Anekant Education Society's

Tuljaram Chaturchand College

of Arts, Science and Commerce, Baramati

(Empowered Autonomous)

Four Year B.Sc. Degree Program in Cyber Security and Digital Science

(Faculty of Science & Technology)

CBCS Syllabus

F.Y.B.Sc. (CS and DS) Semester – I

For Department of Cyber Security and Digital Science

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

Choice Based Credit System Syllabus

As Per NEP 2.0 (2024 Pattern)

To be implemented from Academic Year 2026 – 2027

Title of the Programme: Bachelor of Science (B.Sc.) in Cyber Security and Digital Science

Preamble

The rapid growth of digital technologies, internet connectivity, and data-driven systems has transformed modern society. However, this digital transformation has also increased the risk of cyber threats, data breaches, and cybercrime. Cyber Security and Digital Science have therefore become essential fields that focus on protecting information systems, securing digital infrastructure, and ensuring safe and responsible use of technology.

The **B.Sc. Cyber Security and Digital Science** program aims to provide students with a strong foundation in computing, programming, networking, and information security along with practical knowledge of modern cybersecurity techniques. The curriculum covers important areas such as cyber security fundamentals, ethical hacking, digital forensics, malware analysis, cloud security, IoT security, and cyber laws. Through practical sessions, projects, and hands-on training, students gain experience with cybersecurity tools and technologies used in the industry.

Designed in accordance with the National Education Policy (NEP) 2020, the program emphasizes skill development, problem-solving abilities, and industry relevance. It prepares students to identify cyber threats, protect digital systems, and apply ethical practices in the digital environment.

Graduates of this program will be equipped for careers such as Cyber Security Analyst, Digital Forensics Investigator, Security Consultant, and Network Security Specialist, and can also pursue higher studies and research in the field of cyber security and digital technologies.

Title of the Programme: F.Y.B.Sc. (Cyber Security and Digital Science)

Anekant Education Society's

Tuljaram Chaturchand College

of Arts, Science and Commerce Baramati, Dist.-Pune, MS, India.

(Empowered Autonomous)

Board of Studies in Cyber Security and Digital Science
(Academic Year 2025-26 to 2027-28)

Sr. No.	Name of Members	Designation
1.	**Mr. Rahul Adesh Shah** Assistant Professor, Department of Computer Science, T. C. College, Baramati	**Chairperson**
2.	**Dr. Upendra Durgadas Choudhari** Assistant Professor, Department of Statistics, T. C. College, Baramati	Member
3.	**Mr. Vishal Vilaskumar Shaha** Assistant Professor, Department of B.C.A., T. C. College, Baramati	Member
4.	**Ms. Prajkta Pankaj Kulkarni** Assistant Professor, Department of Computer Science, T. C. College, Baramati	Member
5.	**Mr. Swapnil Pandurang Chemte** Assistant Professor, Department of Computer Science, T. C. College, Baramati	Member
6.		Vice-Chancellor Nominee Subject Expert from SPPU, Pune
7.	**Dr. Rajashri A. Joshi** Assistant Professor, Department of Computer Science I.T., Deogiri College, Chhatrapati Sambhajinagar	Subject Expert from Outside the Parent University
8.	**Mr. Bhushan Santoshrao Kulkarni** Assistant Professor, Department of Computer Science I.T., Deogiri College, Chhatrapati Sambhajinagar	Subject Expert from Outside the Parent University
9.	**Mr. Vilas Raskar** Director, Rahitech IT Solutions, Pune	Representative from industry/corporate sector/allied areas
10.	**Dr. Mayank R. Kothawade** Assistant Professor, MCA Department, VIIT Baramati	Invitee Member
11.	**Mr. Tanishq Shah** Security Analyst, HackerOne, Pune	Member of the College Alumni

Anekant Education Society's

Tuljaram Chaturchand College

of Arts, Science & Commerce, Baramati.

Tuljaram Chaturchand College of Arts, Science & Commerce, Baramati is an empowered autonomous & dynamic institute and has successfully implemented the National Education Policy 2.0 2024 pattern since the academic year 2024-25. We are updating our academic policies as per local needs keeping in view the global perspectives. Accordingly, we have updated our program outcomes as per the graduate attributes defined in New Education Policy. In general, program outcomes are categorized into two categories as disciplinary & interdisciplinary outcomes and generic outcomes.

Program Outcomes for B.Sc.

PO.1. **Comprehensive Knowledge and Understanding**: Graduates will possess a profound understanding of their field of study, including foundational theories, principles, methodologies, and key concepts, within a broader multidisciplinary context.

PO.2. **Practical, Professional, and Procedural Knowledge**: Graduates will acquire practical skills and expertise essential for professional tasks within their field. This includes knowledge of industry standards, best practices, regulations, and ethical considerations, with the ability to apply this knowledge effectively in real-world scenarios.

PO.3. **Entrepreneurial Mindset and Knowledge**: Graduates will cultivate an entrepreneurial mindset, identifying opportunities, fostering innovation, and understanding business principles, market dynamics, and risk management strategies.

PO.4. **Specialized Skills and Competencies**: Graduates will demonstrate proficiency in technical skills, analytical abilities, problem-solving, effective communication, and leadership, relevant to their field of study. They will also adapt and innovate in response to changing circumstances.

PO.5. **Capacity for Application, Problem-Solving, and Analytical Reasoning**: Graduates will possess the capacity to apply learned concepts in practical settings,

solve complex problems, and analyze data effectively. This requires critical thinking, creativity, adaptability, and a readiness to learn and take calculated risks.

PO.6. **Communication Skills and Collaboration**: Graduates will effectively communicate complex information, both orally and in writing, using appropriate media and language. They will also collaborate effectively in diverse teams, demonstrating leadership qualities and facilitating cooperative efforts toward common goals.

PO.7. **Research-related Skills**: Graduates will demonstrate observational and inquiry skills, formulate research questions, and utilize appropriate methodologies for data collection and analysis. They will also adhere to research ethics and effectively report research findings.

PO.8. **Learning How to Learn Skills**: Graduates will acquire new knowledge and skills through self-directed learning, adapt to changing demands, and set and achieve goals independently.

PO.9. **Digital and Technological Skills**: Graduates will demonstrate proficiency in using ICT, accessing information sources, and analyzing data using appropriate software.

PO.10. **Multicultural Competence, Inclusive Spirit, and Empathy**: Graduates will engage effectively in multicultural settings, respecting diverse perspectives, leading diverse teams, and demonstrating empathy and understanding of others' perspectives and emotions.

PO.11. **Value Inculcation and Environmental Awareness**: Graduates will embrace ethical and moral values, practice responsible citizenship, recognize and address ethical issues, and take appropriate actions to promote sustainability and environmental conservation.

PO.12. **Autonomy, Responsibility, and Accountability**: Graduates will apply knowledge and skills independently, manage projects effectively, and demonstrate responsibility and accountability in work and learning contexts.

