Mahatma Education Society's

Pillai HOC College of Arts, Science & Commerce (Autonomous)

Rasayani

Affiliated to University of Mumbai
NAAC Accredited with "A+" Grade in cycle II
ISO 9001:2015 Certified

SYLLABUS

B.Sc. Cyber Security

F. Y. B. Sc. Cyber Security

As per National Education Policy 2020

Academic Year 2026-27

Mahatma Education Society's College Code: 870
PILLAI HOC COLLEGE OF ARTS, SCIENCE & COMMERCE
Pillai HOCL Educational Campus, HOC Colony, Rasayani, Via. Panvel, Dist. Raigad. Pin 410207
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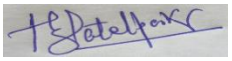
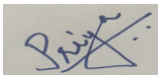
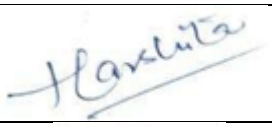
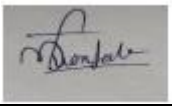
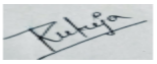
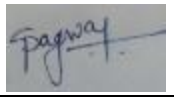
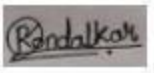
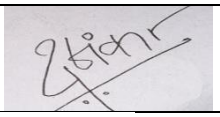
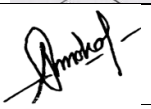
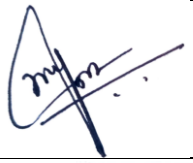
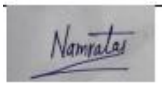
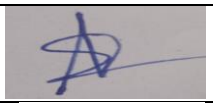
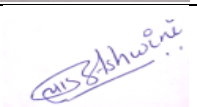
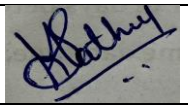
(NAAC Accredited 'A+' Grade , CGPA – 3.26 in Cycle 2 & ISO 9001:2015 Certified)
Affiliated to the University of Mumbai, Approved by Government of Maharashtra
(AUTONOMOUS COLLEGE)

Ref.No: PHCASC/BOS Meeting/Attendance/2026-27 Date: 01.04.2026

Board of Studies Mathematics, Statistics and Computer Application

Sr. No	Name	Signature
1	Dr. Swapna Kadam Vice Chancellor Nominee	
2	Dr. Annie Rajan, Subject Experts	
3	Dr. Homraj Patelpaik Subject Experts	
4	Mr. Swapnil H. Patil Industry Expert	
5	Mr. Akash Ghadge Meritorious Alumnus	
6	Dr. Rinkoo Shantnu Principal	
7	Ms. Priyanka Sorte Chairperson (Programme Co-ordinator BSc. CS)	
8	Ms. Priya Prakash Member (Mathematics, Statistics)	
9	Ms. Harshita Singh Member (Mathematics, Statistics)	
10	Ms. Mrunal Wanjale Member (Mathematics, Statistics)	
11	Ms. Arpita Kante Member (Programme Co-ordinator BSc. DS)	
12	Ms. Anita Mhatre Member (Programme Co-ordinator MSc. DS)	
13	Ms. Sangeeta Menon Member (Programme Co-ordinator BSc.AIML)	
14	Ms. Aarti Wani Member	

15	Ms. Rutuja Madane Member	
16	Ms. Kranti Vartak Member	
17	Ms. Jyoti Borade Member	
18	Ms. Sonali Dagwar Member	
19	Ms. Rutuja Kondalkar Member	
20	Mr. Yash Karkhanis Member	
21	Ms. Aishwarya Mokal Member	
22	Ms. Vinaya Bhoir Member (Programme Co-ordinator BSc. Cyber Security)	
23	Ms. Namrata Kedari Member	
24	Ms. Ashwini Patil Member	
25	Ms. Ashwini Lad Member (Programme Co-ordinator MSc.IT)	
26	Ms. Priyanka Sonawane Member (Programme Co-ordinator BSc.IT)	
27	Mr. Shinoj Mathew Member	

1. Introduction

The Bachelor of Science (B.Sc.) in Cyber Security is an undergraduate programme designed to equip students with the knowledge and skills required to protect digital systems, networks, and data

from cyber threats. In today's technology-driven world, where cyber-attacks are increasing rapidly, the demand for skilled cyber security professionals has become critical across all sectors.

This programme provides a strong foundation in areas such as network security, cryptography, ethical hacking, digital forensics, and information security management. It combines theoretical concepts with practical training through labs and projects, enabling students to identify vulnerabilities, analyze risks, and implement effective security solutions.

The curriculum also emphasizes ethical practices, legal frameworks, and industry standards, ensuring that students develop a responsible and professional approach to cyber security. Upon completion, graduates are prepared for careers such as security analysts, ethical hackers, cyber consultants, and system security administrators, or for higher studies in related fields.

