BCA (System Administration and Cyber Security)
Detailed Syllabus

Semester – II
3SCS2-DM-003-T
Database Concepts & RDBMS
Pre-requisites: Basic Knowledge of Excel

Course Category			
L	**T**	**P**	**C**
3	0	0	3

Course Objective:

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

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Able to explain the basic concepts of database systems, data models, and architecture.	L1
CO2: Able to design ER diagrams and database tables using normalization techniques.	L2
CO3: Able to use relational algebra and relational calculus to perform queries.	L3
CO4: Able to apply SQL commands, constraints, and views to manage and manipulate data.	L3& L4
CO5: Able to analyze transactions and concurrency control methods to maintain data consistency.	L4 & L5

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

Articulation Matrix

(Program Articulation Matrix is formed by the strength of the correlation of COs with POs and PSOs.

The strength of correlation isindicated as 3 for substantial (high), 2 for moderate (medium) correlation,

and 1 for slight (low) correlation)

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	3	2	1	1	-	-	2	1	-	2	2	1
CO2	3	2	2	2	1	2	2	1	1	2	3	2
CO3	3	2	2	1	1	-	2	-	-	2	3	2
CO4	3	2	3	3	2	2	2	1	1	2	2	3
CO5	3	2	3	2	2	2	3	2	2	3	2	3

High-3 Medium-2 Low-1

Course Contents:

UNIT-I Introduction to Databases

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

UNIT-II Database Design

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

UNIT-III Relational Algebra and Calculus

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

UNIT-IV Constraints, Views and SQL

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

UNIT-V Transaction management and Concurrency control

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

Examination Scheme: Total – 100 marks

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

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

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3. **GeeksforGeeks (DBMS Notes)** https://www.geeksforgeeks.org/dbms/
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BCA (System Administration and Cyber Security)
Detailed Syllabus

Semester – II
3SCS2-DM-003-P
Database Concepts & RDBMS
Pre-requisites: Basic Knowledge of Data

Course Category			
L	**T**	**P**	**C**
0	0	2	1

Course Objective:

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

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Able to explain the basic concepts of database systems, data models, and architecture.	L1
CO2: Able to design ER diagrams and database tables using normalization techniques.	L2
CO3: Able to use relational algebra and relational calculus to perform queries.	L3
CO4: Able to apply SQL commands, constraints, and views to manage and manipulate data.	L3& L4
CO5: Able to analyze transactions and concurrency control methods to maintain data consistency.	L4 & L5

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

Articulation Matrix

(Program Articulation Matrix is formed by the strength of the correlation of COs with POs and PSOs.

The strength of correlation isindicated as 3 for substantial (high), 2 for moderate (medium) correlation,

and 1 for slight (low) correlation)

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	3	2	1	1	-	-	2	1	-	2	2	1
CO2	3	2	2	2	1	2	2	1	1	2	3	2
CO3	3	2	2	1	1	-	2	-	-	2	3	2
CO4	3	2	3	3	2	2	2	1	1	2	2	3
CO5	3	2	3	2	2	2	3	2	2	3	2	3

High-3 Medium-2 Low-1

List of Experiments:

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

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

Examination Scheme: Total – 100 marks

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

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

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BCA (System Administration and Cyber Security)
Detailed Syllabus

Semester – II	**Course Category**
3SCS2-DC-002-T	**L T P C**
Programming in C	4 0 0 4
Pre-requisites: Basic Computer Knowledge	

Course Objective:

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

Course Outcomes:

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

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

Articulation Matrix

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CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	3	-	-	-	-	2	1	-	-	2	3	-
CO2	3	-	2	-	-	1	-	-	-	2	2	-
CO3	3	2	1	3	-	2	-	-	2	2	3	3
CO4	2	-	3	3	-	2	-	1	2	2	1	3
CO5	2	-	2	2	2	1	2	1	-	3	2	3

High-3 Medium-2 Low-1

Course Contents:

UNIT-I: Fundamentals of C and Control Structures

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

UNIT-II: Arrays and Functions

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

UNIT-III: Searching and Sorting

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

UNIT-IV: Structures and Pointers

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

UNIT-V: Files, Preprocessor, and Standard Library

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

Examination Scheme: Total – 100 marks

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

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

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5. **Instructor:** David J. Malan (Harvard University)- CS50 2026 - C Programming Lecture

BCA (System Administration and Cyber Security)
Detailed Syllabus

Semester – II
3SCS2-DC-002-P
Programming in C
Pre-requisites: Basic Knowledge of Computer

Course Category			
L	**T**	**P**	**C**
0	0	4	2

Course Objective:

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

Course Outcomes:

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

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

Articulation Matrix

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CO1	3	-	-	-	-	2	1	-	-	2	3	-
CO2	3	-	2	-	-	1	-	-	-	2	2	-
CO3	3	2	1	3	-	2	-	-	2	2	3	3
CO4	2	-	3	3	-	2	-	1	2	2	1	3
CO5	2	-	2	2	2	1	2	1	-	3	2	3