PO.13. **Community Engagement and Service**: Graduates will actively participate in community-engaged services and activities, promoting societal well-being.

Programme Specific Outcomes (PSOs)

PSO1: Cyber Security Fundamentals

Apply fundamental concepts of cyber security, networking, operating systems, and programming to understand and secure digital systems.

PSO2: Threat Identification and Prevention

Identify cyber threats, vulnerabilities, and attacks, and implement appropriate security measures to protect computer systems and networks.

PSO3: Ethical Hacking and Penetration Testing

Use ethical hacking techniques and security tools to assess system vulnerabilities and strengthen organizational security posture.

PSO4: Digital Forensics and Investigation

Perform digital forensic analysis to collect, preserve, and analyze digital evidence for cybercrime investigation.

PSO5: Secure System and Network Design

Design and implement secure architectures for networks, applications, and information systems using modern cybersecurity practices.

PSO6: Legal and Ethical Cyber Practices

Understand cyber laws, digital policies, and ethical responsibilities related to cyber security and information protection.

PSO7: Industry Readiness and Research Skills

Develop practical skills through projects, internships, and research to address real-world cyber security challenges.

Credit Distribution Structure for Three/Four Year Honours/Honours with Research Degree Programme With Multiple Entry and Exit options as per National Education Policy (2024 Pattern as per NEP-2020)

Level/ Difficulty	Sem	Subject CDS-1				Subject CDS-2	Subject CDS-3	GE/OE	SEC	IKS	AEC	VEC	CC	Total
4.5/100	I	2(T)+2(P)				2(T)+2(P)	2(T)+ 2(P)	2(T)	2 (T/P)	2(T) (Generic)	2(T)	2(T)	--	22
	II	2(T)+2(P)				2(T)+2(P)	2(T)+2(P)	2(P)	2 (T/P)	--	2(T)	2(T)	2(T	22
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/Internship OR Continue with Major and Minor **Continue option**: Student will select one subject among the (subject 1, subject 2 and subject 3) as major and other as minor and third subject will be dropped.														
Level/ Difficulty	**Sem**	**Credits Related to Major**				**Minor**	--	**GE/OE**	**SEC**	**IKS**	**AEC**	**VEC**	**CC**	**Total**
		Major Core	**Major Elective**	**VSC**	**FP/OJT/CEP/RP**									
5.0/200	III	4(T)+2(P)	--	2 (T/P)	2(FP)	2(T)+2(P)	--	2(T)	--	2(T)	2(T)	--	2(T)	22
	IV	4(T)+2(P)	--	2 (T/P)	2(CEP)	2(T)+2(P)	--	2(P)	2 (T/P)	--	2(T)	--	2(T)	22
Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4credits core NSQF course/Internship OR Continue with Major and Minor														
5.5/300	V	8(T)+4(P)	2(T)+2(P)		4 (OJT)	2(T)	--	--	--	--	--	--	--	22
	VI	8(T)+4(P)	2(T)+2(P)	4 (T/P)	2(FP/CEP)	--	--	--	--	--	--	--	--	22
Total 3Years		**44**	**8**	**8**	**10**	**18**	**8**	**8**	**6**	**4**	**8**	**4**	**6**	**132**
Exit option: Award of **UG Degree in Major** with 132 credits OR Continue with Major and Minor														
6.0/400	VII	6(T)+4(P)	2(T)+2 (T/P)	--	4(RP)	4(RM)(T)	--	--	--	--	--	--	--	22
	VIII	6(T)+4(P)	2(T)+2 (T/P)	--	8(RP)	--	--	--	--	--	--	--	--	22
Total 4Years		**64**	**16**	**8**	**22**	**22**	**8**	8	**6**	**4**	**8**	**4**	**6**	**176**
Four Year **UG Honours with Research Degree** in Major and Minor with 176 credits														
6.0/400	VII	10(T)+4(P)	2(T)+2 (T/P)	--	--	4(RM) (T)	--	--	--	--	--	--	--	22
	VIII	10(T)+4(P)	2(T)+2 (T/P)	--	4 (OJT)	--	--	--	--	--	--	--	--	22
Total 4Years		**72**	**16**	**8**	**14**	**22**	**8**	8	**6**	**4**	**8**	**4**	**6**	**176**
Four Year **UG Honours Degree** in Major and Minor with 176 credits														

T = Theory **P** = Practical **CDS =** Discipline Specific Course **OE =** Open Elective **SEC =** Skill Enhancement Course
IKS = Indian Knowledge System **AEC =** Ability Enhancement Course **VEC =** Value Education Course **CC =** Co-curricular Course
VSC= Vocational Skill Course **OJT**= On Job Training **CEP**= Community Engagement Project **FP**= Field Project **RP**= Research Project

Course Structure for F.Y.B.Sc. (CS and DS) (2024 Pattern as per NEP- 2.0)

Sem	Course Type	Course Code	Course Title	Theory/ Practical	Credits
I	CDS-I (General)	CDS-101-GEN	Fundamentals of Linux System and Administration	T	02
		CDS-102-GEN	Practical Based on Fundamentals of Linux System and Administration	P	02
	CDS-II (General)	CDS-103-GEN	Fundamentals of C Programming	T	02
		CDS-104-GEN	Practical Based on Fundamentals of C Programming	P	02
	CDS-III (General)	CDS-105-GEN	Computer Architecture & Operating System Basics	T	02
		CDS-106-GEN	Practical Based on Computer Architecture & OS Basics	P	02
	Open Elective (OE)	CDS-107-OE	Cyber Hygiene and Digital Privacy	T	02
	Skill Enhancement Course (SEC)	CDS-108-SEC	Cyber Security Tools Basics Lab	P	02
	Ability Enhancement Course (AEC)	ENG-104-AEC	Functional English – I	T	02
	Value Education Course (VEC)	ENV-105-VEC	Environmental Science	T	02
	Generic Indian Knowledge System (GIKS)	GEN-106-IKS	Generic Indian Knowledge System	T	02
				Total Credits Semester- I	**22**
II	CDS-I (General)	CDS-151-GEN	Fundamentals of Cyber Security	T	02
		CDS-152-GEN	Practical Based on Fundamentals of Cyber Security	P	02
	CDS-II (General)	CDS-153-GEN	Network Security Fundamentals	T	02
		CDS-154-GEN	Practical Based on Network Security	P	02
	CDS-III (General)	CDS-155-GEN	Python Programming	T	02
		CDS-156-GEN	Practical Based on Python Programming	P	02
	Open Elective (OE)	CDS-157-OE	Secure Cloud and Internet Tools	P	02
	Skill Enhancement Course (SEC)	CDS-158-SEC	Network Monitoring and Security Tools Lab	P	02
	Ability Enhancement Course (AEC)	ENG-154-AEC	Functional English – II	T	02
	Value Education Course (VEC)	COS-155-VEC	Digital and Technological Solutions	T	02
	Co-curricular Course (CC)	YOG/PES/CUL/NSS/NCC-156-CC	To be selected from CC Basket	T	02
				Total Credits Semester- II	**22**
				Cumulative Credits Semester I + Semester II	**44**

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Cyber Security and DS (2024 Pattern)

Name of the Programme : B.Sc. Cyber Security and Digital Science

Programme Code : USCDS

Class : F.Y.B.Sc.

Semester : I

Course Type : CDS (General) (Theory)

Course Code : CDS-101-GEN

Course Title : Fundamentals of Linux System and Administration

No. of Credits : 02

No. of Teaching Hours : 30

Course Objectives:

1. To introduce students to the **Linux operating system environment** and its features.
2. To understand **basic Linux commands and file system structure**.
3. To develop skills for **file and directory management in Linux**.
4. To understand **user accounts and permission management**.
5. To introduce **process management and system monitoring**.
6. To familiarize students with **basic shell operations and scripting concepts**.
7. To develop the ability to **administer and manage Linux systems effectively**.

Course Outcome:

By the end of the course, students should be able to:

CO1. Explain the architecture and features of the Linux operating system.

CO2. Use Linux commands for file and directory management.

CO3. Manage users, groups, and file permissions in Linux.

CO4. Perform system operations using shell commands.

CO5. Monitor and control system processes.

CO6. Apply basic shell scripting for task automation.

CO7. Configure and manage a Linux environment for basic administrative tasks.

Topics and Learning Points

UNIT No.	Chapter Name with Topics	No. of Lectures Required
UNIT- I	**Introduction to Linux System** 1.1 Introduction to operating systems: definition, functions and types	7

	1.2 Introduction to Linux: history, features and advantages 1.3 Open-source concept and Linux distributions (Ubuntu, Fedora, Debian etc.) 1.4 Linux architecture: kernel, shell, utilities and user interface 1.5 Introduction to Linux terminal and command structure 1.6 Help and documentation commands: man, help, info 1.7 Basic terminal operations and command usage	
UNIT- II	**Linux File System and File Management** 2.1 Linux file system structure and directory hierarchy 2.2 Navigating directories: pwd, cd, ls commands 2.3 File and directory management: mkdir, rmdir, cp, mv, rm 2.4 File viewing commands: cat, more, less, head, tail 2.5 File searching commands: find, locate, which 2.6 File compression and archiving basics 2.7 File ownership concepts: user, group and others 2.8 File permissions and permission modification commands: chmod, chown	8
UNIT-III	**User and Process Management** 3.1 User accounts and group concepts in Linux 3.2 User management commands: useradd, userdel, usermod, passwd 3.3 Group management basics 3.4 Process concepts and process states 3.5 Process management commands: ps, top, kill 3.6 System monitoring commands: df, du, free, uptime 3.7 Managing background and foreground processes	**7**
UNIT-IV	**Shell and Basic Shell Scripting** 4.1 Introduction to shell and types of shells 4.2 Shell environment and command interpretation 4.3 Environment variables and system variables 4.4 Input and output redirection 4.5 Piping commands and command chaining 4.6 Basics of shell scripting and script structure 4.7 Conditional statements and loops in shell scripts 4.8 Writing simple shell scripts for basic automation tasks	**8**

References:

1. Christopher Negus, Linux Bible, 10th Edition, Wiley, 2020.
2. William Shotts, The Linux Command Line: A Complete Introduction, No Starch Press, 2019.
3. Richard Blum, Christine Bresnahan, Linux Command Line and Shell Scripting Bible, 4th Edition, Wiley, 2020.
4. Jason Cannon, Linux for Beginners: An Introduction to the Linux Operating System and Command Line, CreateSpace Independent Publishing Platform, 2016.

Programme Outcomes and Course Outcomes Mapping:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	2	1	2	2	1	1	1	1	1	1	1	2
CO2	2	3	1	3	2	1	1	2	2	1	1	1	2
CO3	2	3	1	3	3	1	1	2	2	1	1	1	2
CO4	2	3	1	3	2	2	1	2	2	1	1	1	2
CO5	2	3	1	2	3	2	1	2	2	1	1	1	2
CO6	3	3	1	3	3	2	1	2	2	1	1	1	2
CO7	3	3	1	3	3	2	1	2	2	2	1	1	2

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Justification of CO-PO Mapping:

PO1: Comprehensive Knowledge and Understanding
- Strongly mapped with CO1, CO6, CO7 as students understand Linux architecture, commands, and system administration fundamentals.
- Justification: The course builds foundational knowledge of operating systems and Linux environments.

PO2: Practical and Professional Skills
- Strongly mapped with CO2, CO3, CO4, CO5, CO6, CO7.
- Justification: Students gain hands-on experience in Linux command usage, file management, user management, and scripting.

PO3: Data Handling and Management
- Partially mapped with CO2 and CO3.
- Justification: File system operations, file permissions, and directory management introduce basic data handling concepts.

PO4: Problem Solving and Analytical Thinking
- Strongly mapped with CO2, CO3, CO4, CO6.
- Justification: Linux commands and scripting enable students to solve system-level problems.

PO5: Modern Tools Usage
- Strongly mapped with CO3, CO5, CO6, CO7.
- Justification: Students learn modern open-source tools and Linux system utilities.

PO6: Professional and Ethical Responsibility
- Moderately mapped with CO4, CO5, CO6.
- Justification: Understanding system administration and permissions promotes responsible system usage.

PO7: Individual and Team Work
- Partially mapped with CO4 and CO6 through practical and lab-based exercises.

PO8: Communication Skills
- Partially mapped with CO2 and CO4 as students interpret commands, documentation, and system outputs.

PO9: Lifelong Learning
- Moderately mapped with CO5, CO6, CO7.
- Justification: Exposure to open-source systems encourages continuous learning.

PO10–PO13
- Partially mapped as the course contributes foundational knowledge supporting advanced cybersecurity and system administration studies.

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Cyber Security and DS (2024 Pattern)

Name of the Programme	**:** B.Sc. Cyber Security and Digital Science
Programme Code	**:** USCDS
Class	**:** F.Y.B.Sc.
Semester	**:** I
Course Type	**:** CDS (General) (Practical)
Course Code	**:** CDS-102-GEN
Course Title	**:** Practical Based on Fund. of Linux System and Administ.
No. of Credits	**:** 02
No. of Teaching Hours	**:** 60

Course Objectives:

The main objective of this course is to get knowledge about

1. To familiarize students with the Linux operating system environment.
2. To develop skills in using Linux command line interface.
3. To perform file and directory management using Linux commands.
4. To understand user and permission management in Linux.
5. To practice process and system monitoring commands.
6. To introduce basic shell operations and scripting.
7. To develop practical skills for basic Linux system administration tasks.

Course Outcomes:

After completing this course, students will possess skills concerning:

CO1: Use Linux terminal and basic commands effectively.

CO2: Perform file and directory management operations in Linux.

CO3: Manage file permissions and ownership.

CO4: Create and manage user accounts and groups.

CO5: Monitor and control system processes.

CO6: Use shell features such as piping and redirection.

CO7: Develop simple shell scripts for automation tasks.

Topics and Learning Points

Sr. No.	Title of Practical
1	Study of Linux environment and basic terminal commands.
2	Practice of file and directory management commands (pwd, ls, cd, mkdir, rmdir).
3	File handling commands (cp, mv, rm, touch).
4	Viewing and editing files using commands (cat, more, less, head, tail).
5	File searching commands (find, locate, which).
6	File compression and archiving commands (tar, gzip, unzip).
7	Study and implementation of file permissions using chmod command.
8	Changing file ownership using chown and chgrp commands.
9	Creating and managing user accounts (useradd, userdel, passwd).
10	Study of process management commands (ps, top, kill).
11	System monitoring commands (df, du, free, uptime).
12	Input and output redirection operations.
13	Use of pipe operator for command chaining.
14	Writing simple shell scripts using variables.
15	Writing shell scripts using conditional statements and loops.

Note:

1. Every practical is equivalent to four hours per batch per week
2. Practical batch should be of 15 students
3. Students must complete all the practical's to the satisfaction of the teacher concerned.
4. Students must produce at the time of practical examination, the laboratory journal along with the completion certificate signed by the Head of the Department.

References:

1. Christopher Negus, Linux Bible, 10th Edition, Wiley, 2020.
2. William Shotts, The Linux Command Line: A Complete Introduction, No Starch Press, 2019.
3. Richard Blum, Christine Bresnahan, Linux Command Line and Shell Scripting Bible, 4th Edition, Wiley, 2020.
4. Jason Cannon, Linux for Beginners: An Introduction to the Linux Operating System and Command Line, CreateSpace, 2016.

Programme Outcomes and Course Outcomes Mapping:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	2	3	1	2	3	1	1	1	2	1	1	1	2
CO2	2	3	1	3	3	1	1	2	2	1	1	1	2
CO3	2	3	1	3	3	1	1	2	2	1	1	1	2
CO4	2	3	1	3	3	2	1	2	2	1	1	1	2
CO5	2	3	1	2	3	2	1	2	2	1	1	1	2
CO6	3	3	1	3	3	2	1	2	2	1	1	1	2
CO7	3	3	1	3	3	2	1	2	2	2	1	1	2

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Justification of CO-PO Mapping:

PO1: Comprehensive Knowledge and Understanding

- Strongly mapped with CO6 and CO7, moderately with CO1–CO5.

- Justification: Students gain foundational understanding of Linux commands, file systems, and system administration practices.

PO2: Practical, Professional, and Procedural Knowledge

- Strongly mapped with CO1–CO7.

- Justification: The practical course emphasizes hands-on execution of Linux commands, user management, permissions, and scripting, which develops strong professional skills.

PO3: Data Handling, Storage, and Retrieval

- Partially mapped with CO2 and CO3.

- Justification: File management and permission handling involve basic data storage and retrieval concepts in Linux systems.

PO4: Problem Solving and Analytical Thinking

- Strongly mapped with CO2, CO3, CO4, CO6, CO7.

- Justification: Students solve system-level tasks using Linux commands and scripting techniques.

PO5: Modern Tool Usage

- Strongly mapped with CO1–CO7.

- Justification: Students gain experience with Linux terminal tools and system utilities widely used in cybersecurity and system administration.

PO6: Professional and Ethical Responsibility

- Moderately mapped with CO4, CO5, CO6, CO7.

- Justification: Understanding user permissions, system processes, and administrative commands promotes responsible system usage.

PO7: Individual and Team Work

- Partially mapped with CO4 and CO6 through collaborative lab exercises and practical tasks.

PO8: Communication Skills

- Moderately mapped with CO2–CO6 as students interpret command outputs, documentation, and error messages.

PO9: Lifelong Learning

- Moderately mapped with CO5, CO6, CO7.

- Justification: Exposure to open-source Linux systems encourages continuous learning and exploration of advanced system administration topics.

PO10 – PO13

- Partially mapped as the course builds foundational skills that support advanced cybersecurity, networking, and system administration courses in later semesters.

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Cyber Security and DS (2024 Pattern)

Name of the Programme	**:** B.Sc. Cyber Security and Digital Science
Programme Code	**:** USCDS
Class	**:** F.Y.B.Sc.
Semester	**:** I
Course Type	**:** CDS (General) (Theory)
Course Code	**:** CDS-103-GEN
Course Title	**:** Fundamentals of C Programming
No. of Credits	**:** 02
No. of Teaching Hours	**:** 30

Course Objectives:

1. To introduce students to the basic concepts of programming and problem solving.
2. To understand the structure and syntax of C programming language.
3. To develop the ability to write simple C programs using variables and operators.
4. To understand decision making and looping constructs in C.
5. To develop skills in array and string handling in C.
6. To introduce functions and modular programming concepts.
7. To develop logical thinking and problem-solving skills through programming.

Course Outcome:

By the end of the course, students should be able to:

CO1: Explain the fundamentals and structure of C programming language.

CO2: Write C programs using variables, data types, and operators.

CO3: Apply decision-making statements to solve programming problems.

CO4: Implement looping constructs for repetitive tasks.

CO5: Develop programs using arrays and strings.

CO6: Use functions for modular programming.

CO7: Design simple programs to solve computational problems.

Topics and Learning Points

UNIT No.	Chapter Name with Topics	No. of Lectures Required
UNIT- I	**Introduction to Programming and C Language** 1.1 Introduction to programming: problem solving concepts and steps 1.2 Algorithms and flowcharts: concepts and examples 1.3 Overview of C language: history, features and applications 1.4 Structure of a C program 1.5 Character set, tokens and keywords 1.6 Data types and variables in C 1.7 Input and output statements (printf, scanf)	**7**
UNIT- II	**Operators and Decision Making** 2.1 Operators in C: arithmetic, relational, logical and assignment 2.2 Expression evaluation and operator precedence 2.3 Conditional statements: if, if–else, nested if 2.4 Multi-way decision using switch statement 2.5 Conditional operator 2.6 Logical expressions and program examples 2.7 Simple problem-solving using decision statements	7
UNIT-III	**Looping and Arrays** 3.1 Looping concepts and types of loops 3.2 while loop and program examples 3.3 for loop and nested loops 3.4 do–while loop 3.5 Break and continue statements 3.6 One dimensional arrays: declaration and initialization 3.7 Array operations and applications 3.8 Introduction to strings and string handling functions	**8**
UNIT-IV	**Functions and Basic Programming Applications** 4.1 Concept of functions and modular programming 4.2 Types of functions in C 4.3 Function declaration, definition and calling 4.4 Passing arguments to functions 4.5 Recursive functions (basic concept) 4.6 Storage classes (basic idea) 4.7 Simple program development using functions	**8**

References:

1) Brian W. Kernighan, Dennis M. Ritchie, The C Programming Language, 2nd Edition, Prentice Hall, 1988.
2) E. Balagurusamy, Programming in ANSI C, 8th Edition, McGraw Hill, 2019.
3) Byron Gottfried, Programming with C, 3rd Edition, Schaum's Outline Series, McGraw Hill.
4) Yashavant Kanetkar, Let Us C, 18th Edition, BPB Publications, 2020.

Programme Outcomes and Course Outcomes Mapping:

Course Outcomes	Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	2	1	2	2	1	1	1	1	1	1	1	2
CO2	3	3	1	3	3	1	1	2	2	1	1	1	2
CO3	2	3	1	3	3	1	1	2	2	1	1	1	2
CO4	2	3	1	3	3	1	1	2	2	1	1	1	2
CO5	2	3	2	3	3	1	1	2	2	1	1	1	2
CO6	3	3	1	3	3	1	1	2	2	1	1	1	2
CO7	3	3	2	3	3	2	1	2	2	1	1	1	2

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Justification of CO-PO Mapping:

PO1: Comprehensive Knowledge and Understanding

- Strongly mapped with CO1, CO2, CO6, CO7.
- Justification: Students understand programming fundamentals, program structure, and modular programming concepts.

PO2: Practical, Professional, and Procedural Knowledge

- Strongly mapped with CO2, CO3, CO4, CO5, CO6, CO7.
- Justification: Writing programs using operators, decision statements, loops, arrays, and functions develops practical programming skills.

PO3: Data Handling, Storage, and Retrieval

- Moderately mapped with CO5 and CO7.
- Justification: Arrays and strings introduce students to data storage and manipulation techniques.

PO4: Problem Solving and Analytical Thinking

- Strongly mapped with CO2–CO7.
- Justification: Programming exercises require logical thinking and algorithmic problem-solving.

PO5: Modern Tool Usage

- Strongly mapped with CO2–CO7.
- Justification: Students use compilers, programming environments, and debugging tools to develop programs.

PO6: Professional and Ethical Responsibility

- Moderately mapped with CO7.
- Justification: Writing structured and efficient programs promotes professional coding practices.

PO7: Individual and Team Work

- Partially mapped with CO4 and CO7 through lab assignments and collaborative learning.

PO8: Communication Skills

- Moderately mapped with CO2–CO6 as students interpret program logic, errors, and documentation.

PO9: Lifelong Learning

- Moderately mapped with CO6 and CO7.
- Justification: Programming fundamentals motivate students to explore advanced programming languages and technologies.

PO10 – PO13

- Partially mapped as this course provides foundation knowledge for advanced courses in cybersecurity, software development, and system programming.

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Cyber Security and DS (2024 Pattern)

Name of the Programme : B.Sc. Cyber Security and Digital Science

Programme Code : USCDS

Class : F.Y.B.Sc.

Semester : I

Course Type : CDS (General) (Practical)

Course Code : CDS-104-GEN

Course Title : Practical Based on Fundamentals of C Programming

No. of Credits : 02

No. of Teaching Hours : 60

Course Objectives:

1) To develop practical skills in **writing and executing C programs**.
2) To understand the use of **variables, data types, and operators** in programming.
3) To implement **decision making and looping constructs** through programs.
4) To develop programs using **arrays and strings**.
5) To apply **functions for modular programming**.
6) To improve logical thinking through **problem solving using C programs**.
7) To practice **debugging and testing of C programs**.

Course Outcomes:

By the end of the course, students should be able to:

CO1: Write and execute basic C programs using a compiler.

CO2: Implement arithmetic operations and expressions using C programs.

CO3: Develop programs using conditional statements.

CO4: Implement iterative solutions using loops.

CO5: Develop programs using arrays and strings.

CO6: Implement user-defined functions in C programs.

CO7: Design simple programs to solve real-world computational problems.

Topics and Learning Points

Sr. No.	Title of Experiment
1	Study of C programming environment and structure of a C program.
2	Program to perform arithmetic operations using operators.
3	Program to calculate area and perimeter of geometric shapes.
3	Program to find the largest of three numbers using if–else statement.
4	Program to implement switch-case statement.
5	Program to generate multiplication table using loops.
6	Program to find factorial of a number using loop.
7	Program to check whether a number is prime or not.
7	Program to generate Fibonacci series.
8	Program to perform operations on one-dimensional arrays.
9	Program to find maximum and minimum elements in an array.
10	Program to perform string operations (length, copy, compare).
11	Program using user-defined functions for arithmetic operations.
12	Program using recursive functions (factorial or Fibonacci).
13	Program to solve simple real-life problems using functions and loops.
14	Study of C programming environment and structure of a C program.
15	Program to perform arithmetic operations using operators.

Note:

1. Every practical is equivalent to four hours per batch per week
2. Practical batch should be of 15 students
3. Students must complete all the practical's to the satisfaction of the teacher concerned.
4. Students must produce at the time of practical examination, the laboratory journal along with the completion certificate signed by the Head of the Department.

References:

1) Brian W. Kernighan, Dennis M. Ritchie, *The C Programming Language*, 2nd Edition, Prentice Hall.
2) E. Balagurusamy, *Programming in ANSI C*, 8th Edition, McGraw Hill.
3) Byron Gottfried, *Programming with C*, Schaum's Outline Series, McGraw Hill.
4) Yashavant Kanetkar, *Let Us C*, 18th Edition, BPB Publications.

Programme Outcomes and Course Outcomes Mapping:

Course Outcomes	Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	2	3	1	2	3	1	1	1	2	1	1	1	2
CO2	2	3	1	3	3	1	1	2	2	1	1	1	2
CO3	2	3	1	3	3	1	1	2	2	1	1	1	2
CO4	2	3	1	3	3	1	1	2	2	1	1	1	2
CO5	2	3	2	3	3	1	1	2	2	1	1	1	2
CO6	3	3	1	3	3	2	1	2	2	1	1	1	2
CO7	3	3	2	3	3	2	1	2	2	1	1	1	2

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Justification of CO-PO Mapping:

PO1: Comprehensive Knowledge and Understanding

- Moderately mapped with CO1–CO5 and strongly with CO6 and CO7.

- Justification: Students gain fundamental understanding of programming logic, syntax, and program structure.

PO2: Practical, Professional, and Procedural Knowledge

- Strongly mapped with CO1–CO7.

- Justification: Practical programming exercises develop coding, debugging, and implementation skills required for software development.

PO3: Data Handling and Management

- Moderately mapped with CO5 and CO7.

- Justification: Programs involving arrays and strings introduce basic data storage and manipulation techniques.

PO4: Problem Solving and Analytical Thinking

- Strongly mapped with CO2–CO7.

- Justification: Students apply programming constructs to solve computational and logical problems.

PO5: Modern Tool Usage

- Strongly mapped with CO1–CO7.

- Justification: Students use compilers, IDEs, and debugging tools for program development.

PO6: Professional and Ethical Responsibility

- Moderately mapped with CO6 and CO7.

- Justification: Writing structured programs and debugging promotes responsible coding practices.

PO7: Individual and Team Work

- Partially mapped with CO4 and CO6 through practical lab exercises and collaborative problem solving.

PO8: Communication Skills

- Moderately mapped with CO2–CO6 as students interpret program logic, errors, and outputs.

PO9: Lifelong Learning

- Moderately mapped with CO6 and CO7.

- Justification: Programming fundamentals encourage continuous learning of advanced languages and technologies.

PO10 – PO13

- Partially mapped as this course builds foundational programming skills that support advanced courses in cybersecurity, data science, and software development.

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Cyber Security and DS (2024 Pattern)

Name of the Programme : B.Sc. Cyber Security and Digital Science
Programme Code : USCDS
Class : F.Y.B.Sc.
Semester : I
Course Type : CDS (General) (Theory)
Course Code : CDS-105-GEN
Course Title : Computer Architecture & Operating System Basics
No. of Credits : 02
No. of Teaching Hours : 30

Course Objectives:

1) To introduce the **basic structure and components of computer systems**.
2) To understand **data representation and number systems used in computers**.
3) To explain the **basic architecture and functioning of CPU and memory**.
4) To understand **input and output devices and storage systems**.
5) To introduce the **concepts and functions of operating systems**.
6) To understand **process management and memory management basics**.
7) To develop a fundamental understanding of **computer system operations**.

Course Outcome:

By the end of the course, students should be able to:

CO1: Explain the basic organization and components of a computer system.
CO2: Apply number systems and data representation concepts in computing.
CO3: Describe the architecture and working of CPU and memory units.
CO4: Identify different input, output, and storage devices.
CO5: Explain the functions and types of operating systems.
CO6: Describe basic concepts of process and memory management.
CO7: Understand the role of operating systems in managing computer resources.

Topics and Learning Points

UNIT No.	Chapter Name with Topics	No. of Lectures Required
UNIT- I	**Computer System Fundamentals** 1.1 Introduction to computer systems: characteristics and applications 1.2 Basic components of a computer system 1.3 Functional units of a computer: input unit, output unit, memory unit, CPU 1.4 Number systems: binary, decimal, octal and hexadecimal 1.5 Data representation and binary arithmetic 1.6 Introduction to computer organization and architecture 1.7 Overview of hardware and software components	7

UNIT- II	**CPU and Memory Organization** 2.1 Structure and functions of Central Processing Unit (CPU) 2.2 Arithmetic Logic Unit (ALU) and Control Unit 2.3 Registers and instruction cycle 2.4 Types of memory: primary and secondary memory 2.5 RAM, ROM and cache memory 2.6 Memory hierarchy and storage organization 2.7 Secondary storage devices 2.8 Performance factors affecting computer systems	**8**
UNIT-III	**Input–Output Devices and Storage Systems** 3.1 Introduction to input and output devices 3.2 Common input devices: keyboard, mouse, scanner 3.3 Common output devices: monitor, printer, speakers 3.4 Storage devices: hard disk, SSD, optical storage 3.5 Data storage concepts and storage media 3.6 Device controllers and I/O interfaces 3.7 Introduction to peripheral devices	**7**
UNIT-IV	**Operating System Basics** 4.1 Introduction to operating systems and their functions 4.2 Types of operating systems: batch, time-sharing, real-time 4.3 Process concept and process states 4.4 Memory management basics 4.5 File system concepts 4.6 Device management in operating systems 4.7 User interface and system utilities 4.8 Examples of operating systems (Linux, Windows, macOS)	**8**

References:

1) William Stallings, *Computer Organization and Architecture*, 10th Edition, Pearson, 2016.
2) Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, *Operating System Concepts*, 10th Edition, Wiley, 2018.
3) Carl Hamacher, Zvonko Vranesic, Safwat Zaky, *Computer Organization*, 6th Edition, McGraw Hill.
4) Andrew S. Tanenbaum, Herbert Bos, *Modern Operating Systems*, 4th Edition, Pearson.

Programme Outcomes and Course Outcomes Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	2	1	2	2	1	1	1	1	1	1	1	2
CO2	3	2	2	2	2	1	1	1	1	1	1	1	2
CO3	3	2	1	2	2	1	1	1	1	1	1	1	2
CO4	2	2	1	2	2	1	1	1	1	1	1	1	2
CO5	3	2	1	2	2	1	1	1	2	1	1	1	2
CO6	2	2	1	2	2	1	1	1	2	1	1	1	2
CO7	3	2	1	2	2	1	1	1	2	1	1	1	2

Weight: 1 – Partially related 2 – Moderately Related 3 – Strongly related

Justification of CO-PO Mapping:

PO1: Comprehensive Knowledge and Understanding
- Strongly mapped with CO1, CO2, CO3, CO5, CO7.
- Justification: The course builds foundational knowledge of computer architecture, memory systems, and operating systems.

PO2: Practical and Professional Skills
- Moderately mapped with CO1–CO7.
- Justification: Understanding hardware architecture and OS concepts supports practical system usage and system administration.

PO3: Data Handling and Storage
- Moderately mapped with CO2.
- Justification: Number systems and data representation concepts are fundamental to data processing and storage.

PO4: Problem Solving and Analytical Thinking
- Moderately mapped with CO1–CO7.
- Justification: Understanding computer system organization helps students analyze system-level problems.

PO5: Modern Tool Usage
- Moderately mapped with CO1–CO7.
- Justification: Knowledge of system architecture and operating systems enables effective use of modern computing platforms.

PO6: Professional and Ethical Responsibility
- Partially mapped with CO5 and CO6.
- Justification: Understanding operating system functions and resource management promotes responsible system usage.

PO7: Individual and Team Work
- Partially mapped as the course contributes to collaborative learning in lab environments and project work.

PO8: Communication Skills
- Partially mapped through interpretation of system documentation and technical concepts.

PO9: Lifelong Learning
- Moderately mapped with CO5, CO6, CO7.
- Justification: Understanding operating systems encourages further learning in system administration, networking, and cybersecurity.

PO10 – PO13
- Partially mapped since this course provides foundational knowledge that supports advanced subjects such as operating systems, cybersecurity, networking, and system administration.

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Cyber Security and DS (2024 Pattern)

Name of the Programme	**:** B.Sc. Cyber Security and Digital Science
Programme Code	**:** USCDS
Class	**:** F.Y.B.Sc.
Semester	**:** I
Course Type	**:** CDS (General) (Practical)
Course Code	**:** CDS-106-GEN
Course Title	**:** Practical Based on Computer Architecture & OS Basics
No. of Credits	**:** 02
No. of Teaching Hours	**:** 60

Course Objectives:

1) To understand the **basic components and organization of a computer system**.
2) To perform practical exercises on **number systems and binary operations**.
3) To study the **architecture and working of CPU and memory units**.
4) To identify and analyze **input, output, and storage devices**.
5) To understand **basic operating system operations and utilities**.
6) To perform tasks related to **file management and system information**.
7) To develop practical knowledge of **computer system operations**.

Course Outcome:

By the end of the course, students should be able to:

CO1: Identify and explain the components of a computer system.