2. Programme Outcomes (POs)

PO. No.	PO Title	PO's in Brief
PPO1	**Fundamental Knowledge Acquisition**	Graduates will demonstrate a comprehensive and foundational knowledge of their chosen discipline along with an awareness of interdisciplinary connections.
PO2	**Critical Thinking and Analytical Reasoning**	Graduates will be able to analyse complex problems, synthesize data from multiple sources (qualitative and quantitative), and employ logical reasoning to formulate well-supported conclusions and arguments.
PO3	**Effective Communication**	Graduates will exhibit proficiency in both written and oral communication, articulating ideas clearly, persuasively, and ethically to diverse audiences
PO4	**Problem Solving**	Graduates will possess the ability to identify, formulate, and design solutions for real-world problems in their professional or social contexts, applying relevant theoretical knowledge and practical skills.
PO5	**Information and Digital Literacy**	Graduates will demonstrate the capability to locate, evaluate, and effectively use information from various sources, and utilize modern tools and Information and Communication Technology (ICT) for professional and academic tasks.
PO6	**Research Skills and Scientific Temperament**	Graduates will develop a sense of inquiry and research methodology, including the ability to design experiments (where applicable), collect and analyse data, and interpret results while maintaining scientific rigor and intellectual honesty.
PO7	**Ethical Reasoning and Professional Integrity**	Graduates will recognize ethical dilemmas, commit to professional and academic ethics, and demonstrate an understanding of moral and social responsibilities in their personal and professional conduct.

PO8	**Employability and Professional Skills**	Graduates will acquire the necessary job-ready skills, managerial competencies, and professional values to secure gainful employment or pursue advanced education in their respective fields.
PO9	**Environmental and Sustainability Consciousness**	Graduates will understand the importance of environmental conservation and sustainable development, displaying responsibility toward ecological challenges and advocating for healthy environmental practices.
PO10	**Life-Long Learning**	Graduates will develop the capacity for independent and self-directed learning to continuously upgrade their knowledge and skills, enabling them to adapt to rapid technological and societal changes.
PO11	**Civic and Social Responsibility**	Graduates will act as responsible citizens with an informed awareness of constitutional values, engaging proactively in community development and addressing social needs.
PO12	**Empathy and Social Intelligence**	Graduates will be able to cultivate and demonstrate affective, interpersonal, social and emotional intelligence.

3.Programme Specific Outcomes (PSOs)

PSOs. No.	PSO Title	PSOs in brief
PSO1	**Fundamentals of Cyber Security**	Apply core concepts of cyber security, including cryptography, network security, and ethical hacking, to identify and prevent security threats.
PSO2	**Vulnerability Assessment and Analysis**	Analyze systems using security tools and techniques to detect vulnerabilities and perform penetration testing and digital forensics.
PSO3	**Secure System Design**	Design and implement secure applications, networks, and policies to safeguard data and protect against cyber-attacks.
PSO4	Ethics and Legal Compliance	Demonstrate ethical practices and adhere to cyber laws and standards while addressing cyber security challenges.

4. Evaluation Pattern

Marking Code	Marking Scheme
A	50 Marks Semester End Exam, 50 Marks Continuous Assessment (distributed within 15 Marks Class Test, 15 Marks Presentation & Assignment, 10 Marks Online Quiz, 10 Marks Attendance & Class Participation)
B	50 Marks Semester End Exam
C	100 marks Continuous Assessment (distributed within 30 Marks Class Test, 30 Marks Presentation & Assignment, 30 Marks Online Quiz, 10 Attendance & Class Participation)
D	50 Marks of Continuous Assessment (distributed within 15 Marks Class Test, 15 Marks Presentation & Assignment, 10 Marks Online Quiz, 10 Marks Attendance & Class Participation)
E	50 Marks Practical Examination (distributed within 30 Marks Practical Module 1 & 2, 10 Marks Journal, 10 Marks Viva)

Course Structure

Semester I

Course Code	Course Type	Course Title	Theory/ Practical	Marks	Credits	Lectures / Week	Evaluation Pattern
HUSCY101	Major	FUNDAMENTALS OF C PROGRAMMING	Theory	100	2	2	A
HUSCY101P	Major - Practical	PRACTICAL(HUSCY101)	Practical	50	1	2	E
HUSCY102	Major	COMPUTER NETWORKS & OPERATING SYSTEMS	Theory	100	2	2	A
HUSCY102P	Major - Practical	PRACTICAL(HUSCY102)	Practical	50	1	2	E
HUSCY103	Minor	DIGITAL SECURITY ARCHITECTURE	Theory	100	2	2	A
HUSCY103P	Minor - Practical	PRACTICAL(HUSCY103)	Practical	50	1	2	E
HUSCY104	SEC	LINUX OS	Theory	100	2	2	A
HUSCY104P	SEC - Practical	PRACTICAL(HUSCY104)	Practical	50	1	2	E
HUSCY105	IKS	INDIAN ROOTS OF INFORMATION SYSTEM	Theory	50	2	2	D
HUAEC101	AEC	COMMUNICATION SKILLS IN ENGLISH	Theory	50	2	2	D
HUVEC101	VAC/VEC	FUNDAMENTALS OF SOCIAL & EMOTIONAL SKILLS	Theory	100	3	3	C
HUOE104	Multidisciplinary/OE	BASICS OF MARKETING MIX	Theory	100	3	3	C
Total				900	22		**