High-3 Medium-2 Low-1

List of Experiments:

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

Examination Scheme: Total – 100 marks

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

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

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BCA (System Administration and Cyber Security)
Detailed Syllabus

Semester – II
3SCS2-DC-001-T
Fundamentals of Cyber Security
Pre-requisites: Basic Knowledge of Computer

Course Category			
L	**T**	**P**	**C**
4	0	0	4

Course Objective:

- To understand the importance of cybersecurity and cyberattacks.
- To identify types of cyber threats like viruses and ransomware.
- To learn basic cybersecurity tools and technologies.
- To develop security policies and handle incidents.
- To stay updated with new cyber threats and trends.

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Able to understand cybersecurity basics and the need to protect digital data.	L1
CO2: Able to identify common cyber threats and take basic steps to reduce risks.	L2
CO3: Able to explain basic security concepts like encryption, networks, and security tools.	L3
CO4: Able to create simple security policies and manage security incidents.	L4
CO5: Able to analyze new cyber threats, technologies, and follow ethical practices.	L5

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

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

High-3 Medium-2 Low-1

Course Contents:

Unit-I: Introduction to Cyber Security
Fundamentals of cyber security, information security concepts, need and importance of cyber security, cyber space and digital assets, digital identity, types of cybercrimes, CIA triad (confidentiality, integrity, availability), cyberattack overview, cyber security challenges, introduction to ethical hacking, security terminologies (threat, vulnerability, risk, exploit), digital footprint and online privacy, cyber security frameworks (basic idea), role of cyber security in banking, education, and e-governance.

Unit-II: Cyber Threats and Attacks
Malware (virus, worm, trojan, rootkits), ransomware attacks, spyware, adware, key-loggers, phishing, spear phishing, whaling, social engineering techniques (pretexting, baiting), password attacks (brute force, dictionary, credential stuffing), network attacks (DoS, DDoS, man-in-the-middle, session hijacking), web attacks (SQL injection, XSS – basic idea), email attacks and spam security, botnets and zombie systems, insider threats, zero-day vulnerabilities.

Unit-III: Security Technologies and Tools
Firewalls (packet filtering, stateful, application-level), intrusion detection and prevention systems (IDS/IPS), antivirus and endpoint security, cryptography basics (symmetric and asymmetric encryption), hashing and digital signatures, virtual private network (VPN), authentication methods (password, OTP, biometrics), multi-factor authentication (MFA), public key infrastructure (PKI) basics, network security (Wi-Fi security, WPA, WPA2), security tools (Wireshark, Nmap – basic idea), secure browsing and safe internet practices.

Unit-IV: Information Security Management
Information security policies, risk management process (identification, analysis, mitigation), incident response lifecycle (preparation, detection, recovery), cyber laws in India and IT Act 2000, data privacy and protection principles, access control models (DAC, MAC, RBAC), security awareness and training, backup and recovery methods, business continuity planning (BCP), disaster recovery planning (DRP), compliance standards (ISO 27001 – basic idea), log management, monitoring, and auditing.

Unit-V: Emerging Trends and Ethics

Latest cyber security trends, cloud security challenges and solutions, mobile security, IoT security issues, ethical hacking and penetration testing basics, cyber ethics and professional responsibility, artificial intelligence in cyber security, block-chain and cryptocurrency security, cyber forensics introduction, dark web awareness, cyber warfare and national security, career opportunities in cyber security.

Examination Scheme: Total – 100 marks

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

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

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Reference Books:

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2. **Computer Security:** Principles and Practice, William Stallings and Lawrie Brown, Pearson Education, 4th Edition, 2017.
3. **Principles of Information Security**, Michael E. Whitman and Herbert J. Mattord, Cengage Learning, 6th Edition, 2017**.**

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2. Introduction to Cybersecurity / Computer Science, David J. Malan, Harvard University**, https://cs50.harvard.edu/**

BCA (System Administration and Cyber Security)
Detailed Syllabus

Semester – II | **Course Category**
3SCS2-DC-001-P | **L T P C**
Fundamentals of Cyber Security | 0 0 4 2
Pre-requisites: Basic Knowledge of Computer

Course Objective:

- To understand the importance of cybersecurity and cyberattacks.
- To identify types of cyber threats like viruses and ransomware.
- To learn basic cybersecurity tools and technologies.
- To develop security policies and handle incidents.
- To stay updated with new cyber threats and trends.

