preservation, BCNF, Multivalued dependencies and fourth normal form, join dependencies and fifth normal form.

### UNIT-IV

**No. of Hours: 7**

Storage Structure & File Organization: Basic concept, RAID. File Organization. Basic concept of Indexing. Transaction Management: Basic concept, ACID properties, transaction state, Implementation of atomicity & durability, Concurrent execution, Basic idea of serializability. Concurrency & Recovery: Basic idea of concurrency control, Failure Classification, storage structure-

types, stable storage implementation, data access, recovery & Atomicity: log based recovery, deferred database modification, immediate database modification, checkpoints.

#### **UNIT-V**

**No. of Hours: 7**

The concept of NoSQL, Brief history of NoSQL, SQL verses NoSQL, CAP Theorem (Brewer's Theorem), NoSQL pros/cons, Categories of NoSQL database, Production deployment, MongoDB, Key Features, practical with MongoDB.

#### **Text Books:**

1. Database System concepts –Henry F. Korth , Tata McGraw Hill 6th Edition.
2. NoSQL Distilled- Pramod J. Sadalage, Martin Fowler, Addison-Wesley, 2013

#### **Reference Books:**

1. Fundamentals of Database Systems, Elmasri R, Navathe S, Addison Wesley 6th Ed.
2. An introduction to database system-Bipin C. Desai
3. An introduction to Database System -C.J Date
4. SQL, PL/SQL The programming language of Oracle-Ivan Bayross

#### **Online Resources:**

1. [https://onlinecourses.nptel.ac.in/noc22\\_cs91](https://onlinecourses.nptel.ac.in/noc22_cs91)
2. [https://onlinecourses.swayam2.ac.in/cec19\\_cs05](https://onlinecourses.swayam2.ac.in/cec19_cs05)

# CS-4405: DATABASE MANAGEMENT SYSTEM - PRACTICAL

## Course Outcomes (COs):

**CO1:** Knowledge of SQL queries and relational algebra.

**CO2:** Apply normalization techniques for refining of databases.

**CO3:** Construct triggers, procedures, function, packages and cursors using PL/SQL.

**CO4:** Construct database for Case Study/ Real Life Problem.

**CO5:** Knowledge of MongoDB queries.

## Course Contents

### UNIT-I

**No. of Hours: 8**

Oracle Installation.

Create tables according to the following definition

1. Deposit (actno, cname, bname, amount, adate)
2. Branch (bname, city)
3. Customer( cname , city)
4. Borrow( loanno, cname, bname, amount)

actno	cname	bname	amount	adate
100	Anil	VRCE	1000	1-mar-2005
101	Sunil	Ajni	5000	4-jan-2006
102	Mehul	Karolbagh	3500	17-nov-2005
104	Madhuri	Chandani	1200	17-dec-2006
105	Pramod	M.G road	3000	27-mar-2006
106	Sandip	Andheri	2000	31-mar-2006
107	Shivani	Virar	1000	5-sep-2005
108	Kranti	Nehru place	5000	2-jul-2005
109	Naren	Powai	7000	10-aug-2005

Table: Deposit

bname	City
VRCE	Nagpur
Ajni	Nagpur
Karolbagh	Delhi
Chandani	Delhi
Dharmpheth	Nagpur
M.G road	Banglore
Andheri	Bombay
Virar	Bombay
Nehru place	Delhi
Powai	Bombay

Table: Branch

cname	city
Anil	Calcutta
Sunil	Delhi
Mehul	Baroda
Mandar	Patna
Mahuri	Nagpur
Pramod	Nagpur
Sandip	Surat
Shivani	Bombay
Kranti	Bombay
Naren	Bombay

Table: Customer

loanno	cname	bname	Amount
201	Anil	VRCE	1000
206	Mehul	Ajni	5000
311	Sunil	Dharampeth	3000
321	Madhuri	Andheri	2000
375	Pramod	Virar	8000
481	Kranti	Nehru place	3000

Table: Borrow

### Selecting Data from Single Table

1. List all the data from table deposit.
2. List all the data from table borrow.
3. List all the data from table customer.
4. List all the data from table branch.
5. Give account no. and amount of depositors.
6. Give cname and account no. of depositors.
7. Give names of customers.
8. Give names of branches.
9. Give names of borrowers
10. Give names of customers living in city Nagpur.
11. Give names of depositors having amount greater than 4000.
12. Give account date of customer Anil.
13. Give names of all branches located in city Bombay.
14. Give names of borrower having loan no. 206.
15. Give names of depositor having account at VCRE.
16. Give names of all branches located in Delhi;
17. Give account number and deposit amount of customer having account opened between 1-12-2005 and 1-6-2005.
18. Give details of customer Anil.
19. Give name of the city where branch Karolbagh is located.

