B. C. A. (System Administration and Cyber Security)

Semester-II

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

25SACS040T: Database Concepts & RDBMS

Course Objectives

- To know about sound introduction to the discipline of database management systems.
- To learn about 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, and 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, and 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	-	-	-
CO3	-	1	2	3	-	-	1	-	-	-	-	-
CO4	1	-	2	-	3	-	-	-	-	-	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 the relational model, Kinds of relation, Relational database, DBMS v/s RDBMS, Relational algebra, Relational calculus, Functional & Additional operations, Functional dependencies, Multivalued dependencies, Normalization, and 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(System Administration and Cyber Security)

Semester-II

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

25SACS050T: Introduction to Cyber Security

Course Objectives

- To understand the characteristics and value of data.
- To comprehend the characteristics and purpose of cyber warfare.
- To explore methods used to exploit security vulnerabilities.
- To learn about denial of service techniques and their impact.
- To master techniques for protecting devices from cyber threats.

Course Outcomes

1. Interpret cyber security risks by assessing computer systems and network vulnerabilities.
2. Implement cyber security best practices like strong passwords, antivirus usage, and software updates.
3. Evaluate authentication techniques within cyber security contexts.
4. Assess cyber security incidents to devise suitable response plans after thorough investigation.
5. Develop communication strategies for effectively discussing cyber security problems and solutions.

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	-	-	-	-	-	2	1
CO5	-	1	-	2	-	3	-	-	-	-	1	2

High-3 Medium-2 Low-1

Unit-I: The Need for Cybersecurity **15 Hours**

Introduction to cyberspace: History of the Internet, Internet Addresses, DNS, Internet Infrastructure, World Wide Web, introduction to cybercrime, Reasons for Commission of Cyber Crimes, malware and its type, kinds of cybercrime, cyber security techniques, firewall, steganography, some recent cyber security attacks, cyber security initiatives in India, guidelines for the secure password, using password manager, Some popular Password managers, What your online identity and data are, where it is, and why it is of interest to cybercriminals. What organizational data is, and why it must be protected.

Unit–II: Attacks, Concepts, and Techniques **10 Hours**

What cyber warfare is and why organizations, nations, and governments need cyber security professionals to protect their citizens and infrastructure. Security vulnerabilities and the different types of vulnerabilities and malware. The techniques used by attackers to infiltrate a system. The characteristics and operation of a cyber-attack. The trends in the cyber threat landscape.

Unit-III: Protecting Your Data and Privacy **15 Hours**

Tips for protecting your devices and data by creating strong passwords and using wireless networks safely. Authentication techniques help you maintain your data securely with tips about what to do and what not to do online. Protecting devices from threats. Safeguarding your privacy.

Unit –IV: Protecting the Organization **12 Hours**

Equipment, data, and the commonly used security terms such as botnets, the kill chain, and behavior-based security. Cisco's approach to cyber security uses a CSIRT team and a security playbook. Techniques for protecting organizations from cyber-attacks. The behavior-based approach to cybersecurity. Cisco's approach to cyber security.

Unit -V: Will Your Future Be in Cyber Security **8 Hours**

Understanding legal and ethical Issues in Cyber security explores the opportunities for pursuing an education and a career in cyber security**.**

Total: 60 Hours

Book Reference(s)

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole, Sunit Belapur, Wiley
2. Cyber Security for Beginners by Raef Meeuwisse, Cyber Simplicity Ltd.

List of e-Learning Resources:

1.https://www.w3schools.com/php/

2.https://www.geeksforgeeks.org/

Prepared By **AcademicCoordinator** **HOD** **Senior Faculty nominated by DOAA**

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)

B. C. A. (System Administration and Cyber Security)

Semester-II

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

25SACS040P: Database Concepts & RDBMS

Course Objectives

- To provide hands-on experience with database management systems.
- To apply theoretical concepts in practical scenarios.
- To develop proficiency in SQL and PL/SQL.
- To implement systematic database design.
- To perform data manipulation and management tasks effectively.

