BCA (Cloud Computing)

Semester-II

L-3 T-1 P-0 C-4

25BCC040T: Database Concepts & RDBMS

Course Objectives

- To know about sound introduction to the discipline of database management systems.
- To learn about a good formal foundation on the relational model of data and usage of Relational Algebra.
- To learn about concepts of basic SQL as a universal Database language.
- To know about advanced SQL & PL/SQL topics
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.

Course Outcomes (COs)

1. Understand features of DBMS and relational databases.
2. Apply existing database schema and apply normalization for optimization.
3. Analyze data via complex SQL queries.
4. Evaluate ER models for real-life applications, construct Relational Algebra queries.
5. Create RDBMS with SQL constraints and keys.

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	2	3	1	-	-	-	-	-	-	-	-	-
CO2	-	2	3	1	-	-	-	-	2	1	-	-
CO3	-	1	2	3	-	-	1	-	-	-	-	-
CO4	1	-	2	-	3	-	-	1	-	-	2	1
CO5	-	1	-	2	-	3	-	-	-	-	1	2

High-3 Medium-2 Low-1

Unit I: Introduction to DBMS 12 Hours

Basic concepts, , Role of DBMS, Advantages and Disadvantages of DBMS, Schema and Instance, Data Independence, Database Languages, Database Administrator, Database Users, Architecture of DBMS, Applications of DBMS, **Data Models:** Entity Relationship model, Elements–Entities, Attributes, Relationships, Key, Type of Keys, ER Diagram, Various data models.

Unit II: Relational Data models: **12 Hours**

Basic terminology of relational model, Kinds of relation, Relational database, DBMS v/s RDBMS, Relational algebra, Relational calculus, Functional & Additional operations, Functional dependencies, Multivalued dependencies, Normalization, Types of normalizations.

Unit III: Database Integrity **12 Hours**

Definition, Transaction, ACID properties, Transaction state, Concurrency, Concurrency control, Recovery, Distributed database, Data storage, Data Warehousing and Mining, Introduction to oracle and its tools, Client/Server computing.

Unit IV: Introduction to SQL **12 Hours**

Characteristics of SQL, Basic structure, Data types, SQL Commands, Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL), SQL Operators - Arithmetic Operator, Logical Operators, Pattern Matching, Data Constraints, Different Clauses, Joins.

Unit V : PL/SQL **12 Hours**

Indexes, Views, Granting & Revoking permissions, PL/SQL-Block structure, Variables, Constants, Controls & Loops, Transactions- Commit & Rollback, Locks, Error handling in PL/SQL, Procedure & Functions, Database Triggers.

Total Hours: 60

Reference Books:

1. Database System Concepts, Silberschatz Korth, Sudarshan, MH
2. Ullman, ”principles of database systems”, (2nd ed. Galgotia, 1984).
3. Naveen Prakash, Introduction to database management”, TMH, 1993.
4. Ivan Bayross, SQL, PL/SQL ” The Programming Language of Oracle” (2nd Revised ed.), BPB Publications

List of e-Learning Resources:

1. https://www.coursera.org/
2. https://www.udemy.com/
3. https://aws.amazon.com/training/

Prepared By	Academic Coordinator	HOD	Senior Faculty nominated by DOAA

BCA(Cloud Computing)

Semester-II

L-3 T-1 P-0 C-4

25BCC050T : Cloud Computing Concepts-II

Course Objectives

- To grasp hybrid, multi-cloud, and serverless models for deploying applications.
- To assess containerization, orchestration, and infrastructure as code for application deployment.
- To study encryption, IAM, and threat detection for protecting data and applications.
- To investigate edge computing, serverless, and AI for application development.
- To learn cost optimization, auto-scaling, and allocation to improve efficiency.
- Create policies for compliance, data protection, and business continuity in the cloud.

Course Outcomes (COs)

1. Understand the advanced cloud principles, including architectures, deployment, and services.
2. Implement complex cloud solutions using advanced concepts.
3. Assess cloud architectures for various application scenarios.
4. Critique cloud solution performance, security, and cost-effectiveness, suggesting improvements.
5. Create cloud techniques to tackle real-world challenges.