## UNIT-II

No. of Hours: 8

### Join and Cartesian product

1. Give name of customer having living city Bombay and branch city Delhi.
2. Give name of customers having same living city as their branch city.
3. Give names of customers who are borrowers as well as depositors and having living city Nagpur.
4. Give names of customers who are depositors and having the same branch city as that of Sunil.
5. Give the names of depositors having the same city as that of Shivani and having deposit amount greater than 2000.
6. Give the names of borrowers having deposit amount greater than 1000 and the loan amount greater than 2000.
7. Give names of depositors having the same branch as the branch of sunil.
8. Give names of borrowers having loan amount greater than the loan amount of Anil.
9. Give the names of customers living city where branch of depositor sunil is located.
10. Give loan no and loan amount of borrower having the same branch as that of depositor sunil.
11. Give loan no., loan amount, account no. and deposit amount of customers living in city Nagpur.
12. Give loan no., loan amount , account no. and deposit amount of customers having deposit branch located in Delhi
13. Give loan no., loan amount, account no., deposit amount, branch name, branch city and living city of Pramod.
14. Give deposit details and loan details of customer in the city where Pramod is living.
15. Give name of depositors having the same branch city as that of sunil and having the same living city as that of Anil.
16. Give names of depositors having amount greater than 1000 and having the same living city as Pramod.
17. Give city of customer having the same branch city as that of Pramod.
18. Give branch city and living city of Pramod.
19. Give branch city of Sunil or branch city of Anil.
20. Give the living city of Anil and living city of Sunil.

### Set operations

1. List all the customers who are depositors but not borrowers.
2. List all the customers who are both depositors and borrowers.
3. List all the customers, along with their amount, who are either borrowers or depositors and living in city Nagpur.
4. List all the depositors having in all the branches where Sunil is having account.
5. List all the customers living in city Nagpur and having branch city Bombay or Delhi.
6. List all the depositors living in city Nagpur.
7. List all the depositors living in city Nagpur and having branch in city Delhi.
8. List the branch cities of Anil and Sunil.
9. List the borrowers having branch city same as that of Sunil.
10. List the customer having deposit greater than 1000 and loan less than 10000.

11. List the borrowers having branch city same as that of Sunil.
12. List the cities of depositors having branch VRCE.
13. List the depositors having the same living city as that of Sunil and the same branch city as that of Anil.
14. List the depositors having amount less than 8000 and living in the same city as Ms. Shivani.
15. List all the customers who are both depositors and borrowers and living in the same city as Anil.
16. List all the cities where branches of Anil and Sunil are located.
17. List all the customer names and the amount for depositors living in the city where either Anil or Sunil is living.
18. List the amount for the depositors living in the city where Anil is living.
19. List the cities which are either branch city of Anil or living city of Sunil.
20. List the customers who are borrowers and depositors and having living city Bombay and branch city same as that of Sandip.
21. List the customers who are both borrowers and depositors and having the same branch city as that of Anil.

### **UNIT-III**

**No. of Hours: 8**

1. List total loan.
  2. List total deposit
  3. List total loan taken from Andheri branch.
  4. List total deposit of customer having account date later than 1-Jan-2006.
  5. List total deposit of customers living in city Nagpur.
  6. List maximum deposit of customer living in Bombay.
  7. List total deposit of customers having branch city Delhi.
  8. List total deposit of customers living in the city where Sunil is living.
  9. Count total number of branch cities.
  10. Count total number of customer cities.
  11. Give branch name and branch-wise deposit.
  12. Give city name and city wise deposit.
  13. Give city wise name and branch wise deposit.
  14. Give the branch wise deposit of customer after account date 1-jan -2006.
  15. Give branch wise loan of customer living in Nagpur.
  16. Count total no. of customers.
  17. Count total no. of depositor branch wise.
  18. Give maximum loan from branch VRCE.
  19. Give living city wise loan of borrowers.
  20. Give the number of customers who are depositor as well as borrowers.
- Group by and having Clause
1. List the branches having sum of deposit more than 4000.
  2. List the branches having a sum deposit more than 1000 and location in city Bombay.