Course Outcomes (COs)

1. Execute SQL commands and scripts.
2. Create and manipulate database schemas.
3. Develop PL/SQL programs.
4. Perform data retrieval and manipulation.
5. Implement database integrity and security measures.

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

High-3 Medium-2 Low-1

Unit I: Fundamentals of SQL and Data Definition Language 12 Hours

Introduction to SQL and its role in database management, Understanding and implementing Data Definition Language (DDL) commands: Creating tables and defining schema, Modifying table structures, Dropping tables and understanding the implications. Developing schemas for simple databases such as student information systems. Applying basic constraints like primary keys, unique keys, and not null constraints.

Unit II: Data Manipulation and Querying Techniques **12 Hours**

Overview of Data Manipulation Language (DML) commands: Inserting data into tables using various methods, Updating and deleting data while maintaining data integrity. Performing basic and advanced querying using the SELECT statement: Filtering data with WHERE clauses, Sorting data with ORDER BY. Implementing joins to retrieve data from multiple tables. Exploring nested queries and subqueries for complex data retrieval.

Unit III: Advanced SQL Functions and PL/SQL Programming **12 Hours**

Introduction to advanced SQL functions: Using aggregate functions (SUM, AVG, COUNT, etc.), Applying string functions and date functions. Exploring PL/SQL programming: Understanding PL/SQL block structure, Declaring variables and constants, Implementing control structures (IF, CASE statements), and Using loops for iterative processing. Writing PL/SQL programs for basic operations like determining even/odd numbers, and iterating with loops.

Unit IV: Database Triggers, Cursors, and Procedures **12 Hours**

Understanding and creating database triggers: Exploring the use of triggers for automatic data validation and modification, Implementing BEFORE and AFTER triggers. Working with cursors in PL/SQL: Declaring and controlling cursors for row-by-row processing, Using cursors to update and manipulate data programmatically. Developing stored procedures and functions: Creating and invoking stored procedures, Passing parameters, and handling exceptions in PL/SQL.

Unit V: Data Integrity, Security, and Advanced Database Concepts **12 Hours**

Ensuring data integrity through constraints and referential integrity: Implementing foreign keys and check constraints, Enforcing data integrity through constraints. Managing database users and roles: Creating and managing users, Assigning and revoking roles and privileges. Exploring advanced database concepts: Introduction to transaction management and ACID properties, Implementing basic transaction controls with COMMIT and ROLLBACK, Exploring data security best practices and encryption techniques.

Total Hours: 60

List of Experiments

1. Implement the DDL, DML, and DCL commands in RDBMS.
2. Create table for student information like name, age, address, phone, class, college.

3. Insert data into tables using both types of insert commands.
4. Add another column into the database using the modify command.
5. Select particular type of data using the 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 a customer table with the following fields: cust_id, cust_name, cust_add, city, state, and insert 10 records, and apply the following constraints: *NOT NULL, *PRIMARY KEY, *UNIQUE.
11. Apply the WHERE clause on client (cid, cname, salary, cadd, city, state) table with select, delete, and 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 a 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 the addition of all the numbers in the given range.
16. Write a PL/SQL block to display the details about a 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 a trigger on Supplier Detail on update or insert of Scity to convert the first letter of scity into a capital letter.

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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3. https://aws.amazon.com/training/

Prepared By	Academic Coordinator	HOD	Senior Faculty nominated by DOAA

BCA(System Administration and Cyber Security)

Semester-II

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

25SACS050P: Introduction to Cyber Security

Course Objectives

- To provide hands-on experience with cybersecurity tools and techniques.
- To understand and implement security measures for data protection.
- To evaluate and mitigate security vulnerabilities in computer systems and networks.
- To develop skills for incident response and recovery.
- To enhance communication and collaboration skills in cybersecurity contexts.

Course Outcomes

1. Execute cybersecurity tools and scripts for data protection.
2. Create and manipulate security policies and configurations.
3. Develop response plans for cybersecurity incidents.
4. Perform data integrity checks and backups.
5. Implement and manage security measures for devices and networks.

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

High-3 Medium-2 Low-1

Unit-I: Introduction to Cybersecurity Tools **12 Hours**

Exploring Cybersecurity Careers: Research and identify various roles in cybersecurity and their responsibilities, **Communication in Cybersecurity**: Practice effective communication techniques in cybersecurity contexts, **Creating a Secure Cyber Environment**: Develop a basic secure network setup using virtualization tools, **Hashing for Data Integrity**: Use a hashing program to verify the integrity of files.

Unit–II: Protecting Data and Devices **12 Hours**

Strong Password Practices: Create and analyze strong passwords using password managers, **Firewall Configuration**: Configure Windows Firewall settings for enhanced security, **Network Utilities**: Use network utilities like ping, tracert, and ipconfig for troubleshooting and securing networks, **Guidelines for Secure Passwords**: Develop and document guidelines for creating and maintaining secure passwords.

Unit-III: Incident Response and Recovery **12 Hours**

Data Backup and Recovery: Implement and verify data backup and recovery procedures, **Data Ownership and Privacy**: Explore the implications of data ownership and privacy in cloud environments, **Online Safety and Privacy**: Identify and mitigate risks associated with online activities that may compromise safety or privacy, **Privacy Protection Plan**: Develop a comprehensive privacy protection plan for personal or organizational data.

Unit –IV: Advanced Cybersecurity Techniques **12 Hours**

Mobile Device Security: Configure mobile devices for secure Wi-Fi connectivity, **Network Route Tracing**: Trace network routes and analyze the path data takes through the internet, **Internet History Timeline**: Create a timeline highlighting major milestones in internet and cybersecurity history, **Cyber Warfare Implications**: Define and discuss the implications of cyber warfare on national and global security.

Unit -V: Cybersecurity Career and Ethics **12 Hours**

Legal and Ethical Issues in Cybersecurity: Analyze case studies to understand legal and ethical dilemmas in cybersecurity**, Cybersecurity Career Paths:** Research and present on various educational and career paths in cybersecurity**, Effective Communication in Cybersecurity:** Develop and practice communication strategies for conveying cybersecurity issues and solutions to non-technical audiences**, Cybersecurity Threat Trends:** Research current trends in cybersecurity threats and present findings to the class.

Total: 60 Hours

List of Practical Experiments:

1. Research various cybersecurity job roles and their responsibilities.
2. Practice communication techniques for cybersecurity contexts.
3. Create a secure network setup using virtualization tools.
4. Use hashing programs to verify file integrity.
5. Create and analyze strong passwords using password managers.
6. Configure Windows Firewall settings.

7. Use network utilities like ping, tracert, and ipconfig for network troubleshooting.
8. Develop guidelines for secure password creation and maintenance.
9. Implement and verify data backup and recovery procedures.
10. Explore data ownership and privacy implications in cloud environments.
11. Identify and mitigate risks associated with online activities.
12. Develop a privacy protection plan.
13. Configure mobile devices for secure Wi-Fi connectivity.
14. Trace network routes and analyze data paths through the internet.
15. Create a timeline of major milestones in internet and cybersecurity history.
16. Define and discuss the implications of cyber warfare.
17. Analyze legal and ethical case studies in cybersecurity.
18. Research and present on educational and career paths in cybersecurity.
19. Develop communication strategies for conveying cybersecurity issues to non-technical audiences.
20. Research and present current trends in cybersecurity threats.

Book Reference(s)

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole, Sunit Belapur, Wiley
2. Cyber Security for Beginners by Raef Meeuwisse, Cyber Simplicity Ltd.

List of e-Learning Resources:

1.https://www.w3schools.com/php/

2.https://www.geeksforgeeks.org/php-tutorial/

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BCA(System Administration and Cyber Security)

Semester-II

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

25SACS060P: Linux Administration Lab

Course Objectives:

- To learn basic Linux commands for files, 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. Understand basic Linux commands for file, software, and user management.
2. Interpret Linux commands and their parameters.
3. Apply Linux commands for software installation, file handling, and user management.
4. Evaluate file systems for specific use cases.
5. Design shell scripts for automating administrative tasks.

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	-	-	-	-	-	2	1
CO5	-	1	-	2	-	3	-	-	-	-	1	2

High-3 Medium-2 Low-1

Units

Unit I: Introduction to Linux and Basic Commands 18 Hours

Understanding the Directory Structure, **Linux Installation**, **Basic Linux Commands**: alias, cat, cd, cp, ls, man, mkdir, rm, pwd, chmod, and chown, and **File Handling**: Use commands for creating and viewing files (cat, more, pg), and handling directories (ls, cd, cp, mv, rm, mkdir, rmdir).

Unit II: File System Management 18 Hours

File System Concepts: ext2 and ext3, **Mounting File Systems**: Use commands like mount, umount, and fsck for managing file systems, **File Permissions**: Learn to set and manage file and directory permissions, **Filter Commands**: wc, head, tail, cut, tr, and grep (with regular expressions).

Unit III: User and Group Management 18 Hours

User Account Management: Add, modify, and remove user accounts, **Group Management**: Manage groups and group memberships, **Password Management**: Implement password policies and manage user passwords, **Process Management**: ps, kill, and nice.

Unit IV: Network and Server Configuration 18 Hours

Networking Basics: ifconfig, ping, netstat, and traceroute, **DHCP and DNS Setup**: Configure a DHCP server and a DNS server, **File Servers**: Set up NFS and Samba file servers, **Web and FTP Servers**: Install and configure Apache web server and FTP server.

Unit V: Shell Scripting and Automation 18 Hours

Introduction to Shell Scripting, **Script Examples**: Create scripts for tasks like finding the factorial of a number and listing directory files, **Advanced Scripting**: Develop scripts for more complex administrative tasks, **Scheduling Tasks**: Use `cron` jobs to schedule scripts and tasks.

Total Hours: 90

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.

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/

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BCA (System Administration and Cyber Security)

Semester-II

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

25SACS250P: 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. Understand data structures, algorithms, arrays, pointers.
2. Apply stack, queue, recursion.
3. Analyze linked lists, sorting algorithms.
4. Evaluate searching, hashing techniques.
5. Create tree traversals and graph traversals like depth-first and breadth-first.

Articulation Matrix

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

High-3 Medium-2 Low-1

Unit-I : Fundamentals of Data Structures and Algorithms **6 Hours**

Introduction: Elementary data organization, Data Structure definition, Categories of data structures, Data structure operations, Applications of data structures, Abstract Data type, Algorithms complexity and time-space trade off, Big-O notation, Array, Pointers, functions.

Unit-II: Stack and Queue Operations Overview **6 Hours**

Stack: Stack, Operations on stack, Recursion, Polish Notation: Infix, Prefix, Postfix, Conversion from one to another using stack, Multiple Stack.

Queue: Queue, Application of Queue, Circular Queue, Dequeue, Priority Queue.

Unit-III : Linked List Operations and Applications **6 Hours**

Linked List: Singly Linked list, Operation on Singly Linked list, Header node, Stack and Queue Linked list. Doubly Linked List, Circular Linked list. Application Linked list.

Unit-IV: Searching and Sorting Algorithms **6 Hours**

Searching and Sorting: sequential search, binary search, sorting- Bubble sort, selection sort, insertion sort, quick sort, merge sort, Heap sort, Hash Table, Techniques.

Unit-V: Trees and Graphs Fundamentals **6 Hours**

Trees: definitions-height, depth, order, degree, parent and child relationship etc; Binary Trees, Basic operations on Binary tree, representation of binary tree, Tree traversals - preorder, inorder and postorder traversals, Threaded binary trees;

Graphs: Introduction to graphs, Definition, Terminology, Directed, Undirected & Representation of graphs, Graph Traversal-Depth first & Breadth first search.

Total Hours:30

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: 30

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.amrita.edu/course/data-structures-lab-2/
2. https://elearn.daffodilvarsity.edu.bd/course/view.php?id=11771
3. https://www.udemy.com/
4. https://online-degree.swayam2.ac.in/mri22_01_d03_s1_cc4/preview

Prepared By	Academic Coordinator	HOD	Senior Faculty nominated by DOAA

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