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	2	3	1	-	-	-	-	-	-	-	-	-
CO2	-	2	3	1	-	-	-	-	2	-	-	-
CO3	-	1	2	3	-	-	1	-	-	1	-	-
CO4	1	-	2	-	3	-	-	-	-	-	1	2
CO5	-	-	-	1	-	3	-	2	-	-	2	1

High-3 Medium-2 Low-1

Unit I: Introduction to Cloud Computing Services 12 Hours

Introduction: Definition, Types of Cloud services: Software as a Service - Platform as a Service –Infrastructure as a Service - Database as a Service- Monitoring as a Service –Communication as services. Service providers- Google App Engine, Amazon EC2, Microsoft Azure, Sales force. Introduction to Map Reduce, GFS, HDFS, Hadoop Framework.

Unit II: Virtualization Architecture **12 Hours**

Virtualization, Virtualization Architecture, Need for Virtualization, Pros and cons of Virtualization, Types of Virtualization, Virtual Machine monitor, Virtual machine properties, Interpretation and binary translation, Understanding Hypervisors– Xen, KVM, VMware Workstation, Virtual Box, Hyper-V, Virtual Desktop Infrastructure.

Unit III:Hardware Virtualization **12 Hours**

Hardware Virtualization, Software Virtualization, Server Virtualization, Storage Virtualization, OS Virtualization, Linux Virtualization, Windows Virtualization, Virtualization Examples.

Unit IV:Load Balancing and Virtualization **12 Hours**

Load Balancing and Virtualization, Imaging, Porting Applications, Virtual Machines Provisioning and Manageability, Migration, Provisioning in the Cloud Context, Virtual Clusters and Resource management, Virtualization for Data Centre Automation

Unit V: Security in Clouds **12 Hours**

Security in Clouds: Cloud security challenges, Software as a Service Security, Common Standards: The Open Cloud Consortium, The Distributed management Task Force, Standards for Application Developers –Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

Total Hours: 60

Reference Books:

1. "Cloud Computing for Dummies"(Wiley India Edition),2010,Bloor R., Kanfman M., Halper F. Judith Hurwitz.
2. "Cloud Computing: Principles and Paradigms", Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, John Wiley and Sons Publications, 2011.
3. "Cloud Computing: Insights into New-Era Infrastructure", Dr Kumar Sourabh, John Wiley and Sons Publications, 2011.
4. "Cloud Computing: Black Book", Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde Deven Shah, Kogent Learning Solutions, Dreamtech Press.
5. Krutz , Vines, "Cloud Security " , Wiley Pub
6. James E Smith, Ravi Nair, "Virtual Machines", Morgan Kaufmann Publishers, 2006.
7. http://cloud-standards.org/wiki/index.php?title=Main_Page
8. "Mastering Cloud Computing", Rajkumar Buyya, C. Vecchiola & S. Thamarai Selvi, McGRAW Hill Publication

List of e-Learning Resources:

1. https://www.coursera.org/
2. https://www.udemy.com/
3. https://aws.amazon.com/training/

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Syllabus to be offered at BCA (CC & SACS), BLib,
25ALS110T : Environmental Studies

Sem. – II **L-2 T-0 P-0 C-2**

Course Objective:

- To this course introduces students to environment concerns.
- To learn about environment and factors affecting it.
- To acquire environmental ethics and its protection.
- To acquire knowledge of the natural system and it correlation with the living world

Course Outcomes (COs)

1. Understand the natural environment and its sources.
2. Understand the ecosystem and biodiversity.
3. Apply knowledge of various types of pollution
4. Apply the concepts of legally environmental protection
5. Analyze the principles and components of green building design, including energy efficiency, water conservation, and materials selection.

Articulation Matrix (For BCA)

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
CO1	1	2	2	2	3	2	3	3	2	3	-	-
CO2	1	2	2	2	2	2	3	2	2	3	-	-
CO3	1	1	2	3	2	2	3	3	2	3	-	1
CO4	1	1	2	3	3	2	3	3	2	3	-	-
CO5	1	1	2	3	2	2	3	3	2	1	-	2

High-3 Medium-2 Low-1

Articulation Matrix (For B.Lib.)