3. List the names of customers having deposit in the branches where the average deposit is more than 1000.
4. List the name of customers having maximum deposit.
5. List the name of customers having maximum deposit in the customers living in Nagpur.
6. List the name of branch having highest number of depositors.
7. Count the number of depositors living in Nagpur.
8. Give the name of customers in Powai branch having more deposit than all customer VRCE branch.
9. Give names of customers in Karolbagh branch having more deposit than any other in Virar branch.
10. Give names of customers having highest deposit in the branch where Sunil is having deposit.
11. Give the highest deposit of the city where branch of Sunil is located.
12. Give names of customers having more deposit than the average deopait in their respective branches.
13. Give names of customers having maximum deposit among deposits of Nagpur for branch VRCE.
14. Give the name of branch where name of depositors is less than 2.
15. Give name and city having more customers living in than Nagpur.
16. Give names of branches having the number of depositors more than the number of borrowers.
17. Give the names of customers living in the city where the maximum numbers of depositors are located.
18. Give the name of cities in which the maximum numbers of branches are located.
19. Give the names of borrowers having the same branch city and highest borrower.
20. Count the number of customers living in the city where branch is located.

#### **UNIT-IV**

**No. of Hours: 8**

1. Give 10% interest to all depositors.
2. Give 10% interest to all depositors having branch vrce.
3. Give 10% interest to all depositors living in Nagpur.
4. Give 10% interest to all depositors living in Nagpur and having branch in city Bombay.
5. Add hundred rupees to the deposit of Anil and assign it to Sunil.
6. Change the deposit of VCRE branch to 1000 and change the branch as VCRE\_Ambhazari.
7. Assign to all deposit of Anil the maximum deposit from VRCE branch.
8. Change the living city of VRCE branch borrowers to Nagpur.
9. Update deposit of Anil give him maximum deposit from depositors in living city Nagpur.
10. Deposit the sum of the deposits of Sunil and Vijay in an account of Anil.
11. Transfer Rs 10 from the account of Anil to the account of Sunil.
12. Transfer Rs 10 from the account of Anil to the account of Sunil if both are having the same branch.
13. Transfer Rs 10 from the account of Madhuri to the account of Parmod if both are lining in Nagpur.
14. Delete from customer.
15. Delete depositors of branches having number of customer between 1 and 3.
16. Delete branches having average deposit less than 5000.
17. Delete branches having maximum loan more than 5000.

18. Delete branches having deposit from Nagpur.
19. Delete deposit of Anil and Sunil if both are having branch Virar.
20. Delete deposit of Anil and Sunil if both are having living city Nagpur.
21. Delete deposit of Anil and Sunil if both are having same living city.
22. Delete deposit of Anil and Sunil if they are having less deposit than Vijay.
23. Delete deposit of Vijay.
24. Delete deposit of Ajay if Vijay is not a depositor.
25. Delete customer from Bombay city.
26. Delete depositors if the branch is Virar and depositor name is Ajay.
27. Delete depositors having deposit less than 500.
28. Delete borrower having loan more than 10000.
29. Delete borrower having loan more than 10000 and branch Karolbagh.
30. Delete the names of those depositors of VRCE branch who live in the city Bombay.
31. Delete borrower having branch name Chandani.
32. Delete borrower of branches having average loan less than 1000.
33. Delete borrower of branches having the minimum number of customers.