CO2: Perform conversions between different number systems.

CO3: Demonstrate understanding of CPU and memory organization.

CO4: Identify and use common input, output, and storage devices.

CO5: Perform basic operating system operations and commands.

CO6: Manage files and directories using operating system utilities.

CO7: Apply fundamental concepts of computer architecture and OS in practical tasks.

Topics and Learning Points

Sr. No.	Title of Experiment
1	Study of basic components of a computer system and their functions.
2	Conversion between number systems (binary, decimal, octal, hexadecimal).
3	Binary arithmetic operations (addition, subtraction).
3	Study of CPU architecture and its components (ALU, control unit, registers).
4	Study of different types of primary memory (RAM, ROM, cache).
5	Study of secondary storage devices (HDD, SSD, optical storage).
6	Identification and study of input devices (keyboard, mouse, scanner).
7	Identification and study of output devices (monitor, printer, speakers).
7	Study of operating system environment and system utilities.
8	Basic file and directory management operations in operating system.
9	Viewing system information and hardware configuration.
10	Study of process management and task management tools.
11	Study of file system structure and disk management.
12	Study of device management and peripheral devices.
13	Practical demonstration of basic operating system functions.
14	Study of basic components of a computer system and their functions.
15	Conversion between number systems (binary, decimal, octal, hexadecimal).

References:

1) William Stallings, Computer Organization and Architecture, 10th Edition, Pearson.
2) Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts, 10th Edition, Wiley.
3) Andrew S. Tanenbaum, Herbert Bos, Modern Operating Systems, 4th Edition, Pearson.
4) Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 6th Edition, McGraw Hill.

Programme Outcomes and Course Outcomes Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	2	3	1	2	3	1	1	1	2	1	1	1	2
CO2	2	3	2	3	3	1	1	2	2	1	1	1	2
CO3	2	3	1	2	3	1	1	1	2	1	1	1	2
CO4	2	3	1	2	3	1	1	1	2	1	1	1	2
CO5	2	3	1	3	3	1	1	2	2	1	1	1	2

CO6	2	3	1	3	3	2	1	2	2	1	1	1	2
CO7	3	3	2	3	3	2	1	2	2	1	1	1	2

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Justification of CO-PO Mapping:

PO1: Comprehensive Knowledge and Understanding
- Strongly mapped with CO7 and moderately with CO1–CO6.
- Justification: The course provides practical understanding of computer architecture, number systems, and operating system basics.

PO2: Practical and Professional Skills
- Strongly mapped with CO1–CO7.
- Justification: Practical exercises such as number system conversion, hardware identification, and OS operations develop technical and professional skills.

PO3: Data Handling and Storage
- Moderately mapped with CO2 and CO7.
- Justification: Number system conversions and data representation are fundamental concepts for data processing.

PO4: Problem Solving and Analytical Thinking
- Strongly mapped with CO2, CO5, CO6, CO7.
- Justification: Students perform logical operations, system management tasks, and analyze system behavior.

PO5: Modern Tool Usage
- Strongly mapped with CO1–CO7.
- Justification: Students interact with operating system tools, system utilities, and hardware interfaces.

PO6: Professional and Ethical Responsibility
- Moderately mapped with CO6 and CO7.
- Justification: Understanding system resources and file management promotes responsible use of computing systems.

PO7: Individual and Team Work
- Partially mapped through laboratory activities and collaborative learning tasks.

PO8: Communication Skills
- Moderately mapped with CO2–CO6 through interpretation of system outputs and technical documentation.

PO9: Lifelong Learning
- Moderately mapped with CO5–CO7.
- Justification: Understanding computer architecture and OS concepts encourages further exploration of advanced computing topics.

PO10 – PO13
- Partially mapped as the course supports advanced studies in cybersecurity, operating systems, networking, and system administration.

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Cyber Security and DS (2024 Pattern)

Name of the Programme : B.Sc. Cyber Security and Digital Science

Programme Code : USCDS

Class : F.Y.B.Sc.

Semester : I

Course Type : Open Elective (Theory)

Course Code : CDS-107-OE

Course Title : Cyber Hygiene and Digital Privacy

No. of Credits : 02

No. of Teaching Hours : 30

Course Objectives:

1) To introduce the **concept of cyber hygiene and safe digital practices**.
2) To understand **common cyber threats and online risks**.
3) To develop awareness about **password security and authentication methods**.
4) To understand **digital privacy and personal data protection**.
5) To introduce **safe internet browsing and social media practices**.
6) To understand **cyber laws and responsible use of digital resources**.
7) To promote **secure and ethical behavior in the digital environment**.

Course Outcomes:

By the end of the course, students should be able to:

CO1: Explain the concept of cyber hygiene and safe digital practices.

CO2: Identify common cyber threats such as phishing, malware, and social engineering.

CO3: Apply secure password management and authentication techniques.

CO4: Understand digital privacy principles and data protection practices.

CO5: Demonstrate safe use of internet and social media platforms.

CO6: Understand basic cyber laws and responsible digital behaviour.

CO7: Apply cyber safety measures to protect personal and organizational data.

Topics and Learning Points

UNIT No.	Chapter Name with Topics	No. of Lectures Required
UNIT- I	**Introduction to Cyber Hygiene** 1.1 Introduction to cyberspace and digital environment 1.2 Concept and importance of cyber hygiene 1.3 Common cyber threats and attacks	7

	1.4 Malware types: virus, worm, trojan, ransomware 1.5 Social engineering attacks 1.6 Phishing and email fraud 1.7 Basic cyber safety practices	
UNIT- II	**Password Security and Online Safety** 2.1 Importance of strong passwords 2.2 Password management techniques 2.3 Multi-factor authentication 2.4 Safe internet browsing practices 2.5 Secure use of public Wi-Fi networks 2.6 Email security and spam awareness 2.7 Online scams and fraud prevention 2.8 Safe online communication practices	**8**
UNIT-III	**Digital Privacy and Data Protection** 3.1 Concept of digital privacy 3.2 Personal data and sensitive information 3.3 Data protection practices 3.4 Privacy settings in online platforms 3.5 Privacy risks in social media 3.6 Safe sharing of information online 3.7 Digital footprint and identity protection	**7**
UNIT-IV	**Cyber Ethics and Legal Awareness** 4.1 Cyber ethics and responsible digital behavior 4.2 Introduction to cyber laws 4.3 IT Act and legal provisions related to cybercrime 4.4 Cybercrime types and examples 4.5 Reporting cybercrime and cyber safety resources 4.6 Digital citizenship and responsible technology use 4.7 Organizational cyber hygiene practices 4.8 Future challenges in cyber security and privacy	**8**

References

1) Nina Godbole, Sunit Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India.
2) Charles P. Pfleeger, Shari Lawrence Pfleeger, Security in Computing, 5th Edition, Pearson.
3) William Stallings, Lawrie Brown, Computer Security: Principles and Practice, Pearson.
4) Joseph Migga Kizza, Guide to Computer Network Security, Springer.

Programme Outcomes and Course Outcomes Mapping:

Course Outcomes	Programme Outcomes (POs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	3	2	1	2	2	2	1	1	2	1	1	1	2
CO2	3	2	1	2	2	2	1	1	2	1	1	1	2
CO3	2	2	1	2	2	2	1	1	2	1	1	1	2
CO4	2	2	1	2	2	2	1	1	2	1	1	1	2
CO5	2	2	1	2	2	2	1	2	2	1	1	1	2
CO6	2	2	1	2	2	3	1	2	2	1	1	1	2
CO7	3	2	1	2	2	3	1	2	2	1	1	1	2

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Justification of CO-PO Mapping:

PO1: Comprehensive Knowledge and Understanding

- Strongly mapped with CO1, CO2, CO7 and moderately with CO3–CO6.

- Justification: The course introduces fundamental concepts of cyber hygiene, cyber threats, and digital privacy.

PO2: Practical and Professional Skills

- Moderately mapped with CO1–CO7.

- Justification: Students learn practical safety practices such as password management, secure browsing, and privacy protection.

PO3: Data Handling and Management

- Partially mapped with CO3 and CO4.

- Justification: Digital privacy and data protection practices relate to responsible handling of personal data.

PO4: Problem Solving and Analytical Thinking

- Moderately mapped with CO1–CO7.

- Justification: Students identify cyber threats and apply preventive measures to maintain digital security.

PO5: Modern Tool Usage

- Moderately mapped with CO2–CO5.

- Justification: The course involves safe usage of digital platforms, security tools, and online services.

PO6: Professional and Ethical Responsibility

- Strongly mapped with CO6 and CO7.

- Justification: Understanding cyber laws, ethics, and responsible digital behavior promotes ethical use of technology.

PO7: Individual and Team Work

- Partially mapped as the course promotes awareness activities and collaborative learning.

PO8: Communication Skills

- Moderately mapped with CO5 and CO6 as students learn safe communication practices in digital environments.

PO9: Lifelong Learning

- Moderately mapped with CO1–CO7.

- Justification: Awareness of cyber threats and privacy risks encourages continuous learning in cybersecurity.

PO10 – PO13

- Partially mapped as the course builds awareness and foundational cybersecurity knowledge useful for advanced cybersecurity and digital safety studies.

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Cyber Security and DS (2024 Pattern)

Name of the Programme	**:** B.Sc. Cyber Security and Digital Science
Program Code	**:** USCDS
Class	**:** F.Y.B.Sc.
Semester	**:** I
Course Type	**:** Skill Enhancement Course (SEC)
Course Code	**:** CDS-108-SEC
Course Title	**:** Cyber Security Tools Basics Lab
No. of Credits	**:** 2 credits
No. of Teaching Hours	**:** 60

Course Objectives:

1) To introduce students to **basic cyber security tools and environments**.
2) To develop practical skills in **identifying vulnerabilities and security threats**.
3) To understand the use of **network monitoring and scanning tools**.
4) To practice **system security assessment techniques**.
5) To learn the basics of **password security and encryption tools**.
6) To familiarize students with **open-source cyber security utilities**.
7) To develop practical awareness of **cyber security practices and tools**.

Course Outcomes:

By the end of the course student will be able to

CO1: Identify and use basic cyber security tools.

CO2: Perform basic network scanning and monitoring tasks.

CO3: Analyze system vulnerabilities using security tools.

CO4: Apply password security and encryption techniques.

CO5: Demonstrate safe system and network usage practices.

CO6: Use cyber security tools to detect potential threats.

CO7: Apply practical cyber security techniques for system protection.

Topics and Learning Points:

Sr. No.	Title of Experiment
1	Introduction to cyber security lab environment and security tools.
2	Study and usage of network scanning tools (e.g., Nmap).
3	Basic network monitoring using Wireshark.
3	Identifying open ports and services on a system.
4	Password strength testing and password security tools.
5	Introduction to vulnerability scanning tools.
6	Study of malware detection tools and antivirus utilities.
7	Basic system security assessment techniques.
7	Study of firewall configuration and security settings.
8	Secure browsing practices and browser security tools.
9	File encryption and decryption techniques.
10	Study of secure file transfer methods.
11	Log analysis for security monitoring.
12	Identifying phishing and suspicious websites.
13	Demonstration of basic cyber security incident response practices.
14	Introduction to cyber security lab environment and security tools.
15	Study and usage of network scanning tools (e.g., Nmap).

References

1) William Stallings, Lawrie Brown, Computer Security: Principles and Practice, Pearson.
2) Nina Godbole, Sunit Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India.
3) Joseph Migga Kizza, Guide to Computer Network Security, Springer.
4) Jon Erickson, Hacking: The Art of Exploitation, No Starch Press.

Programme Outcomes and Course Outcomes Mapping:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO1	2	3	1	2	3	1	1	1	2	1	1	1	2
CO2	2	3	1	3	3	1	1	2	2	1	1	1	2
CO3	2	3	1	3	3	1	1	2	2	1	1	1	2
CO4	2	3	1	3	3	2	1	2	2	1	1	1	2
CO5	2	3	1	2	3	2	1	2	2	1	1	1	2
CO6	3	3	1	3	3	2	1	2	2	1	1	1	2

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

Justification of CO-PO Mapping:

PO1: Comprehensive Knowledge and Understanding

- Moderately mapped with CO1–CO5 and strongly with CO6 and CO7.
- Justification: Students gain understanding of cybersecurity tools, vulnerability assessment, and system protection techniques.

PO2: Practical and Professional Skills

- Strongly mapped with CO1–CO7.
- Justification: Hands-on use of security tools such as scanning, monitoring, and encryption utilities develops practical cybersecurity skills.

PO3: Data Handling and Management

- Moderately mapped with CO7.
- Justification: Security tools involve monitoring and protecting data in systems and networks.

PO4: Problem Solving and Analytical Thinking

- Strongly mapped with CO2, CO3, CO4, CO6, CO7.
- Justification: Students analyse sssystem vulnerabilities and apply security tools to detect and mitigate threats.

PO5: Modern Tool Usage

- Strongly mapped with CO1–CO7.
- Justification: The course involves the use of modern cybersecurity tools and utilities widely used in security analysis.

PO6: Professional and Ethical Responsibility

- Moderately mapped with CO4–CO7.
- Justification: Students learn responsible use of security tools and ethical cybersecurity practices.

PO7: Individual and Team Work

- Partially mapped through laboratory exercises and collaborative practical activities.

PO8: Communication Skills

- Moderately mapped with CO2–CO6 through interpretation of tool outputs and security reports.

PO9: Lifelong Learning

- Moderately mapped with CO5–CO7.
- Justification: Exposure to cybersecurity tools encourages continuous learning in advanced cybersecurity practices.

PO10 – PO13

- Partially mapped as the course contributes foundational practical knowledge supporting advanced cybersecurity, ethical hacking, and digital forensics courses.