CO/PO/PSO	PO 1	PO 2	PO 3	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	1	-	2	-	1	2	-	-
CO2	1	-	2	-	1	2	-	-
CO3	1	-	2	-	-	2	-	-
CO4	1	-	2	-	1	2	-	-
CO5	1	-	2	-	1	2	-	-

High-3 Medium-2 Low-1

Unit- I Environment and Natural Resources: **5 Hours**

- Multidisciplinary nature, Scope and Importance of Environment
- Components of Environment: Atmosphere, Hydrosphere, Lithosphere, and Biosphere.
- Brief account of Natural Resources and associated problems: Land Resource, Water Resource, Energy Resource
- Concept of Sustainability and Sustainable Development

Unit- II Ecosystem and Biodiversity: **5 Hours**

- Ecosystem: Structure function and types their Preservation & Restoration

15/5/25 15/05/25 15/05/25 15/05/25

- Biodiversity and its conservation practices.

Unit- III Environmental Pollution **5 Hours**

- Pollution: Types, Control measures, Management and associated problems.
- Deforestation
- Domestic and global environmental concerns
- Soil salination

Unit -IV Environmental laws & legislations **5 Hours**

- Environmental Law and Legislation: Protection and conservation Acts.
- International Agreement & Programme.
- Environmental Movements, communication and public awareness programme.
- National and International organizations related to environment conservation and monitoring

Unit -V Sustainable habitat, industrialization and urbanization **10 Hours**

(A)

- Concept of green building
- volatile organic compounds (VOCs)
- GRIHA rating and LEED rating
- Green business, green computing, E-waste management

(B) Suggested activities: (at least one)

1. Case Studies: Present real-world environmental case studies for students to analyze and discuss. Examples could include environmental disasters, environmental justice issues, or successful conservation projects.
2. Industrial Visit to a local polluted site Urban / Rural/ Industrial / Agricultural /Treatment plant (drinking water or waste water)
3. Study of simple ecosystem.
4. Study of BSI and WHO Standards/ Specification for drinking water.

Total: 30 Hours

References

1. Rajagopalan, R. (2011). *Environmental Studies.* Oxford IBH Pub
2. Kogent Learning Solutions Inc. (2012). *Energy, Environment, Ecology and Society.* Dreamtech.
3. Odum, E. P. (1971). *Fundamentals of Ecology.* Philadelphia: Saunders.
4. Centre for Science and Environment. (2021). *Climate Change: Science and Politics.* New Delhi.
5. Rosencranz, A., Divan, S., & Noble, M. L. (2001). *Environmental law and policy in India.*
6. Kaushik, A., & Kaushik, C. P. (2018). *Perspectives in Environmental Studies.* New Age International Publishers.

List of e-Learning Resources:

1. https://nptel.ac.in/courses/122/102/122102006/
2. https://nptel.ac.in/courses/105/102/105102089/
3. https://www.nature.com
4. IntroductiontoEnvirorunentalLawandPolicy(coursera)
5. OurEarth:It'sClimate,History,andProcesses(coursera)

15/05/25 15/05/25 15/05/25 15/05/25 15/5/25

HOD
Department of Mathematics
Mandsaur University, Mandsaur (458001)

BCA (Cloud Computing)

Semester-II

L-0 T-0 P-4 C-2

25BCC040P: Database Concepts & RDBMS

Course Objectives

- To know about sound introduction to the discipline of database management systems.
- To learn about a good formal foundation on the relational model of data and usage of Relational Algebra.
- To learn about concepts of basic SQL as a universal Database language.
- To know about advanced SQL & PL/SQL topics
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.

Course Outcomes (COs)

1. Students will be able to implement and execute DDL, DML, and DCL commands in an RDBMS, including table creation, data insertion, and data manipulation.
2. Students will be able to apply various SQL commands to manage and query data, including creating tables with constraints, performing joins, and using nested queries.
3. Students will be able to write and execute PL/SQL blocks to perform operations such as determining if a number is odd or even, displaying repeated text, and performing arithmetic calculations.
4. Students will be able to create and manage SQL triggers to automatically modify data, such as capitalizing the first letter of a city name upon update or insertion.
5. Students will be able to write and execute PL/SQL blocks to perform specific database tasks, including updating records with cursors and managing employee salary adjustments.