#### **UNIT-V**

**No. of Hours: 8**

1. PLSQL code to find sum of two numbers
2. PLSQL code to print Fibonacci series
3. PLSQL code to find whether given number is even or odd
4. Create function to display square of given number.
5. Create procedure to display division of student.
6. Create package having one procedure to add two numbers and one function to subtract two numbers.
7. Demonstrate cursor.
8. Demonstrate trigger.
9. CASE STUDY: STUDENT PROGRESS MONITORING SYSTEM  
A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BCA(Hons) MSc, etc) within the framework of the modular system. The college provides a number of modules, each being characterised by its code, title, credit value, module leader, teaching staff and the department they come from. A module is co-ordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: some modules require pre-requisites modules and some degree programmes have compulsory modules. The database is also to contain some information about students including their numbers, names, addresses, degrees they read for, and their past performance (i.e. modules taken and examination results).
10. Illustration of Where Clause, AND, OR operations in MongoDB.
11. Execute the Commands of MongoDB and operations in MongoDB : Insert, Query, Update, Delete and Projection. (Note: use any collection)

#### **Text Books:**

1. NoSQL Distilled- Pramod J. Sadalage, Martin Fowler, Addison-Wesley, 2013

2. SQL, PL/SQL The programming language of Oracle-Ivan Bayross

**Reference Books:**

1. Oracle Database 10g: The Complete reference, Kevin Loney.

**Online Resources:**

1. [https://onlinecourses.nptel.ac.in/noc22\\_cs91](https://onlinecourses.nptel.ac.in/noc22_cs91)

2. [https://onlinecourses.swayam2.ac.in/cec19\\_cs05](https://onlinecourses.swayam2.ac.in/cec19_cs05)

# CS-6518: CLOUD COMPUTING

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## Course Outcomes (COs):

- CO1:** Understand the concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing
- CO2:** Understand the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, multicloud.
- CO3:** : Developing In-depth Knowledge of Cloud Service Models and Virtualization and design cloud computing solutions according to the application domain.
- CO4:** Implement IaaS, SaaS, PaaS through AWS, Google Cloud, Salesforce and other service providers.
- CO5:** Learn the core issues and latest trends and technologies of cloud computing.
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## Course Contents

### UNIT-I

**No. of Hours: 10**

Cloud Computing definition, Types of cloud, Evolution of Cloud Computing, Applications cloud computing, Cluster Computing, Major Players in Cloud Computing, Issues and challenges in Cloud, Cloud stakeholders, SLAs, Economics of the Cloud

Cloud Models: Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud. Advantages, disadvantages and applications of the deployment models.

### UNIT-II

**No. of Hours: 8**

Basics of Virtualization, Types of Virtualization, Virtualization using virtualbox, Virtualization Tools and Mechanisms, Creating virtual machines in AWS, Virtualization for Data-center Automation, Scalability, Load balancing, Server Management, Fault Tolerance.

### UNIT-III

**No. of Hours: 12**

Types of Cloud services: Infrastructure as a Service: Compute Services, clusters, HPC, Data Storage services and its categories- File storage, Block storage, Object storage, applications utilizing cloud storage, Network Services.

Platform as a Service: Understand and develop application using PaaS. Software as a Service: Applications, working, development methodology, advantages and disadvantages.

### UNIT-IV

**No. of Hours: 8**

Database as a Service, Functions as a service-Serverless Computing, Microservices Introduction to MapReduce, HDFS, Hadoop Framework. Devops, Containers, Kubernetes.

### UNIT-V

**No. of Hours: 8**

Security issues in cloud, AI and Machine Learning in Cloud, Fog Computing, Edge Computing, Green Cloud.

Case Studies:

Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V.

Cloud Service Providers- AWS, Microsoft Azure, Github, Google Workspace, Salesforce

**Text Books:**

1. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering cloud computing: foundations and applications programming. Newnes, 2013.
2. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, “Distributed and cloud computing from Parallel Processing to the Internet of Things”, Morgan Kaufmann, Elsevier – 2012

**Reference Books:**

1. Cloud Computing “A Practical Approach” Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. McGraw-Hill.
2. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
3. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2010.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, TMH, 2009.
5. Kumar Saurabh, “ Cloud Computing – insights into New -Era Infrastructure”, Wiley India,2011.