Abbreviations:

SEC: Skill Enhancement Course
AEC: Ability Enhancement Course
VAC: Value Added Course
VEC: Value Education Course
IKS: Indian Knowledge System
OE: Open Elective

SEMESTER I

BOS	**Mathematics, Statistics and Computer Application**				
Course	**Fundamentals of C Programming**				
Course Code	**HUSCY101**	**Level**	**4.5**		
		Type	**Theory**	**Practical**	**Total**

Semester	I	Credits	2	1	3
Type	Major	No of Teaching Hours	30	30	60
Evaluation Pattern	Total Marks	Semester End	Continuous	Practical	
	150	50	50	50	

Learning Objectives	
1	Understand the basic structure, syntax, and compilation process of programs written in the C Programming Language.
2	Use variables, data types, operators, and input/output functions from the C Standard Library to write simple C programs.
3	Develop programs using decision-making statements and looping constructs to solve computational problems.
4	Design modular programs using functions, parameter passing, and basic recursion techniques.
5	Implement programs using arrays and pointers and understand their relationship with memory.
6	Apply basic program organization concepts including preprocessor directives, command-line arguments, and introductory memory layout (stack and heap).

Course Outcomes	
After successful completion of this course, students would be able to: -	
CO1	Explain basic concepts of C programming including syntax, data types, operators, I/O functions, and control structures.
CO2	Develop C programs using control statements, functions, arrays, and command line arguments.
CO3	Analyze programs using pointers, arrays, recursion, and memory concepts.
CO4	Design modular C programs using structured programming techniques.

Modules at Glance

Module No.	Content	No. of Hours	CO Mapping
1	C Fundamentals History and Features of C and Control and Iteration	15	CO1, CO2, CO3
2	Program Organization and Memory Concepts	15	CO4, CO5

Syllabus

Module No.	Content	No. of Lectures

1	**Introduction to C :** History and features of C Programming Language, Structure of a C program, Compilation and execution process, Basic syntax and program development **Basic Elements :** Keywords and identifiers. Variables and constants, Data types and type casting, Operators , Operator precedence and associativity **Input and Output :** Functions from the C Standard Library printf() and scanf(), getchar() and putchar(), Format specifiers, Escape sequences **Control Structures :** Decision making statements **:** if, if–else, switch **Iteration statements :** while, do–while, for **Jump statements :** break, continue & goto.	15
2	**Functions :** Concept of modular programming,Standard and user-defined functions,Function declaration, definition, and function call, Parameter passing (call by value),Return values,Introduction to recursion **Arrays :** Concept and declaration of arrays,One-dimensional arrays,Two-dimensional arrays,Initialization and element access,Passing arrays to functions,Memory layout basics (row-major order) **Pointers :**Concept of pointers,Pointer declaration and initialization,Basic pointer operations,Relationship between arrays and pointers **Preprocessor Directives :**Preprocessor concept #include #define Simple macros and header files **Command Line Arguments :**Concept of command line arguments, argc and argv **Basic Memory Layout** Overview of program memory,Stack and heap concept,Global and local variables	15
Case Study Scenario		
M1	Examination Result Processing System Using Functions and Arrays (C Programming) A degree college wants to automate the process of calculating student results for a class of 5 students. Each student has marks in 3 subjects: Mathematics Programming Data Structures The college administration wants the system to: Store marks of all students Calculate total and average marks Find highest scorer in each subject Display marks in tabular format Use modular programming approach Use arrays for data storage	
M2	ATM Banking System Using Control and Iteration Statements in C A bank wants to develop a simple ATM Machine Simulation System. When a customer inserts their ATM card: The system asks for a 4-digit PIN. If the PIN is correct, a menu is displayed: Check Balance Deposit Money Withdraw Money Exit If the PIN is incorrect, the user gets only 3 attempts. The system should: Prevent withdrawal if balance is insufficient Continue showing menu until user selects Exit	

Reference Books:

- **"The C Programming Language"**
  Authors: Brian W. Kernighan and Dennis M. Ritchie:The classic and authoritative book on C, written by the language creators. Covers fundamentals, control structures, functions, and arrays clearly.
- **"Programming in ANSI C"**
  Author: E. Balagurusamy:A very popular textbook with easy explanations and many examples, covering all basics and more.
- **"Let Us C"**
  Author: Yashavant Kanetkar:Beginner-friendly, focused on fundamentals and practical programming with plenty of exercises.
- **"C Programming: A Modern Approach"**
  Author: K. N. King:Comprehensive, suitable for beginners and intermediate learners, with clear explanations on functions, arrays, and control structures.
- **"Expert C Programming: Deep C Secrets"**
  Author: Peter van der Linden:For advanced learners who want to deepen their understanding after mastering basics.