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	2	3	1	-	-	-	-	-	-	-	-	-
CO2	-	2	3	1	-	-	-	1	2	-	-	-
CO3	-	1	2	3	-	-	1	-	-	-	-	-
CO4	1	-	2	-	3	-	-	-	-	1	2	1
CO5	-	1	-	2	-	3	-	-	-	-	1	2

High-3 Medium-2 Low-1

Unit I: SQL Commands and Table Management **12 Hours**

Able to implement and execute DDL, DML, and DCL commands in an RDBMS, including table creation, data manipulation, and running commands like DROP, ROLLBACK, and DESC.

Unit II: Data Operations and Queries: **12 Hours**

Able to create tables with specified fields and constraints, insert data using various methods, and apply SQL queries to select, arrange, and join data.

Unit III: Advanced SQL Queries **12 Hours**

Able to write and execute nested queries and joins to retrieve and manipulate data across multiple tables.

Unit IV: PL/SQL Programming **12 Hours**

Able to develop and execute PL/SQL blocks for various tasks, including conditional logic, loops, cursors, and arithmetic operations.

Unit V : Triggers and Data Integrity **12 Hours**

Able to create and manage triggers to enforce data integrity rules, such as modifying data automatically upon updates or insertions.

Total Hours: 60

List of Experiments

1. To implement the DDL,DML and DCL commands in RDBMS.
2. Create table for student information like name, age, add, phone, class, college.
3. Insert data into tables using both types of insert commands.
4. Add another column into database using modify command.
5. Select particular type of data using select command like, functions .
6. Run commands like DROP table, ROLLBACK, EDIT, DESC, / .
7. Apply nested Queries by joining two tables & select particular data item from both tables.
8. Arrange columns data items in ascending or descending order.
9. Join tables using join command.
10. create customer table with following fields- cust_id, cust_name, cust_add, city, state and insert 10 record and apply the following constraints *NOTNULL, *PRIMARY KEY ,*unique.
11. Apply the Where clause on client(cid, cname, salary, cadd, city, state) table with 1.select 2.delete 3. To insert data into some other table.
12. Write a PL/SQL block to display whether the given number is odd or even.
13. Write a PL/SQL block to display LJIET 10 times using for loop.
14. Write a PL/SQL block using cursor to update salary of a given programmer by 25%.
15. Write a PL/SQL block to display addition of all the numbers in the given range
16. Write a PL/SQL block to display the detail about given employee from EMP table.
17. Write a PL/SQL block to find the salary of a given employee and raise his salary by 20%.

18. Create trigger on Supplier Detail on update or insert of Scity to convert first letter of scity into capital letter.

Total Hours: 60

Reference Books:

1. Database System Concepts, Silberschatz Korth, Sudarshan, MH
2. Ullman, ”principles of database systems”, (2nd ed. Galgotia, 1984).
3. Naveen Prakash, Introduction to database management”, TMH, 1993.
4. Ivan Bayross, SQL, PL/SQL ” The Programming Language of Oracle” (2nd Revised ed.), BPB Publications

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1. https://www.coursera.org/
2. https://www.udemy.com/
3. https://aws.amazon.com/training/

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BCA(Cloud Computing)

Semester-II

L-0 T-0 P-4 C-2

25BCC050P : Cloud Computing Concepts-II

Course Objectives

- To provide foundational knowledge of cloud computing concepts and AWS services, including EC2, S3, and EBS.
- To develop hands-on skills in deploying, configuring, and managing AWS cloud infrastructure.
- To enable students to implement secure cloud solutions using AWS security groups, IAM roles, and encryption techniques.
- To familiarize students with cost optimization strategies and automation tools in AWS for efficient resource management.
- To prepare students for industry-recognized AWS certifications by covering practical applications and real-world scenarios.

Course Outcomes (COs)

1. Demonstrate the ability to launch, configure, and manage EC2 instances for cloud-based applications.
2. Apply security best practices to protect cloud infrastructure using AWS security groups, IAM policies, and encryption.
3. Manage scalable storage solutions with Amazon S3 and EBS, including data backup, versioning, and lifecycle policies.
4. Automate cloud resource management using AWS tools like EBS Lifecycle Manager.
5. Design and implement cost-effective and secure cloud solutions aligning with industry standards and best practices.

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	2	3	1	-	-	-	-	-	-	-	-	-
CO2	-	2	3	1	-	-	-	-	2	-	-	-
CO3	-	1	2	3	-	-	1	-	-	-	-	-
CO4	1	-	2	-	3	-	-	-	-	-	1	2
CO5	-	-	-	1	-	3	-	2	-	-	2	1

High-3 Medium-2 Low-1

Unit I: EC2 Instance Management 12 Hours

Learn to launch, configure, and manage Amazon EC2 instances, including AMIs, Elastic IPs, and security settings for scalable cloud solutions.

Unit II: Web Server Configuration on EC2 12 Hours

Deploy and secure web servers on EC2 instances by implementing security groups, SSH restrictions, and bastion hosts for controlled access.

Unit III: Amazon S3 Storage Operations **12 Hours**

Gain hands-on experience with Amazon S3 for file storage, versioning, lifecycle management, and access control for scalable data management.

Unit IV: Elastic Block Store (EBS) Management **12 Hours**

Explore EBS volume creation, attachment, resizing, backups, and encryption to manage persistent cloud storage efficiently.

Unit V: Elastic Block Store (EBS) Management **12 Hours**

Explore EBS volume creation, attachment, resizing, backups, and encryption to manage persistent cloud storage efficiently.

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Total Hours: 60

List of Experiments

EC2 Instance Management

1. Launch and connect to an EC2 instance
2. Create and use Amazon Machine Image (AMI)
3. Resize EC2 instance (change instance type)
4. Configure Elastic IP with EC2
5. Configure user data for EC2 instance initialization

Web Server Configuration on EC2

6. Creating a web server on EC2
7. Implement EC2 security groups
8. Restrict SSH access by IP address
9. Configure a web server with security group rules
10. Create a bastion host for secure access

Amazon S3 Storage Operations

11. Create an S3 bucket and upload files
12. Set up public access for static website hosting
13. Enable versioning in S3
14. Set up lifecycle policies for automatic file management
15. Implement bucket policies for access control

Elastic Block Store (EBS) Management

16. Create and attach an EBS volume to an EC2 instance
17. Detach EBS from one instance and attach it to another
18. Expand an EBS volume and resize the file system
19. Attach one EBS volume to multiple EC2 instances
20. Create EBS snapshots for backup
21. Change EBS volume types
22. Automate EBS volume backup using EBS Lifecycle Manager

23. Manage snapshot and AMI recycle bin
24. Copy snapshots across regions/accounts
25. Implement EBS encryption

Total Hours: 60

Reference Books:

1. **Michael Wittig, Andreas Wittig**, "Amazon Web Services in Action", Manning Publications, 2nd Edition, 2018.
2. **Ben Piper, David Clinton**, "AWS Certified Solutions Architect Official Study Guide", Wiley, 2nd Edition, 2020.
3. **Thomas Erl, Zaigham Mahmood, Ricardo Puttini**, "Cloud Computing: Concepts, Technology & Architecture", Prentice Hall, 1st Edition, 2013.
4. **Mark Wilkins**, "Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud", Pearson Education, 1st Edition, 2019.
5. **Alberto Artasanchez**, "AWS for Solutions Architects: Design Your Cloud Infrastructure by Implementing DevOps, Containers, and Amazon Web Services", Packt Publishing, 1st Edition, 2021.

List of e-Learning Resources:

1. https://www.coursera.org/
2. https://www.udemy.com/
3. https://aws.amazon.com/training/

Prepared By	Academic Coordinator	HOD	Senior Faculty nominated by DOAA

BCA (Cloud Computing)

Semester-II

L-0 T-0 P-6 C-3

25BCC060P: Linux Administration Lab

Course Objectives:

- To learn basic Linux commands for file, software, and user management.
- To apply Linux commands for software installation, file handling, and user management.
- To interpret Linux commands and their parameters.
- To evaluate file systems for specific use cases.
- To design shell scripts for automating administrative tasks.

Course Outcomes:

1. Students will be able to navigate and manage the Unix/Linux directory structure and install Linux operating systems.
2. Students will be able to use RPM commands to install, uninstall, and upgrade software packages on Linux.
3. Students will be able to execute basic and advanced Linux commands for file and directory management, including creating, moving, and deleting files.
4. Students will be able to set up and configure various Linux servers, including DHCP, NFS, Samba, FTP, DNS, and Apache web servers.
5. Students will be able to write and execute shell scripts to perform tasks such as calculating factorials and listing directory files.

Articulation Matrix

(Program Articulation Matrix is formed by the strength of the correlation of COs with POs and PSOs. The strength of correlation isindicated 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	2	3	1	-	-	-	-	-	-	-	-	-
CO2	-	2	3	1	-	-	-	1	2	-	-	-
CO3	-	1	2	3	-	-	1	-	-	1	-	-
CO4	-	1	2	-	3	-	-	-	-	-	2	1
CO5	-	1	-	2	-	3	-	-	-	-	1	2

High-3 Medium-2 Low-1

Unit 1: Unix/Linux Fundamentals and Installation **18 Hours**

Able to understand the Unix/Linux directory structure and install Linux operating systems, including managing software with RPM.

Unit 2: Linux File System and Command Line Basics **18 Hours**

Able to manage Linux file systems, execute basic and advanced file handling commands, and understand Linux file system concepts such as ext2 and ext3.

Unit 3: User and Group Management **18 Hours**

Able to add, modify, and remove user accounts, manage user groups, and set permissions for files and directories.

Unit 4: Server Setup and Configuration **18 Hours**

Able to set up and configure various network services, including DHCP, NFS, Samba, FTP, DNS, and Apache web servers.

Unit 5: Shell Scripting and Text Processing **18 Hours**

Able to write and execute shell scripts for tasks such as calculating factorials and listing directory files, and utilize text processing commands effectively.

List of Experiments

1. Study of Directory structure of Unix & Linux
2. Installation of Linux Operating System
3. Managing software with RPM :- Installing, Uninstalling, Upgrading
4. Study of Linux File System concept ext3, ext2.
5. Study of Basic Linux commands like: alias, cat, cd, chroot, cp, cpio, dc, df, dir, du, fdformat, find, finger, grep, gunzip, gv, gvim, gzip, halt, hostname, ifconfig, kill, logout, lpc, lpd, lp, rm, ls, man, mcopy, mformat, mkdir, more, mount, mt, mv, passwd, ping, ps, pwd, quota, quotaoff, rm, rmdir, route, set, shut down, sort, stat, strings, su, tar, tree, umount, unzip, vdir, vi, view, wc, who, whoami, zip.
6. Study of File systems: - mount, fsconf and other related commands
7. Study of Files and Directory handling Commands - ls, cd, cp, mv, rm, mkdir, rmdir
8. Study of Commands for Creating and Viewing ordinary files – cat, more, pg.
9. Study of Filter Commands – wc, head, tail, cut, tr, grep (with regular expressions)
10. Adding a new user, Modifying and Removing User accounts.
11. Managing users and managing Groups and managing passwords.
12. Working with vi text editor
13. Providing permission to file and directories
14. Setting up DHCP Server.
15. Setting up NFS File Server.

16. Setting up samba Server
17. Setting up FTP server
18. Setting up to DNS & Apache web server
19. Interface with ifconfig, ping, netstat, traceroute, telnet
20. Write a shell script to find the factorial of a given integer.
21. Write a shell script to list all of the directory files in a directory.

Total Hours: 90

Reference Books

1 Bill Ball, David Pitts, “Red Hat Linux 7 Unleashed”, Techmedia SAMS Publication
2. Evi Nemeth, Garth Snyder, Scott Seebass, Trent R. Hein, “UNIX System Administration
3. Handbook” Person Education Asia (LPE) (IIIrd Edition) 4 Red hat Linux & fedora unlashed Authors Bill Ball & Hoyt Dust.