Course Outcomes:

Course Outcomes (COs)	Level *
CO1: Able to understand cybersecurity basics and the need to protect digital data.	L1
CO2: Able to identify common cyber threats and take basic steps to reduce risks.	L2
CO3: Able to explain basic security concepts like encryption, networks, and security tools.	L3
CO4: Able to create simple security policies and manage security incidents.	L4
CO5: Able to analyze new cyber threats, technologies, and follow ethical practices.	L5

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

Articulation Matrix

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

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

High-3 Medium-2 Low-1

List of Experiments:

1. **Digital Footprinting:** Use "Google Dorks" and advanced search operators to find publicly exposed sensitive information of a dummy domain.
2. **WHOIS Analysis:** Perform a WHOIS lookup on various domains to identify registration details, name servers, and expiry dates.
3. **Digital Identity Audit:** Analyze and document your own digital footprint using tools like "Have I Been Pwned" to check for data breaches.
4. **System Info & Security Baseline:** Use command-line tools (systeminfo, ipconfig, netstat) to document the current security state of a workstation.

5. **Phishing Simulation:** Use the **Social Engineering Toolkit (SET)** to create a cloned login page of a popular website for educational awareness.
6. **Email Header Analysis:** Inspect the "Long Headers" of a spam email to trace the sender's IP address and check for SPF/DKIM failures.
7. **Password Cracking (Dictionary Attack):** Use **John the Ripper** or **Hashcat** to crack a simple password hash using a wordlist.
8. **Malware Analysis (Static):** Use tools like **VirusTotal** or **PEStudio** to analyze a suspicious (but non-executable) file for malicious strings.
9. **Network Reconnaissance:** Use **Nmap** to perform a "Stealth Scan" on a local network to identify active hosts and open ports.
10. **DoS Simulation:** Demonstrate a Denial of Service (DoS) concept in a private lab using a tool like **LOIC** against a test web server.

11. **Packet Sniffing:** Use **Wireshark** to capture local network traffic and filter for unencrypted protocols like HTTP or FTP to view plain-text data.
12. **Firewall Configuration:** Configure **Windows Defender Firewall** or **iptables** to block specific IP addresses and port numbers.
13. **Symmetric Encryption:** Use **GnuPG (GPG)** or **OpenSSL** to encrypt and decrypt a text file using the AES-256 algorithm.

14. **Asymmetric Encryption:** Generate a Public/Private key pair and demonstrate the process of digital signing and verification.
15. **Hashing for Integrity:** Calculate the MD5 and SHA-256 checksums of a file before and after making a minor change to understand data integrity.
16. **VPN Setup:** Install and configure a browser-based or system-wide VPN and verify the change in public IP and geolocation.
17. **Multi-Factor Authentication (MFA):** Set up and demonstrate 2FA/MFA on a test account using **Google Authenticator** or hardware tokens.
18. **Secure Browsing:** Configure a "Hardened Browser" profile (Privacy settings, disabling cookies, installing HTTPS Everywhere and uBlock Origin).

19. **Log Management:** Access and analyze **Windows Event Viewer** logs to identify failed login attempts and system errors.
20. **Access Control Lists (ACLs):** Demonstrate Role-Based Access Control (RBAC) by creating user groups with different folder permissions (Read, Write, Execute) in Windows/Linux.
21. **Backup & Recovery:** Perform a full system backup and a selective file recovery using built-in OS tools.
22. **Vulnerability Scanning:** Use **OpenVAS** or **Nessus Essentials** to scan a local machine for known security weaknesses.
23. **Incident Response Documentation:** Prepare a mock "Incident Report" based on a simulated malware infection scenario.

24. **Steganography:** Use a tool like **Steghide** to hide a secret text message inside an image file and extract it.
25. **SQL Injection (Web Attack):** Use a vulnerable environment like **DVWA (Damn Vulnerable Web App)** to perform a basic SQL injection to bypass a login page.
26. **Cross-Site Scripting (XSS):** Demonstrate a "Reflected XSS" attack in a lab environment to show how malicious scripts execute in a browser.
27. **Mobile Security Audit:** Use an app like **Exodus Privacy** to analyze the trackers and permissions of various Android applications.
28. **Digital Forensics:** Use **Autopsy** or **FTK Imager** to recover "permanently deleted" files from a USB drive.

Examination Scheme: Total – 100 marks

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

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

List of Books:

Textbook:

1. **Cybersecurity Essentials**, Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, Wiley India, 1st Edition, 2018.

Reference Books:

1. **Network Security Essentials:** Applications and Standards, William Stallings, Pearson Education, 6th Edition, 2019.
2. **Computer Security:** Principles and Practice, William Stallings and Lawrie Brown, Pearson Education, 4th Edition, 2017.
3. **Principles of Information Security**, Michael E. Whitman and Herbert J. Mattord, Cengage Learning, 6th Edition, 2017**.**

Important Websites:

1. NPTEL (IIT Online Courses), Cyber Security and Privacy, **https://onlinecourses.nptel.ac.in/noc26_cs52/preview**
2. Introduction to Cybersecurity / Computer Science, David J. Malan, Harvard University**, https://cs50.harvard.edu/**