Semester End Evaluation (50 Marks) **Time : 2 Hours**

Paper Pattern

Question No.	Questions	Total Marks : 50
Q1	Attempt 3 out of 5	15
Q2	Attempt 3 out of 5	15
Q3	Attempt 3 out of 5	15
Q4	Case Study	05

Practical Syllabus

Sr. No	List of Practical	No. of. Lectures	CO Mapping
1	Write a simple C program demonstrating the basic structure (including comments). Use different keywords, identifiers, variables, and constants in a program.	3	CO1
2	Write programs demonstrating the use of arithmetic, relational, logical, assignment, and ternary operators.	3	CO2,CO3
3	Use getchar() and putchar() to read and print characters	3	CO1,CO2
4	Write programs implementing decision-making using if, if-else, and switch statements	3	CO3
5	Write programs demonstrating loops: while, do-while, and for.	3	CO3
6	**Functions:** a) Write functions to perform simple tasks and call them from main (). b) Demonstrate the difference between standard library functions and user-defined functions. c) Write recursive functions (e.g., factorial, Fibonacci series).	3	CO4

7	**Array:** a) Declare and initialize one-dimensional and two-dimensional arrays. b) Write programs to access and manipulate array elements.	3	CO5,CO6
8	Pointers and Arrays Demonstrate pointer declaration, initialization, and basic operations. Access and manipulate array elements using pointers. Understand the relationship between arrays and pointers.	3	CO5,CO6
9	Preprocessor Directives Use #define to define constants and simple macros. Include header files for standard library functions.	3	CO5,CO6
10	Command Line Arguments Accept inputs through command-line arguments. Demonstrate conversion of arguments and display values.	3	CO5,CO6

Semester End Practical Evaluation **Time: 2 Hours**

Question No.	Questions	Total Marks
Q.1	Program	30
Q.2	Journal	10
Q.3	Viva & Attendance	10

BOS	**Mathematics, Statistics and Computer Application**		
Course	**Computer Networks & Operating Systems.**		
	HUSCY102	**Level**	**4.5**

Course Code		Type	Theory	Practical	Total
Semester	I	Credits	2	1	3
Type	Major	No of Teaching Hours	30	30	60
Evaluation Pattern	Total Marks	Semester End	Continuous		Practical
	150	50	50		50

Learning Objectives	
1	To introduce the fundamental concepts of Computer Networks, including types of networks, topologies, devices, and transmission media.
2	To explain network models such as the OSI and TCP/IP models, IP addressing, and commonly used networking protocols.
3	To provide basic knowledge **of** Network Security, common threats, and essential security practices.
4	To develop understanding **of** Operating System concepts, including structure, functions, types, and process & memory management.
5	To familiarize students with file systems, user interfaces (GUI & CLI), operating system examples, and system security fundamentals.

Course Outcomes	
After successful completion of this course, students would be able to: -	
CO1	Explain fundamental concepts of computer networks and operating systems, including types, models, devices, and basic security concepts.
CO2	Apply knowledge of IP addressing, protocols, file operations, and basic network configurations in practical scenarios.
CO3	Analyze network models, transmission media, OS structures, process scheduling, and memory management techniques.
CO4	Design basic network setups and apply system security measures using appropriate tools and operating system features.

Modules at Glance

Module No.	Content	No. of Hours	CO Mapping
1	Computer Networks & Security Fundamentals	15	CO1, CO2, CO3
2	Operating Systems & System Security	15	CO4, CO5

Syllabus

Module No.	Content	No. of Lectures
1	**Introduction to Computer Networks –** Definition, Advantages, and Applications, Types of Networks: LAN, MAN, WAN, PAN; Network Topologies: Bus, Star, Ring, Mesh, Hybrid. **Network Devices –** Hub, Switch, Router, Bridge, Gateway, Modem, Network Interface Card (NIC). **Network Models –** OSI Model Layers and Functions, TCP/IP Model Overview. **Transmission Media –** Wired: Twisted Pair, Coaxial, Optical Fiber, Wireless: Radio, Microwave, Infrared. **IP Addressing & Protocols –** IPv4, IPv6, MAC Address, Common Protocols (HTTP, HTTPS, FTP, SMTP, DNS).	15

	Introduction to Network Security – Importance of Security, Common Threats (Virus, Worms, Phishing, DoS), Basic Security Practices.	
2	**Introduction to Operating Systems –** Definition, Functions, and Types (Batch, Time-sharing, Distributed, Real-Time), Structure of Operating System. **Process and Memory Management –** Concept of Process, Thread, Scheduling, Introduction to Memory Management and Virtual Memory. **File System and Storage Management –** File Types, Directory Structure, File Operations (Create, Delete, Copy, Move). **User Interface –** GUI vs CLI, Introduction to Shell and Terminal. **Operating System Examples –** Features of Windows, Linux, and macOS, Open Source Operating Systems. **System Security Basics –** User Authentication, Passwords, Permissions, Introduction to Firewalls and Antivirus.	15
Case Study Scenario		
M1	A company has connected all computers in its office using a **local network**. Recently, employees reported slow network performance and occasional network failures. The network administrator is analyzing the **network topology and devices** used in the organization. **Question:** Explain different **network topologies** and suggest which topology would be most suitable for improving reliability and performance in the company network.	
M2	A company has connected all computers in its office using a **local network**. Recently, employees reported slow network performance and occasional network failures. The network administrator is analyzing the **network topology and devices** used in the organization. **Question:** Explain different **network topologies** and suggest which topology would be most suitable for improving reliability and performance in the company network.	

Reference Books:

1. Andrew S. Tanenbaum – Computer Networks
2. Behrouz A. Forouzan – Data Communications and Networking
3. Abraham Silberschatz – Operating System Concepts
4. Sumitabha Das – Unix Concepts and Applications
5. Online resources and Linux manuals

Semester End Evaluation (50 Marks) **Time : 2 Hours**

Paper Pattern

Question No.	Questions	Total Marks : 50
Q1	Attempt 3 out of 5	15
Q2	Attempt 3 out of 5	15
Q3	Attempt 3 out of 5	15
Q4	Case Study	05

Practical Syllabus

Sr. No	List of Practical	No. of. Lectures	CO Mapping
1	Study of different network topologies (using diagrams or simulation tools).	3	CO1
2	Identify and explain various networking devices (Router, Switch, Hub, etc.).	3	CO1
3	Demonstration of IP configuration and checking connectivity using ping command.	3	CO2
4	Use of basic network commands: ipconfig, tracert, netstat, nslookup.	3	CO2
5	Setting up a small LAN connection between two systems.	3	CO1, CO2
6	File and Directory Operations using CLI Perform the following commands: Create directory Create file Copy file Move file Delete file	3	CO5
7	To view network configuration details. Commands: ipconfig ping getmac	3	CO2
8	To understand the difference between Graphical User Interface (GUI) and Command Line Interface (CLI).	3	CO5
9	To study the firewall settings in an operating system.	3	CO3, CO5
10	To view network security settings.	3	CO, CO5

Semester End Practical Evaluation **Time: 2 Hours**

Question No.	Questions	Total Marks
Q.1	Program	30
Q.2	Journal	10
Q.3	Viva & Attendance	10

BOS	**Mathematics, Statistics and Computer Application**
Course	**Digital Security Architecture**

Course Code	HUSCY103	Level	4.5		
		Type	Theory	Practical	Total
Semester	I	Credits	2	1	3
Type	Minor	No of Teaching Hours	30	30	60
Evaluation Pattern	Total Marks	Semester End	Continuous		Practical
	150	50	50		50

Learning Objectives	
1	To introduce the fundamentals of number systems and data representation used in digital computers.
2	To understand the working of logic gates and Boolean algebra used in digital circuit design.
3	To explain the design and functioning of basic combinational and sequential circuits.
4	To provide knowledge of basic computer organization and processor architecture.
5	To introduce students to the concept of hardware vulnerabilities and hardware-level security threats.
6	To understand the importance of secure hardware design and hardware-based security mechanisms in cyber security.

Course Outcomes	
After successful completion of this course, students would be able to: -	
CO1	Explain number systems, logic gates, Boolean algebra, and basic components of computer organization.
CO2	Perform number system conversions, binary arithmetic, and implement basic combinational and sequential circuits.
CO3	Analyze instruction cycle, processor operations, memory organization, and hardware interactions within a computer system.
CO4	Design basic digital circuits and apply secure hardware concepts to enhance system security.

Modules at Glance

Module No.	Content	No. of Hours	CO Mapping
1	Fundamentals of Digital Systems	15	CO1, CO2, CO3
2	Computer Architecture and Hardware Security	15	CO4, CO5, CO6

Syllabus

Module No.	Content	No. of Lectures
1	**Number Systems and Data Representation** : Binary, Octal, Decimal, Hexadecimal Number Systems, Conversion between Number Systems, Binary Arithmetic (Addition and Subtraction), Representation of Data in Computers. **Logic Gates and Boolean Algebra** : Basic Logic Gates: AND, OR, NOT, Universal Gates: NAND, NOR, Exclusive Gates: XOR, XNOR, Basic Boolean Algebra Laws and Logic Expressions **Combinational Circuits**: Half Adder and Full Adder, Multiplexer and Demultiplexer, Encoder and Decoder, Applications of Combinational Circuits in Computer Systems.	15

	Sequential Circuits and Memory Elements: Introduction to Sequential Circuits, Flip-Flops (SR, JK, D, T), Registers and Counters, Basic Concept of Memory in Digital Systems.	
2	**Basic Computer Organization**: Components of a Computer System, CPU, ALU, Control Unit, Registers, Memory Types: Cache, RAM, ROM, Input and Output Devices. **Instruction Cycle and Processor Basics**: Basic Instruction Cycle (Fetch-Decode-Execute), Introduction to Microprocessors, Role of Operating System in Hardware Interaction. **Introduction to Hardware Security**: Importance of Hardware Security in Cyber Security, Hardware Vulnerabilities in Computer Systems, Basic Idea of Hardware Attacks. **Secure Hardware Concepts**: Trusted Hardware and Secure Boot, Introduction to Hardware-based Security Mechanisms, Importance of Secure Architecture in Cyber Security.	15
Case Study Scenario		
M1	A cybersecurity engineer is designing a simple encryption system where binary data from a user password is processed using logic circuits before storing it in the system. The system uses **XOR logic gates** to combine the password bits with a secret key to generate encrypted data. **Question:** Explain how the **XOR gate** can be used for simple encryption and decryption of binary data. Illustrate your answer with a suitable example using binary values.	
M2	An organization discovered that some computers in their network were infected with malware that modified the **boot process** of the operating system. To prevent such attacks, the organization decided to implement **secure boot and trusted hardware mechanisms** in their systems. **Question:** Explain the concept of **secure boot** and discuss how hardware-based security mechanisms help protect computer systems from unauthorized modifications during the boot process.	

Reference Books:

- Digital Design – M. Morris Mano, 5th Edition, Pearson Education.
- Digital Fundamentals – Thomas L. Floyd, 11th Edition, Pearson Education.
- Computer Organization and Architecture: Designing for Performance – William Stallings, 10th Edition, Pearson Education.
- Computer Organization and Design: The Hardware/Software Interface – David A. Patterson and John L. Hennessy, 5th Edition, Morgan Kaufmann.
- Hardware Security: Design, Threats, and Safeguards – Debdeep Mukhopadhyay and Rajat Subhra Chakraborty, 1st Edition, CRC Press.

Semester End Evaluation (50 Marks) **Time : 2 Hours**

Paper Pattern

Question No.	Questions	Total Marks : 50
Q1	Attempt 3 out of 5	15
Q2	Attempt 3 out of 5	15
Q3	Attempt 3 out of 5	15

Q4	Case Study	05

Practical Syllabus

Sr. No	List of Practical	No. of. Lectures	CO Mapping
1	Conversion between Binary, Decimal, Octal and Hexadecimal Number Systems	3	CO1
2	Performing Binary Addition and Subtraction Operations	3	CO1
3	Implementation and Verification of Basic Logic Gates (AND, OR, NOT)	3	CO2
4	Implementation and Verification of Universal Gates (NAND and NOR)	3	CO2
5	Implementation of XOR Gate and its Use in Simple Encryption	3	CO2
6	Design and Simulation of Half Adder Circuit	3	CO3
7	Design and Simulation of Full Adder Circuit	3	CO3
8	Design and Simulation of Multiplexer (MUX) Circuit	3	CO3
9	Simulation of Flip-Flops for Basic Data Storage	3	CO3
10	Study of Hardware Security Mechanisms in Computer Systems	3	CO4,CO5,CO6

Semester End Practical Evaluation **Time: 2 Hours**

Question No.	Questions	Total Marks
Q.1	Program	30
Q.2	Journal	10
Q.3	Viva & Attendance	10

BOS	**Mathematics, Statistics and Computer Application**				
Course	**Linux OS**				
Course Code	**HUSCY104**	**Level**	**4.5**		
		Type	**Theory**	**Practical**	**Total**
Semester	**I**	**Credits**	2	1	3
Type	**SEC**	**No of Teaching Hours**	30	30	60
Evaluation Pattern	**Total Marks**	**Semester End**	**Continuous**		**Practical**
	150	50	50		50

Learning Objectives	
1	Understand the fundamentals of the Linux operating system and its importance in the field of Cyber Security.
2	Gain knowledge of Linux file system structure and basic file handling operations.
3	Understand the Linux permission model, user management, and system security basics.
4	Learn process management techniques and basic networking concepts in Linux environment.
5	Develop basic shell scripting skills for performing simple automation tasks.
6	Build foundational skills required for advanced cybersecurity tools and system administration tasks.

Course Outcomes	
After successful completion of this course, students would be able to: -	
CO1	Explain basic concepts of Linux, its architecture, file system structure, and role in cybersecurit
CO2	Use Linux commands for file handling, user management, process monitoring, and basic networking tasks.
CO3	Analyze file permissions, process activities, and network configurations to understand system security.
CO4	Develop simple shell scripts using control structures to automate basic administrative and security tasks.

Modules at Glance

Module No.	Content	No. of Hours	CO Mapping
1	Linux System Fundamentals and Security Basics	15	CO1, CO2, CO3
2	Process Management, Networking and Shell Scripting	15	CO4, CO5, CO6

Syllabus

Module No.	Content	No. of Lectures
1	**Basics of Linux & OS:** Introduction to Operating Systems, Importance of Linux in Cyber Security, Linux Architecture: Kernel & Shell (basic idea), Open-source concept**,** Overview of Ubuntu and Kali Linux **Linux File System and Directory Structure**	15

	/home, /etc, /bin, /var, Absolute and relative paths, Basic use of help commands (man), Importance of file structure in security, Basic File Handling Commands **File & directory commands:** ls, cd, pwd, mkdir, rmdir File operations: cp, mv, rm, Viewing files: cat, less, File editing using nano editor **File Permissions and User Management :** File permissions: read, write, execute**,** chmod (basic symbolic method only), File ownership & chown, Root user and sudo privileges**,** Importance of permissions in security	
2	**Process Management in Linux:** Concept of processes, Foreground & background processes, Basic commands: ps, top, Terminating processes using kill, Importance of monitoring processes in security **Networking Basics in Linux:** Basic networking concepts (IP address), Checking network using ip command, testing connectivity using ping, Introduction to SSH (basic idea only), Role of networking in cybersecurity **Introduction to Shell Scripting:** Concept of Shell & Bash, Writing and running simple scripts, Script structure & execution permission, Variables and basic input/output (read, echo) **Control Structures in Shell Scripting :** Conditional statements (if-else), Loop (for loop only), Simple scripts: File checking, Display system info, Basic backup, Idea of automation in cybersecurity	15
Case Study Scenario		
M1	A company using a Linux system based on Ubuntu stores confidential project files in the /home/projects directory. Recently, it was found that some users accessed and modified files that were not assigned to them. The system administrator wants to restrict access so that only authorized users can read or modify specific files, while protecting important system files in the /etc directory. **Question:** As a Linux administrator, explain how you would use file permissions, ownership (chmod, chown), user groups, and sudo privileges to secure the system and prevent unauthorized access.	
M2	In a cybersecurity lab running Kali Linux, the system becomes slow during practical sessions. On investigation, it is suspected that some background processes are consuming high CPU resources. Additionally, some students report that they cannot connect to the internet. The lab instructor also wants a simple script to display basic system information daily. **Question:** Explain how you would identify and terminate high CPU-consuming processes, check network configuration and connectivity, and write a basic shell script to display system information such as current user and date.	

Reference Books:

1. **William E. Shotts Jr.**, *The Linux Command Line*, No Starch Press.
2. **Richard Blum and Christine Bresnahan**, *Linux Command Line and Shell Scripting Bible*, Wiley Publications.
3. **Jason Cannon**, *Linux for Beginners: An Introduction to the Linux Operating System and Command Line*, CreateSpace Independent Publishing.
4. **Evi Nemeth, Garth Snyder, Trent R. Hein and Ben Whaley**, *UNIX and Linux System Administration Handbook*, Pearson Education.
5. **The Linux Foundation**, *Introduction to Linux (LFS101x Course Material)*, Linux Foundation Publications.

Semester End Evaluation (50 Marks) **Time: 2 Hours**

Paper Pattern

Question No.	Questions	Total Marks : 50
Q1	Attempt 3 out of 5	15
Q2	Attempt 3 out of 5	15
Q3	Attempt 3 out of 5	15
Q4	Case Study	05

Practical Syllabus

Sr. No	List of Practical	No. of. Lectures	CO Mapping
1	Introduction to Linux interface and basic commands	3	CO1
2	File and directory management commands	3	CO2
3	Working with file permissions using chmod, chown	3	CO3
4	User and group management commands	3	CO3
5	Viewing and managing processes	3	CO4
6	Write a simple shell script to display system information	3	CO5
7	Write a script to accept user input and display a message	3	CO5
8	Write a shell script using if-else conditions	3	CO6
9	Write a script using loops to display numbers 1 to 10	3	CO6
10	Display network configuration using ip command; test network connectivity using ping	3	CO4

Semester End Practical Evaluation **Time: 2 Hours**

Question No.	Questions	Total Marks : 50
Q.1	Program	30
Q.2	Journal	10
Q.3	Viva & Attendance	10

BOS	**Mathematics, Statistics and Computer Application**				
Course	**Indian Roots of Information System**				
Course Code	**HUSCY105**	**Level**		**4.5**	
		Type		**Theory**	**Total**
Semester	**I**	**Credits**		**02**	**02**
Type	**IKS**	**No of Teaching hours**		**30**	**30**
Evaluation/ Assessment	**Total Marks**	**Semester End**	**Continuous**		**Practical**
	50	**-**	**50**		**-**

Learning Objectives	
1	To sensitize the students about context in which they are embedded i.e. Indian culture and civilisation including its Knowledge System and Tradition.
2	To help students to understand the knowledge, art and creative practices, skills and values in the ancient Indian system.
3	To introduce the contribution from Ancient Indian system & tradition to modern science & Technology.

Course Outcomes	
CO1	Learner will understand and appreciate the rich Indian Knowledge Tradition.
CO2	Learner will understand the contribution of Indians in various fields
CO3	Learner will experience increase subject-awareness and self-esteem

Modules At Glance

Module No.	**Content**	**No. of Lectures**	**Mapping with CO**
1	Introduction to Indian Knowledge System	15	CO1,CO2
2	Basics Applications inspired by IKS	15	CO2,CO3
		30	

Syllabus

Module No	**Content**	**No. of Lectures**
1	Introduction to Indian Knowledge System: Introduction to IKS: What is knowledge System, Characteristic & Features of Indian Knowledge System, Why IKS? : Cultural Awareness and Pride,Holistic Learning,Preservation and Innovation Tradition & Scope of IKS : Vedas and Upanishads,Mathematics in Ancient India, Architecture & Vāstu, Scope: Natural Language Processing (NLP),Artificial Intelligence & Machine Learning,Algorithm Optimization Inspired by Vedic Math History of Computers: Generations of Computers & Types of Computers	**15**

2	Basic Applications inspired by IKS Mathematics & Computation : Logic & Reasoning (Nyāya and Anumāna) Binary Concepts using Vedic Mathematics Patterns & Algorithms (Chandaḥśāstra – Prosody) & Language Structure (Paninian Grammar):Patterns in poetic meters → similar to binary sequences, Application in text analysis and compression algorithms, Concepts of meta-rules → foundations of programming languages , Influence on Natural Language Processing (NLP) Time Representation & Calendars (Panchanga): Ancient Indian calendars use complex astronomical data, Concepts of time, cycles → used in simulations, data modeling Classification and Categories (Ayurvedic Ontologies): Tridosa and Disease Classification,Knowledge Management,Data Analysis,Tools and Technologies	**15**
Case Study Scenario		
M1	An educational technology initiative aims to promote the Indian Knowledge System (IKS) by creating a digital platform that introduces its key characteristics, cultural significance, and holistic approach to learning. The platform highlights knowledge from the Vedas and Upanishads, showcases ancient Indian contributions to mathematics and science, and explains how traditional ideas of learning preservation and innovation remain relevant today, while drawing simple connections between ancient knowledge systems and the evolution of modern computing.	
M2	A research project applies concepts from Indian Knowledge Systems to modern technology by using Nyāya logic and Vedic mathematics for computational problem solving, Paninian grammar and Chhandashastra for text analysis and NLP, Panchanga-based time models for simulations, and Ayurvedic classifications for data organization, demonstrating how traditional frameworks can support modern data analysis and technological applications.	

References Books

1. Concise history of science in India- D.M. Bose, S.N Sen, B.V. Subbarayappa.
2. Positive sciences of the Ancient Hindus- Brajendranatha seal, Motilal Banrasidas, Delhi 1958.
3. History of Chemistry in Ancient India & Medieval India, P.Ray- Indian Chemicals Society,Calcutta 1956
4. Charaka Samhita- a scientific synopsis, P. Ray & H.N Gupta National Institute of Sciences of India, New Delhi 1965.
5. MacDonnell A.A- History of Sanskrit literature
6. Winternitz M- History of Indian Literature Vol. I, II & III
7. Dasgupta S.N & De S.K- History of Sanskrit literature Vol. I.
8. Ramkrishna Mission- cultural heritage of India Vol. I, II & III.
9. Majumdar R. C & Pushalkar A.D- History & culture of the Indian people, Vol. I, II & III.
10. Keith A.B- History of Sanskrit literature.
11. Varadachari V- History of Sanskrit literature Chaitanya Krishna- A new History of Sanskrit