List of e-Learning Resources:

1.https://www.w3schools.com/Linux/
2.https://www.geeksforgeeks.org/linux-tutorial/

Prepared By	**Academic Coordinator**	**HOD**	**Senior Faculty nominated by DOAA**

BCA (Cloud Computing)

Semester-II

L-0 T-0 P-6 C-3

25BCC250: Data Structure Using C Lab

Course Objectives

- To know about elementary data organization and the definition of data structures.
- To learn about stack operations, recursion, and Polish Notation.
- To learn about queue operations, including circular and priority queues.
- To know about linked lists, including singly, doubly, and circular, in various applications.
- To learn about searching and sorting algorithms such as sequential and binary search, and various sorting techniques.

Course Outcomes

1. Students will be able to implement insertion and deletion operations in arrays and queues using C/C++ programming.
2. Students will be able to perform matrix operations including addition, subtraction, multiplication, and transpose.
3. Students will be able to create, initialize, and manage pointers, and perform recursive operations such as calculating factorials.
4. Students will be able to implement fundamental data structures, including stacks and linked lists, and perform operations such as push, pop, and node manipulation.
5. Students will be able to apply and compare various sorting algorithms (insertion, bubble, selection, quick sort) and search techniques (linear and binary search) on arrays.

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	PO5	PO6	PSO1	PSO2
CO1	1	-	-	-	-	-	3	-	-	1	-
CO2	-	1	2	-	-			1	-	-	-
CO3	-	-	-	-	-	3		-	-	-	-
CO4	-	-	2	2	-	-	2	-	1	-	-
CO5	-	-	-	-	-	-		-	-	-	1

High-3 Medium-2 Low-1

Unit-I : Unit 1: Array and Matrix Operations **18 Hours**

Able to implement insertion and deletion operations in arrays and perform matrix operations including addition, subtraction, multiplication, and transpose.

Unit-II: Pointers and Recursion **18 Hours**

Able to create, initialize, and manage pointer variables and use recursion to solve problems such as calculating factorials.

Unit-III : Stack and Queue Implementations **18 Hours**

Able to implement stack and queue data structures using arrays and perform operations such as push, pop, insertion, and deletion.

Unit-IV: Linked List Operations **18 Hours**

Able to create, manipulate, and manage singly linked lists, including insertion and deletion of nodes at various positions.

Unit-V: Sorting, Searching, and Tree Traversal **18 Hours**

Able to apply and implement various sorting algorithms (insertion sort, bubble sort, selection sort, quick sort) and search techniques (linear and binary search), as well as perform tree traversal operations.

Total Hours:90

List of Experiments

1. Write a program to implement insertion () and deletion () operation in array.
2. Write a program for addition, subtraction, multiplication and transpose of matrix.
3. Write a program to create, initialize, assign and access a pointer variable.
4. Write a program to find the factorialof a number using recursion.
5. Write a program to swap two numbers using call by value and call by reference.
6. Write a program to implement Push () and Pop () operationsin a stack using arrays.
7. Write a program to implement insertion () and deletion () operationsin a queue using array.
8. Write a program to create 5 nodes in singly linked list.
9. Write a program to insert an element at the end, beginning and at the end position in a single linked list.
10. Write a program to delete an element at the end, beginning and at the end position in a single linked list.
11. Write a program to implement stack using linked list.
12. Write a program to search an element in an array using linear search and binary search.
13. Write a program to sort an array using insertion sort.
14. Write a program to sort an array using bubble sort.
15. Write a program to sort an array using selection sort.
16. Write a program to sort an array using quick sort.
17. Write a program to implement tree traversal technique.

Total Hours: 90

Reference Books:

1. Fundamentals Of Data Structure, By S. Sawhney & E. Horowitz
2. Date Structure: By lipschuists (Schaum's. outline Series Mcgraw Hill publication)
3. TennenBaum A.M. & others: Data Structures using C & C++; PHI

4. Yashwant Kanetkar, Understanding Pointers in C, BPB.

List of e-Learning Resources:

1. https://www.edx.org /
2. https://www.udemy.com/
3. https://www. coursera.com/
4. https://ntptel.ac.in/

Prepared By	Academic Coordinator	HOD	Senior Faculty nominated by DOAA

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