**Online Resources:**

1. <https://www.mygreatlearning.com/cloud-computing/free-courses>
2. <https://aws.amazon.com/training/digital/>
3. <https://www.simplilearn.com/introduction-to-cloud-computing-basics-skillup>
4. <https://www.geeksforgeeks.org/>
5. <https://www.javatpoint.com/>

# CS-6518: CLOUD COMPUTING - PRACTICAL

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## Course Outcomes (COs):

- CO1:** Understand the concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.
- CO2:** Understand the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, multcloud.
- CO3:** Developing In-depth Knowledge of Cloud Service Models and Virtualization and design cloud computing solutions according to the application domain.
- CO4:** Implement IaaS, SaaS, PaaS through AWS, Google Cloud, Salesforce and other service providers.
- CO5:** Learn the core issues and latest trends and technologies of cloud computing.
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## Course Contents

### UNIT-I

**No. of Hours: 6**

1. Install Virtualbox/VMware Workstation with different flavor of linux or windows OS on top of windows.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.
3. Create a free account in AWS and create a virtual machine, configure it and run program on VM.

### UNIT-II

**No. of Hours: 4**

1. Explore data storage, server management, cloud watch and load balancing tools of AWS. Attach data storage to VM.
2. Create account and explore the applications of GitHub.
3. Explore cloud platforms for Web Application development and Mobile App development.

### UNIT-III

**No. of Hours: 4**

1. Create a website using Wordpress and host it on cloud.
2. Explore Google workspace.
3. Create a free account in Salesforce (if available) and explore its functionalities.

### UNIT-IV

**No. of Hours: 6**

1. Develop a SAAS application in team and deploy it on cloud.
2. Explore microservices and serverless computing.
3. Understand DevOps concepts and implementation details. Write complete note on steps required for developing CI/CD pipelines.

### UNIT-V

**No. of Hours: 4**

1. Explore security solutions in cloud.
2. Install Hadoop single node cluster and run simple applications like wordcount.
3. Study scalability through containerized applications and kubernetes.

**Text Books:**

1. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering cloud computing: foundations and applications programming. Newnes, 2013.
2. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and cloud computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier – 2012

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2. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
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2. <https://aws.amazon.com/training/digital/>
3. <https://www.simplilearn.com/introduction-to-cloud-computing-basics-skillup>
4. <https://www.geeksforgeeks.org/>
5. <https://www.javatpoint.com/>

# IC-4915: ORGANIZATION AND MANAGEMENT CONCEPTS

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## Course Outcomes (COs):

- CO1:** Identify the key management processes and the relevance of management in organizations.
- CO2:** Understand the management skills required in organizations and how these might be applied.
- CO3:** Understand how to structure organizations, delegate authority, and manage human resources.
- CO4:** Apply analytical skills to solve organizational problems and make informed, non-programmed decisions
- CO5:** Evaluate their own managerial skills.
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## Course Contents

### UNIT-I

**No. of Hours: 8**

Introduction To Management, Definition of Management, Management functions, Role of Managers, Principles of Management, Management Thought- Classical School, Systems Theory School.

### UNIT-II

**No. of Hours: 8**

Planning Nature and purpose of planning, types of planning, planning process, Decision making.

### UNIT-III

**No. of Hours: 8**

Organising And Staffing Formal and Informal Organization, Basis of Departmentation, Span of Management, Line and Staff Conflicts, Definition of Staffing, Selection Process, Performance Appraisal, Career Strategy.

### UNIT-IV

**No. of Hours: 8**

Motivation And Leadership- Motivation, Theories- Maslow's Need Hierarchy Theory, McGregor's Theory X and Theory Y, Herzberg's two-factor theory, Leadership, Managerial grid.

### UNIT-V

**No. of Hours: 8**

Controlling The basic control process, Control as a feedback system, Real-time control, organizational time management, Goal setting, prioritization, and stress management.

### Text Books:

1. R.D Agrawal, Organization & Management.1/E PHI 1997.
2. Tripathy PC And Reddy PN, Principles of Management, Tata McGraw-Hill, 5th Edition, 2012.

### Reference Books:

1. Harold Koontz Heinz Weihrich- Essentials of Management- Tata McGraw Hill Publishing Company Ltd.

### Online Resources: