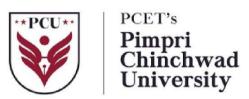Pimpri Chinchwad Education Trust's

Pimpri Chinchwad University

Sathe, Pune - 412106

Curriculum Structure

B.Sc. (Cyber Security)

(2025 Pattern)

School of Computer Applications

Effective from

Academic Year 2025-26

PCU
PCET's
Pimpri
Chinchwad
University
Learn | Grow | Achieve

Program Curriculum

Preamble:

At Pimpri Chinchwad University, we present the Bachelor of Science (Cyber Security), an Undergraduate Program designed to equip students with a comprehensive understanding of Computer Science and Cyber Security. As aspiring professionals in the field of computing, we acknowledge the weight of responsibility that accompanies our education. Upholding the highest standards of integrity, professionalism, and ethical conduct is fundamental to our academic pursuits and beyond. We embrace the imperative of continuous learning and adaptability in an era marked by rapid technological advancement, pledging to proactively seek new knowledge and master emerging technologies.

The BSc (Cyber Security) program curriculum is designed to provide students with the practice of protecting computer systems, networks, and data from digital threats, such as unauthorized access, data breaches, malware, and other cyber-attacks.

Overall, an BSc (Cyber Security) program aims to provide students with a well-rounded education that prepares them for a successful career in the IT industry and for further academic pursuits.

Vision and Mission of Program:

Vision:

Explore the different horizons in the field of Cyber Security, digital threats, data breaches and Cyber-attacks.

Mission:

Develop a strong foundation in computer science and information technology. Cultivate smart and ethical cybersecurity professionals and entrepreneurs globally.

Program Educational Objectives:

Here are some possible Program Educational Objectives (PEOs) for a Bachelor of Science (Cyber Security).

1. To prepare youth to take up positions as Secure software designers and developers.
2. To aim at the development of knowledge and skills for defending and developing secure software systems.
3. To prepare students with social interaction skills, communication skills, life skills, entrepreneurial skills, and research skills which are necessary for career growth and for leading a quality life.

Program Outcome

Here are some possible Program Outcomes (POs) for a Bachelor of Science (Cyber Security) program: -

PO 1: Develop Core Competencies: The program aims to develop the core competencies required for a career in computer science and Cyber Security.

PO 2: Develop Practical Cybersecurity Skills: The program focuses on equipping students with practical skills required for securing computer systems and networks.

PO 3: Analyze and Mitigate Security Risks: The program emphasizes the importance of risk management and equips students with the knowledge to make informed decisions regarding security measures.

PO 4: Foster Ethical and Professional Practices: The program instills ethical and professional values in students, emphasizing the importance of integrity, privacy, and responsible use of cybersecurity knowledge and skills.

PO 5: Promote Critical Thinking and Problem-Solving Abilities: The program aims to develop students' analytical and problem-solving skills in the context of cybersecurity.

PO 6: Collaborate and Communicate Effectively: The program emphasizes the importance of teamwork and effective communication skills. These skills are essential for working effectively in multidisciplinary cybersecurity teams and conveying complex concepts to various stakeholders.

PO 7: Stay Updated with Emerging Technologies and Trends: The program aims to keep students abreast of the rapidly evolving field of cybersecurity. They are encouraged to stay updated with emerging technologies, trends, and research advancements in cybersecurity.

PO 8: Establishing strategies in developing and implementing ideas in multi- disciplinary environments using computing, cyber security and management skills as a member or leader in a team.

PO 9: Contribute to progressive community and society in comprehending different cyber security activities.

PO 10: Gain confidence for self and continuous learning to improve knowledge and competence as a member or leader of a team.

PO11: Communication Skills: Express thoughts and ideas effectively in writing and orally; communicate with others using appropriate medium; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

PO12: Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes to identify and detect Cyber Vulnerabilities and resolve new Cyber Threats.

Program Specific Outcomes

On successful completion of the programme, the graduates of Bachelor of Science (Cyber Security) programme will be able to:

PSO1: -Resolve security issues in computer networks and maintenance of Cyber Security systems to secure an IT infrastructure.

PSO2: -Provide Security Based Solutions with to solve real life problems like malware, phishing, spamming and other Cyber Threats, related to Cyber Security.

PSO3: -Design, Implement, and Monitor-Cyber Security Mechanisms, to ensure the protection of Information Technology Assets through Advanced Penetration Testing and Reverse Engineering to get to know the perspective of Cyber Criminals.

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VIII.	UHV-I-: Professional Ethics	73-74
IX.	OPEN ELECTIVE-II: Cyber Laws	75-76
X.	OPEN ELECTIVE-II: E-Commerce	77-78
XI.	MOOC I: Digital Forensics Essentials (MOOC)	
XII.	MOOC II: Privacy Law and Data Protection	
6.	**Course Details: Semester - III**	
I.	Design Analysis of Algorithm	
II.	Design Analysis of Algorithm Lab	
III.	Web Application Security	
IV.	Web Application Security Lab	
V.	MAJOR ELECTIVE-I: Operating System Security	
VI.	MAJOR ELECTIVE-I: Firewall and VPN Security	
VII.	Security Assessment and Risk Analysis	
VIII.	Statistical Techniques	
IX.	UHV-II: Understanding Harmony	
X.	COI: Constitution of India	
XI.	MOOC I-Foundation of Big data	
XII	Foreign Language-I: German	
XIII	Foreign Language-I: Japanese	
7.	**Course Details: Semester - IV**	
I.	Operating Systems - Linux	
II.	Operating Systems Lab	
III.	Mobile Security	
IV.	Mobile Security Lab	

V.	MAJOR ELECTIVE-II: Cyber laws & Security Policies	
VI.	MAJOR ELECTIVE-II: Cyber Threat Intelligence	
VII.	Data Privacy	
VIII.	COI: Constitution of India	
IX.	MOOC I: IT Support Professional Certificate	
X.	MOOC II: Search Engine Optimization	
XII.	Foreign Language-II: Japanese	
XIII.	Foreign Language-II: German	
XIV.	Exit Policy-UG CERTIFICATE	
XV.	Exit Policy-UG DIPLOMA	
8	**Course Details: Semester - V**	
I.	Python Programming	
II.	Python Programming Lab.	
III.	Blockchain Technology	
IV.	Blockchain Technology Lab	
V.	MAJOR ELECTIVE-I: Cyberspace Operations and Design	
VI.	MAJOR ELECTIVE-I: Secure Software Design and Development	
VII.	Cyber Security and Risk Management	
VIII.	Applied Cryptography	
IX.	Minor IV	
X.	Mini Project Using BlockChain / Python	
XI.	ACALR301/ACEVS301	
XII.	Foreign Language - III-German	
XIII.	Foreign Language - III-Japanese	
XIV.	MOOC I-Security in Wireless Ad hoc Network	

9	**Course Details: Semester – VI (SCHEME – A & B)**	
I.	Cyber Threat Management	
II.	Minor –V	
III.	Industrial Training / Internship / Seminar/ Research Internship	
IV.	MOOC I -Research Methodologies and Techniques	
V.	MOOC II-Mobile Forensic	
10	**Course Details: Semester – VII**	
I.	Introduction to Machine Learning	
II.	Introduction to Machine Learning Lab	
III.	Digital Forensics	
IV.	Digital Forensics Lab	
V.	AI in Cyber Security	
VI.	Digital Payments and Its Security	
VII	Cloud Computing Security	
VIII	Mini Project	
IX	ALR: Aptitude & Logical Reasoning / EVS: Environmental Studies	
X.	Mobile Forensic **(MOOC)**	
11	**Course Details: Semester – VIII**	
I.	Cloud Infrastructure and Services **(MOOC)**	
II.	Security Analysis and Reporting **(MOOC)**	
III.	Major Project/ Research Project / Internship	

CURRICULUM FRAMEWORK

Sr. No.	Type of course	Abbreviations
1	Major	MAJ
2	Elective (Minor Stream/Vocational/Program Specific)	MIN
3	Open Electives	OE
4	Ability Enhancement Courses	AEC
5	Skill Enhancement Courses	SEC
6	Vocational Skill Course	VSC
7	Summer Internship/ On Job Training	OJT
8	Project	PROJ
9	Field Project	FP
10	Indian Knowledge System	IKS
11	Co-Curricular	CC
12	Community Engagement Program	CEP
13	Value Education Course	VEC

Sr. No.	Type of course	No. of Courses	Total Credits No	Total Credits %
1	Major	33	79	49
2	Elective (Minor Stream/Vocational/Program Specific)	5	10	6
3	Open Electives	4	8	5
4	Ability Enhancement Courses	3	-	-
5	Skill Enhancement Courses	6	18	11
6	Vocational Skill Course	6	13	8
7	Summer Internship/On Job Training/Project	2	4	3
8	Field Project	2	26	16
9	Indian Knowledge System	1	-	-
10	Value Education Course (Audit Courses)	8	2	1
	Total	70	160	100

CREDIT DISTRIBUTION: SEMESTER WISE

Sr. No.	Type of course	1	2	3	4	5	6	7	8	Total
1	Major	13	12	13	14	11	3	10	3	79
2	Elective (Minor Stream/Vocational/Program Specific)	-	2	2	2	2	2	-	-	10
3	Open Electives	2	2	2	2	-	-	-	-	8
4	Ability Enhancement Courses	-	-	-	-	-	-	-	-	0
5	Skill Enhancement Courses	5	2	3	2	3	-	3	-	18
6	Vocational Skill Course	-	2	-	-	2	3	3	3	13
7	Summer Internship/On Job Training/Project	-	-	-	-	2	-	2	-	4
8	Field Project	-	-	-	-	-	12	-	14	26
9	Indian Knowledge System									AC
10	Value Education Course (Audit Courses)	-	-	-	-	-	-	2	-	2
	Total	20	20	20	20	20	20	20	20	160

Course Code Nomenclature

COURSE CODE	COURSE NAME	COURSE TYPE
UBS101	C Programming	MAJM
UBS102	C Programming Lab	MAJM
UBS103	Data Communication and Networking	MAJM
UBS104	Data Communication and Networking Lab.	MAJM
UBS106	Basic Mathematics	BSC
UBS107	Fundamentals of Computer Architecture	SEC
UEG101	Applied Communication	AEC
ACUHV101	UHV- I: Professional Ethics	AC
ACIKSSS101	IKS: Concepts and Application in Science	AC
UBS105A	OPEN ELECTIVE-I: Introduction to Cyber Security	OE
UBS105B	OPEN ELECTIVE-I: Introduction to Digital Electronics	OE
UBSM101	**Programming with a Purpose(MOOC)**	MOOC
UBSM102	**Internet of Things (IOT)(MOOC)**	MOOC
SEMESTER-II		
UBS109	Data Structure using C	MAJM
UBS110	Data Structure using C lab	MAJM
UBS111	Unix & Shell Programming	MAJM
UBS112	Unix & Shell Programming Lab	MAJM
UBS114	Foundation of Cryptography	VSC
UBS115	Discrete Mathematics	BSC
ACIKSSS101	IKS: Concepts and Application in Science	AC
ACUHV101	UHV-I: Professional Ethics	AC
UBS116A	OPEN ELECTIVE-II: Cyber Laws	OE
UBS116B	OPEN ELECTIVE-II: E-Commerce	OE
UBSM103	Digital Forensics Essentials (MOOC)	**MOOC**
UBSM104	Privacy Law and Data Protection	**MOOC**
UCEXBS101	VSC: Cyber Defense	VSC
UCEXBS102	VSC: Project	VSC

SEMESTER-III		
UBS201	Design Analysis of Algorithm	MAJM
UBS202	Design Analysis of Algorithm Lab	MAJM
UBS203	Web Application Security	MAJM
UBS204	Web Application Security Lab	MAJM
UBS205A	MAJOR ELECTIVE-I: Operating System Security	MAJE
UBS205B	MAJOR ELECTIVE-I: Firewall and VPN Security	MAJE
UBS207	Statistical Techniques	BSC
ACUHV201	UHV-II: Understanding Harmony	AC
ACCOI201	COI: Constitution of India	AC
UBSM201	**Foundation of Big data(MOOC)**	**MOOC**
UFL201A	Foreign Language-I: German	AEC
UFL201B	Foreign Language-I: Japanese	AEC
SEMESTER-IV		
UBS209	Operating Systems - Linux	MAJM
UBS210	Operating Systems Lab	MAJM
UBS211	Mobile Security	MAJM
UBS212	Mobile Security Lab	MAJM
UBS213A	MAJOR ELECTIVE-II: Cyber laws & Security Policies	MAJE
UBS213B	MAJOR ELECTIVE-II: Cyber Threat Intelligence	MAJE
UBS214	Data Privacy	SEC
ACCO1201	COI: Constitution of India	AC
ACUHV201	UHV-II: Understanding Harmony	AC
UFL202A	Foreign Language-II: Japanese	AEC
UFL202B	Foreign Language-II: German	AEC
UBSM202	**IT Support Professional Certificate (MOOC)**	**MOOC**
UBSM203	**Search Engine Optimization (MOOC)**	**MOOC**
UDIEXBS201	VSC: Cyber Crime Investigation and Digital Forensics	VSC
UDIEXBS202	Project	VSC

SEMESTER-V

UBS301	Python Programming	MAJM
UBS302	Python Programming Lab.	MAJM
UBS303	Blockchain Technology	MAJM
UBS304	Blockchain Technology Lab	MAJM
UBS305A	MAJOR ELECTIVE-I: Cyberspace Operations and Design	MAJE
UBS305B	MAJOR ELECTIVE-I: Secure Software Design and Development	MAJE
UBS306	Cyber Security and Risk Management	BSC
MIN	Minor IV	
UBS307	Mini Project Using Blockchain / Python	PROJ
ACALR301/ACEVS 301	ACALR301/ACEVS301	AC
UFL301A	Foreign Language - III-German	AEC
UFL301B	Foreign Language - III-Japanese	AEC
UBSM301	Security in Wireless Ad hoc Network	MOOC

SEMESTER-VI
(SCHEME - A)

UBS309	Cyber Threat Management	MAJM
ACEVS301/ ACALR301	EVS: Environmental Studies / ALR: Aptitude & Logical Reasoning	AC
UETCS105	Minor –V	MIN
UBS310	Industrial Training / Internship / Seminar/ Research Internship	FP
UBSM302	Research Methodologies and Techniques	MOOC
UBSM303	MOOC	MOOC

SEMESTER-VI
(SCHEME - B)

UBS308	Cyber Threat Management	MAJM (MOOC)
ACEVS301/ ACALR301	EVS: Environmental Studies / ALR: Aptitude & Logical Reasoning	AC
UETCS105	Minor –V	MIN
UBS310	Industrial Training / Internship / Seminar/ Research Internship	FP
UBSM302	Research Methodologies and Techniques	MOOC
UBSM303	MOOC	MOOC

	SEMESTER-VII		
UBS401	Introduction to Machine Learning	MAJM
UBS402	Introduction to Machine Learning Lab	MAJM
UBS403	Digital Forensics	MAJM
UBS404	Digital Forensics Lab	MAJM
UBS405	AI in Cyber Security	SEC
UBS406	Digital Payments and Its Security	VSC
UBS407	Cloud Computing Security	BSC
UBS408	Mini Project using Machine Learning	PROJ
UETAD105	ALR: Aptitude & Logical Reasoning / EVS: Environmental Studies	AC
UBSM401	Mobile Forensic	MOOC
UFL401A	Foreign Language - III-German	AEC
UFL401B	Foreign Language - III-Japanese	AEC
	SEMESTER-VIII		
UBSM402	Cloud Infrastructure and Services (**MOOC**)	MOOC
UBSM403	Security Analysis and Reporting(**MOOC**)	MOOC
UBS411	Major Project/ Research Project / Internship	FP

B.Sc. (Cyber Security) Curriculum Structure
2025 Pattern (AS PER NEP 2020)

COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME						ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS		CIA	ESA	PR/OR	TOTAL
UBS101	MAJM	C Programming	3	-	-	3	3		40	60		100
UBS102	MAJM	C Programming Lab	-	1	-	1	2		25		25	50
UBS103	MAJM	Data Communication and Networking	3	-	-	3	3		40	60		100
UBS104	MAJM	Data Communication and Networking Lab.	-	1	-	1	2		25		25	50
UBS106	BSC	Basic Mathematics	3	-	-	3	3		40	60		100
UBS107	VEC	Fundamentals of Computer Architecture	3	-	-	3	3		40	60		100
UEG101	AEC	Applied Communication	2	-	-	-	2		50			50
ACUHV101/ ACIKSET102	AC	UHV-I: Professional Ethics/ IKS: Concepts and Application in Science	2	-	-	-	2		50			50
UBS105	OE	OPEN ELECTIVE-I	2	-	-	2	2		20	30		50
UBSM101	**MOOC**	**Programming with a Purpose(MOOC)**		-	-	2	2		25		25	50
UBSM102	**MOOC**	**Internet of Things (IOT)(MOOC)**		-	-	2	2		25		25	50
TOTAL			**18**	**2**	**0**	**20**	**24**		**380**	**270**	**100**	**750**
OPEN ELECTIVE-I												
UBS105A	OE	Introduction to Cyber Security	2	-	-	2	2		20	30		50
UBS105B	OE	Introduction to Digital Electronics	2	-	-	2	2		20	30		50

B.Sc. (Cyber Security) Curriculum Structure

			SEMESTER II									
COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME					ASSESSMENT SCHEME				
			TH	PR	TUT	CREDIT	HRS	CIA	ESA	PR/OR	TOTAL
UBS109	MAJM	Data Structure using C	3	-	-	3	3	40	60		100
UBS110	MAJM	Data Structure using C Lab	-	2	-	1	2	25		25	50
UBS111	MAJM	Unix & Shell Programming	3	-	-	3	3	40	60		100
UBS112	MAJM	Unix & Shell Programming Lab	-	2	-	1	2	25		25	50
UBS114	VSC	Foundation of Cryptography	2	-	-	2	2	20	30		50
UBS115	BSC	Discrete Mathematics	2	-	-	2	2	20	30		50
	MIN	Minor I	2	-	-	2	2	20	30		50
ACUHV 101/ ACIKSET102	AC	IKS: Concepts and Application in Science/ UHV-I: Professional Ethics	2	-	-	-	2	50			50
UBS116	OE	OPEN ELECTIVE-II	2	-	-	2	2	20	30		50
UBSM103	**MOOC**	**Digital Forensics Essentials (MOOC)**		-	-	2	2	25		25	50
UBSM104	**MOOC**	**Privacy Law and Data Protection (MOOC)**		-	-	2	2	25		25	50
TOTAL			**14**	**4**	**0**	**20**	**24**	**310**	**240**	**100**	**650**
OPEN ELECTIVE-II											
UBS116A	OE	Cyber Laws	2	-	-	2	2	20	30		50
UBS116B	OE	E-Commerce	2	-	-	2	2	20	30		50

Exit Policy: UG Certificate in B.Sc. (Cyber Security): A Students who opt to exit after completion of the first year and have scored the required credits offered by the school in the program structure will be awarded a UG certificate in **B.Sc. (Cyber Security),** provided they must earn additional credits during the summer vacation of the first year.

Course Code	Course Type	Course Name	Teaching Scheme					Assessment Scheme			
			TH	PR	TUT	CREDIT	HRS	CIA	ESA	PR/OR	TOTAL
UCEXBS101	VSC	Cyber Crime Investigation and Digital Forensics/ MOOC	2	-	-	2	2	-	-	50	50
UCEXBS102	VSC	Project	-	2	-	2	4	-	-	50	50

B.Sc. (Cyber Security) Curriculum Structure

			TEACHING SCHEME					ASSESSMENT SCHEME			
SEMESTER III											
Course Code	Course Type	Course Name	TH	PR	TUT	CREDIT	HRS	CIA	ESA	PR/OR	TOTAL
UBS201	MAJM	Design Analysis of Algorithm	3	-	-	3	3	40	60		100
UBS202	MAJM	Design Analysis of Algorithm Lab	-	1	-	1	2	25		25	50
UBS203	MAJM	Web Application Security	3	-	-	3	3	40	60		100
UBS204	MAJM	Web Application Security Lab	-	1	-	1	2	25		25	50
UBS205	MAJE	Major Elective - I	3	-	-	3	3	40	60		100
UBS206	VEC	Security Assessment and Risk Analysis	3	-	-	3	3	40	60		100
UBS207	BSC	Statistical Techniques	2	-	-	2	2	20	30		50
ACUHV201/ ACCOI201	AC	UHV-II: Understanding Harmony /COI: Constitution of India	2	-	-	-	2	50			50
	MIN	Minor II	2	-	-	2	2	20	30		50
UBSM201	**MOOC**	**Foundation of Big data(MOOC)**		-	-	2	2	25		25	50
UFL201	AEC	Foreign Language - I	2	-	-	-	2	50			50
TOTAL			**18**	**2**	**0**	**20**	**26**	**375**	**300**	**75**	**750**
MAJOR ELECTIVE - I											
UBS205A	MAJE	Operating System Security	3	-	-	3	3	40	60		100
UBS205B	MAJE	Firewall And VPN Security	3	-	-	3	3	40	60		100
UFL201 FOREIGN LANGUAGE - I											
UFL201A	AEC	Foreign Language-I: German	2	-	-	-	2	50			50
UFL201B	AEC	Foreign Language-I: Japanese	2	-	-	-	2	50			50

B.Sc. (Cyber Security) Curriculum Structure

Course Code	Course Type	Course Name	Teaching Scheme						Assessment Scheme			
			TH	PR	TUT	CREDIT	Hrs.		CIA	ESA	PR/OR	TOTAL
			Semester IV									
UBS209	MAJM	Operating Systems - Linux	3	-	-	3	3		40	60		100
UBS210	MAJM	Operating Systems Lab	-	1	-	1	2		25		25	50
UBS211	MAJM	Mobile Security	3	-	-	3	3		40	60		100
UBS212	MAJM	Mobile Security Lab	-	1	-	1	2		25		25	50
UBS213	MAJE	Major Elective - II	3	-	-	3	3		40	60		100
UBS214	SEC	Data Privacy	3	-	-	3	3		40	60		100
ACCOI201/ ACUHV201	AC	COI: Constitution of India / UHV-II: Understanding Harmony	2	-	-	-	2		50			50
	MIN	Minor III	2	-	-	2	2		20	30		50
UBSM202	**MOOC**	**IT Support Professional Certificate (MOOC)**		-	-	2	2		25		25	50
UBSM203	**MOOC**	**Search Engine Optimization (MOOC)**		-	-	2	2		25		25	50
UFL202	AEC	Foreign Language - II	2	-	-	-	2		50			50
Total			**18**	**2**	**0**	**20**	**26**		**380**	**270**	**100**	**750**
MAJOR ELECTIVE - II												
UBS213A	MAJE	Cyber laws & Security Policies	3	-	-	3	3		40	60		100
UBS213B	MAJE	Cyber Threat Intelligence	3	-	-	3	3		40	60		100
UFL202 FOREIGN LANGUAGE - II												
UFL202A	AEC	Foreign Language-II: Japanese	2	-	-	-	2		50			50
UFL202B	AEC	Foreign Language-II: German	2	-	-	-	2		50			50

Exit Policy: UG Diploma in B.Sc. (Cyber Security): A Students who opt to exit after completion of the second year and have scored the required credits offered by the school in the program structure will be awarded a UG diploma in **B.Sc. (Cyber Security),** provided they must earn additional credits during the summer vacation of the second year.

COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME						ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	Hrs.		CIA	ESA	PR/OR	TOTAL
UDIEXBS201	VSC	Cyber Defense/MOOC	**2**	-	-	**2**	**2**		-	-	50	50
UDIEXBS202	VSC	Project	-	**4**	-	**4**	**8**		50	-	50	100

B.Sc. (Cyber Security) Curriculum Structure

COURSE CODE	COURSE TYPE	COURSE NAME	TH	PR	TUT	CREDIT	HRS		CIA	ESA	PR/OR	TOTAL
— SEMESTER V												
UBS301	MAJM	Python Programming	3	-	-	3	3		40	60		100
UBS302	MAJM	Python Programming Lab.	-	1	-	1	2		25		25	50
UBS303	MAJM	Blockchain Technology	3	-	-	3	3		40	60		100
UBS304	MAJM	Blockchain Technology Lab	-	1	-	1	2		25		25	50
UBS305	MAJE	Major Elective - III	3	-	-	3	3		40	60		100
UBS306	SEC	Cyber Security and Risk Management	3	-	-	3	3		40	60		100
	MIN	Minor IV	2	-	-	2	2		20	30		50
UBS307	PROJ	Mini Project Using Blockchain / Python	-	2	-	2	4		25		25	50
UBSM301	**MOOC**	**Security in Wireless Ad hoc Network (MOOC)**	-	-	-	2	2		25		25	50
UETAD105	MIN	ALR: Aptitude & Logical Reasoning / EVS: Environmental Studies	2			-	2		50			50
UFL301	AEC	Foreign Language - III	2	-	-	-	2		50			50
TOTAL			18	4	0	20	28		380	270	100	750
UBS305 MAJOR ELECTIVE - III												
UBS305A	MAJE	Cyberspace Operations and Design	3	-	-	3	3		40	60		100
UBS305B	MAJE	Secure Software Design and Development	3	-	-	3	3		40	60		100

B.Sc. (Cyber Security) Curriculum Structure

SEMESTER VI (SCHEME A)											
COURSE CODE	COURSE TYPE	COURSE NAME	TEACHING SCHEME					ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS	CIA	ESA	PR/OR	TOTAL
UBS309	MAJ	Cyber Threat Management	2	-	-	2	2	20	30	-	50
UBSM302	**MOOC**	**Research Methodologies & Techniques (MOOC)**	-	-	-	2	2	25	-	25	50
UBSM303	**MOOC**	MOOC	-	-	-	2	2	25	-	25	50
UETCS105	MIN	Minor -V	2	-	-	2	2	20	30	-	50
UBS312	FP	Industrial Training / Internship / Seminar/ Research Internship	-	12	-	12	12	250	-	250	500
UFL302	AEC	Foreign Language - IV	2	-	-	-	2	50	-	-	50
TOTAL			6	12	0	20	22	390	60	350	750

SEMESTER VI (SCHEME B)											
Course Code	Course Type	Course Name	TEACHING SCHEME					ASSESSMENT SCHEME			
			TH	PR	TUT	CREDIT	HRS	CIA	ESA	PR/OR	TOTAL
UBSM309	MAJ	Cyber Threat Management (MOOC)	2	-	-	2	2	20	30	-	50
UBSM302	**MOOC**	**Research Methodologies & Techniques (MOOC)**	-	-	-	2	2	25	-	25	50
UBSM303	**MOOC**	MOOC	-	-	-	2	2	25	-	25	50
UETCS105	MIN	Minor -V	2	-	-	2	2	20	30	-	50
UBS312	FP	Industrial Training / Internship / Seminar/ Research Internship	-	12	-	12	12	250	-	250	500
UFL302	AEC	Foreign Language - IV	2	-	-	-	2	50	-	-	50
TOTAL			6	12	0	20	22	390	60	350	750

Note:

1. Scheme A – Regular Students (student should maintain a minimum attendance of 75%)
2. Scheme B – Students with Pre-Placement Offer (students should follow the activity schedule and report accordingly).

B.Sc. (Cyber Security) Curriculum Structure

Course Code	Course Type	Course Name	Teaching Scheme						Assessment Scheme			
			TH	PR	TUT	CREDIT	HRS		CIA	ESA	PR/OR	TOTAL
UBS401	MAJM	Introduction to Machine Learning	3	-	-	3	3		40	60		100
UBS402	MAJM	Introduction to Machine Learning Lab	-	2	-	2	4		25		25	50
UBS403	MAJM	Digital Forensics	3	-	-	3	3		40	60		100
UBS404	MAJM	Digital Forensics Lab	-	1	-	1	2		25		25	50
UBS405	SEC	AI in Cyber Security	2	-	-	2	2		20	30		50
UBS406	SEC	Digital Payments and Its Security	2	-	-	2	2		20	30		50
UBS407	VSC	Cloud Computing Security	2	-	-	2	2		20	30		50
UBSM401	**MOOC**	Mobile Forensic (MOOC)	-	-	-	2	2		25		25	50
UETAD 105	MIN	ALR: Aptitude & Logical Reasoning / EVS: Environmental Studies	2	-	-	-	2		50			50
UBS408	PROJ	Mini Project	-	2	-	2	4		25		25	50
Total			**14**	**6**	**0**	**20**	**26**		**290**	**210**	**100**	**600**

The table title row reads **SEMESTER-VII**.

B.Sc. (Cyber Security) Curriculum Structure

			SEMESTER-VIII									
Course Code	Course Type	Course Name	Teaching Scheme						Assessment Scheme			
			TH	PR	TUT	CREDIT	HRS		CIA	ESA	PR/OR	TOTAL
UBSM402	MOOC	Cloud Infrastructure and Services (**MOOC**)	-	-	-	3	-		50	-	50	100
UBSM403	MOOC	Security Analysis and Reporting(**MOOC**)	-	-	-	3	-		50	-	50	100
UBS411	FP	Major Project/ Research Project / Internship	-	14	-	14	28		250	-	250	500
			-	14	-	20	28		350	-	350	700

B.Sc.(Cyber Security) 2025 PATTERN

COURSE DETAILS

Semester - I

Name of the Program:	BSc			Semester: I		Level: UG	
Course Name	C Programming			Course Code and Course Type		UBS101/MAJM	
Course Pattern	2025			Version		2.0	

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical and Oral
3	-	-	3	3	40	60	

Prerequisite:

Course Objectives (CO):	The objectives of: 1 To introduce foundational concepts of problem solving using algorithms and flowcharts and relate them to C programming. 2 To build a solid understanding of C language constructs including variables, data types, operators, and control statements. 3 To develop modular programming skills using functions, arrays, and recursion in C. 4 To impart a clear understanding of pointers, structures, and dynamic memory allocation. 5 To enable students to perform string manipulations and file operations using C programming.
Course Learning Outcomes (CLO):	Students will be able to: 1. Design algorithms and flowcharts to solve simple computational problems. 2. Write C programs using control structures, operators, and expressions for logical computation. 3. Apply functions, arrays, and recursion to develop structured and efficient C programs. 4. Utilize pointers and structures to manage complex data and perform dynamic memory operations. 5. Implement string handling and file processing techniques for data management and interaction in C.

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I: Introduction to Programming and Basics of C		
Introduction to problem solving using computers, Problem solving steps, Algorithms- definition, characteristics, examples, advantages and limitations, Flowcharts - definition, notations, examples, advantages and limitations, Comparison with algorithms, History of 'C' language, Features of 'C', Limitations of 'C', Structure of a 'C' program, 'C' Program development life cycle, Function as building blocks, 'C' tokens, Character set, Keywords, Identifiers	CLO 1	9
UNIT II: Control Statements in C		

Variables, Constants (character, integer, float, string, escape sequences, enumeration constant), Data Types (Built-in and user defined data types), Operators, Expressions, types of operators, Operator precedence and Order of evaluation, Character input and output, String input and output, Formatted input and output, Decision making structures:- if ,if-else, switch and conditional operator, Loop control structures:- while ,do while, for, Use of break and continue, Nested structures, Unconditional branching (goto statement), Role of Preprocessor, Format of preprocessor directive, File inclusion directives (#include), Macro substitution directive, argumented and nested macro, Macros versus functions	**CLO 2**	9
UNIT III: Functions and Array in C		
Concept of function, Advantages of Modular design, Standard library functions, User defined functions:- declaration , definition, function call, parameter passing (by value , by reference), return statement, Recursive functions, Scope of variables and Storage classes, Concept of array, Types of Arrays – One, Two and Multidimensional array, Array Operations - declaration, initialization, accessing array elements, Memory representation of two-dimensional array (row major and column major), Passing arrays to function.	**CLO3**	9
UNIT IV: Pointers and Structure		
Introduction to Pointers. Declaration, definition, initialization, dereferencing, Pointer arithmetic, Relationship between Arrays & Pointers- Pointer to array, Array of pointers, Multiple indirection (pointer to pointer), Functions and pointers- Passing pointer to function, Returning pointer from function,Function pointer, Dynamic memory management- Allocation(malloc(),calloc()), Resizing(realloc()),Releasing (free()), Memory leak, dangling pointers. Types of pointers, Concept of structure, definition and initialization, use of typedef, Accessing structure members, Nested Structures, Arrays of Structures, Structures and functions- Passing each member of structure as a separate argument, Passing structure by value / address, Pointers and structures.	**CLO4**	9
UNIT V: String and File Handling		
String Literals, string variables, declaration, definition, initialization, Syntax and use of predefined string functions, Array of strings, Strings and Pointers Command line arguments, Introduction to streams, Types of files, Operations on text files, Standard library input/output functions, Random access to files.	**CLO5**	9
Total Hours		45

Learning resources
Reference Books:

1. **"Let Us C"** by Yashavant Kanetkar
   - Publisher: BPB Publications
   - ISBN: 978-9387289903
2. **"Programming in ANSI C"** by E. Balagurusamy
   - Publisher: McGraw Hill
   - ISBN: 978-1259004612
3. **"The C Programming Language"** by Brian W. Kernighan and Dennis M. Ritchie
   - Publisher: Pearson Education
   - ISBN: 978-0131103627

Online Resources and E-Learning Resources

1. **C Programming Tutorials - GeeksforGeeks**
   - https://www.geeksforgeeks.org/c-programming-language/
2. **C Programming Documentation - TutorialsPoint**
   - https://www.tutorialspoint.com/cprogramming/index.htm
3. **C Programming Guide - Programiz**
   - https://www.programiz.com/c-programming

PCET's
PCU
PCET's
Pimpri
Chinchwad
University

Name of the Program:	BSc	Semester: I		Level: UG
Course Name	C Programming Lab	Course Code/ Course Type		UBS102/MAJM
Course Pattern	2025	Version		2.0
Teaching Scheme				Assessment Scheme

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	2	-	2	4	25	-	25

Prerequisite: Basic Computers is required.

Course Objectives (CO):	The objectives of Programming Concepts Using C Language are: - 1. To understand the fundamentals of C programming and problem-solving techniques. 2. To develop logic building and implement decision-making and looping constructs in C. 3. To apply functions, arrays, and recursion for structured programming. 4. To demonstrate the use of pointers, structures, and dynamic memory allocation in C. 5. To develop file handling and string manipulation skills using C for real-world applications.
Course Learning Outcomes (CLO):	Students would be able to: 1. Write simple programs using fundamental C concepts like data types, variables, operators, and expressions. 2. Implement decision control and iterative structures in C to solve logical problems. 3. Apply modular programming concepts using functions, arrays, and recursion. 4. Demonstrate knowledge of pointers, memory management, and structured data types. 5. Perform file handling operations and implement string manipulations using C language features.

Course Contents/Syllabus:
Practical Plan

Activity Number	Assignment/Practical /Activity Title	Week Number/ Turn	Details	CLO	Hours
1	**Introduction to Programming and Basics of C**	Week 1 / Turn 1 and 2	**Problem 1:** Write a C program to display "Welcome to C Programming" on the screen. **Problem 2:** Write a C program to display your name, roll number, and course details.	CLO1	4
2	**Introduction to Programming and Basics of C**	Week 2/ Turn 1 and 2	**Problem 1:** Write a program to demonstrate the use of arithmetic, relational, and logical operators. **Problem 2:** Convert temperature from Fahrenheit to Celsius and vice versa using mathematical expressions. **Problem 3:** Write a C program that contains syntax errors and debug it using an IDE.	CLO1	4
3	**Introduction to Programming and Basics of C**	Week 3/ Turn 1 and 2	**Problem 1:** Draw a flowchart and write an algorithm to find the largest of three numbers. Then, implement the program in C. **Problem 2:** Draw a flowchart and write a C program to calculate the area and circumference of a circle.	CLO1	4
4	**Control Statements in C**	Week 4/ Turn 1 and 2	**Problem 1:** Write a program to check whether a given number is even or odd using an if-else statement. **Problem 2:** Develop a program that determines if a person is eligible to vote based on their age.	CLO2	4
5	**Control Statements in C**	Week 5/ Turn 1 and	**Problem 1:** Write a C program to implement a simple calculator using switch case. **Problem 2:** Write a C program to print the factorial of a number using	CLO2	4

		2	a for loop.		
			Problem 3: Develop a program that takes a student's marks as input and assigns grades using the conditional operator.		
6	**Control Statements in C**	Week 6/ Turn 1 and 2	**Problem 1:** Write a program to print the multiplication table of a given number using a for loop. **Problem 2:** Implement a program that calculates the sum of the first N natural numbers using a while loop. Problem 3: Write a C program to check whether a number is prime using while or do-while loop.	CLO2	4
7	**Functions and Array in C**	Week 7/ Turn 1 and 2	**Problem 1:** Write a C program to calculate the sum of digits of a number using a function. **Problem 2:** Write a C program to calculate the GCD of two numbers using recursion.	CLO3	4
8	**Functions and Array in C**	Week 8/ Turn 1 and 2	**Problem 1:** Write a C program to find the average of elements in an array. **Problem 2:** Write a program to perform a linear search in an array.	CLO3	4
9	**Functions and Array in C**	Week 9/ Turn 1 and 2	**Problem 1:** Write a C program to perform matrix addition/subtraction. **Problem 2:** Write a C program to pass an array to a function and find the largest element.	CLO3	4
10	**Pointers and Structure**	Week 10/ Turn 1 and 2	**Problem 1:** Write a C program to demonstrate pointer arithmetic operations. **Problem 2:** Write a C program to swap two numbers using call by reference.	CLO4	4
11	**Pointers and Structure**	Week 11/ Turn 1 and 2	**Problem 1:** Write a C program using structures to store and display student information (name, roll no,	CLO4	4

			marks).		
			Problem 2: Write a C program to demonstrate an array of structures.		
12	**Pointers and Structure**	Week 12/ Turn 1 and 2	**Problem 1:** Write a C program using pointers and structures to calculate the total and average marks of students. **Problem 2:** Write a program using an array of structures to store and display data of 5 employees.	CLO4	4
13	**String and File Handling**	Week 13/ Turn 1 and 2	**Problem 1:** Write a C program to implement predefined string functions like strlen(), strcpy(), strcmp(), strcat(). **Problem 2:** Write a C program to read and write a string using pointers.	CLO5	4
14	**String and File Handling**	Week 14/ Turn 1 and 2	**Problem 1:** Write a C program to accept command-line arguments and print them. **Problem 2:** Write a C program to write data to a file and read it back.	CLO5	4
15	**String and File Handling**	Week 15/ Turn 1 and 2	**Problem 1:** Write a C program to perform random access operations on a file. **Problem 2:** Write a C program to count the number of characters, words, and lines in a file.	CLO5	4
Total					**60 hours**

Learning resources

Textbooks:

1. E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill
2. P. K. Sinha & Priti Sinha: Computer Fundamentals.
3. Kamthane: Programming with ANSI and TURBO C (Pearson Education)

Reference Books:

1. Henry Mullish & Hubert L.Cooper: The Spirit of C, Jaico
2. Ashok N Kamthane: Programming with ANS and Turbo C, Pearson
3. V. Rajaraman: Programming in C.

Online Resources/E-Learning Resources
1. https://onlinecourses.nptel.ac.in/noc20_cs913
2. https://www.programiz.com/c-programming

Name of the Program:	BSc(Cyber Security)	Semester: I	Level: UG
Course Name	Data Communication and Networking	Course Code and Course Type	UBS103/MAJM
Course Pattern	2025	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical and Oral
3	-	-	3	3	40	60	-

Prerequisite: Students should have basic knowledge of Computer

Course Objectives (CO):	The objectives are: 1. To learn and understand the fundamental concepts of computer network. 2. To understand the communication architecture and functionalities. 3.To learn and understand the layering concepts and functions of each layer. 4. To apply IP addressing and routing concepts. 5. To analyze the significance of layers in OSI and TCP/IP in real life applications of networking.
Course Learning Outcomes (CLO):	Students will be able to: 1. Remember the fundamental concepts of networking. 2. Understand the different terminologies in datalink layer. 3. Compare and contrast the OSI and TCP/IP models and understand their role in networking. 4. Implement IP addressing schemes, subnetting, and apply routing concepts using protocols. 5. Apply networking principles to real-world scenarios, including configuring mail servers and understanding web communications.

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I Introduction		
Computer communication, Communication system, Signal and Data, Transmission Modes, Synchronous and asynchronous transmission. Transmission Media: a) Guided Media – Twisted Pair, Coaxial and Fiber-optic cables, b) Unguided Media: Radio, Micro Waves and Satellite, Multichannel Data Communication: Circuits, channels, Network Topologies, LAN, MAN, WAN, Multiplexing: FDM, TDM, CDM and WDM, Ethernet (Standard and Fast): frame format and specifications	CLO 1	9
UNIT II Data Link Layer		
Connection oriented N/Ws vs Connectionless N/Ws, Peer to peer networks, Design issues of Datalink layer. Framing: Fixed size framing, Variable size framing, Function of Datalink layer:	CLO	9

Flow Control, Error Control, Error detection and correction, CRC, Simplex stop and wait, CSMA/CD, CSMA/CA, Sliding window protocol, Elementary data link protocols, HDLC, PPP	**2**	
UNIT III The OSI Reference Model		
Need of network models, Concept of layering in networking, ISO/OSI Reference model, The TCP/IP model, Comparison of OSI and TCP/IP models, Network protocols, Real world applications	**CLO3**	**9**
UNIT IV IP Addressing and Routing		
Concept of IP Addressing, IP addresses – Network part and Host Part, Network Masks, Network addresses and Broadcast addresses, Address Classes, Loop back address, IP routing concepts, Routing protocols: RIP, OSPF, BGP, Routing Tables, Stream & Packets, Sliding Windows, Role and Features of IP, TCP Connections types and working. IPV6: The next generation Protocol, IPv4 Vs IPv6.	**CLO4**	**9**
UNIT V Application Layer		
Domain Name System (DNS) and DNS servers, DHCP, Electronic Mail: Architecture and services, Message Formats, MIME, message transfer, SMTP, Mail Gateways, Relays, Configuring Mail Servers, File Transfer Protocol, World Wide Web: Introduction, Architectural overview, static and dynamic web pages, WWW pages and Browsing, HTTP, HTTPS	**CLO5**	**9**
Total Hours		**45**

Learning resources
Textbooks:

1. Computer Networks Andrew S. Tanenbaum, Pearson,5th Ed

2. Data Communications and Networking Behrouz A. Forouzan, TMH,4th Ed.

3. Computer Networks and Internets with Internet Applications Douglas E. Comer

Reference Books:

1. Cryptography and Network Security Atul Kahate , TMH, 2nd Ed

2. Network Essential Notes GSW MCSE Study Notes

3. Internetworking Technology Handbook CISCO System

Online Resources and E-Learning Resources

1. https://www.tutorialspoint.com/data_communication_computer_network/index.htm

2. https://www.guru99.com/data-communication-computer-network-tutorial.html

Name of The Program:	BSc (Cyber Security)		Semester: I		Level: UG	
Course Name	Data Communication and Networking Lab.		Course Code/ Course Type		UBS104/MAJM	
Course Pattern	2025		Version		1.0	

Teaching Scheme

Assessment Scheme

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	2	-	1	2	25	-	25

Prerequisite: Basic Knowledge of Data Communication is required.

Course Objectives (CO):	The objectives are: 1. List out the basic network concepts. 2. To Classify the various types of topologies used in configuration of Network. 3. Make use of Network devices to install the LAN. 4. Examine performance of the network by using various commands. 5. Make use of Network Protocols to Transfer files, Configure Connectivity, Configure firewall.
Course Learning Outcomes (CLO):	Students would be able to: 1. Define the wired computer network topologies. 2. Explain the relevant network model for data communication. 3. Illustrate Error Correction and Error Detection Methods. 4. Analyze the performance of the given network. 5. Configure the network component and assign an IP address.

Course Contents/Syllabus: Practical Plan

Activity Number	ent/Practical/ Title	Week Number/Turn	Details	CLO	Hours
1	Introduction to Basic Network types and connection.	Week 1/ Turn 1 and 2	Type of network topology used in the lab and prepare technical specifications for it.	CL O1	2
2	Connecting Computers	Week 2/ Turn 1 and 2	Connect computers in bus topology and transfer the data.	CLO1	2
3	Network Topology	Week 3/ Turn 1 and 2	Connect computers in star topology and test the performance.	CLO1	2
4	Configure LAN	Week 4/ Turn 1 and 2	Install/configure/Test Peer to Peer LAN and sharing of resources.	CLO2	2

5	Point to Point Network	Week 5/ Turn 1 and 2	Configure Point to Point network in laboratory.	CLO2	2
6	Connect devices on the LAN	Week 6/ Turn 1 and 2	Prepare patch cord and cross connection cables, use to connect the devices on the LAN.	CLO2	2
7	Install LAN Network	Week 7/ Turn 1 and 2	Using a Switch Install a LAN network consisting of 6 computers.	CLO3	2
8	Error Detection.	Week 8/ Turn 1 and 2	Locate the error bit in the given data stream by applying the different error detection methods.	CLO3	2
9	Error Correction Methods	Week 9/ Turn 1 and 2	Correct the error in each data stream by applying the different error correction methods.	CLO3	2
10	Performance of Network	Week 10/ Turn 1 and 2	Use route command to test the performance of the given network.	CLO4	2
11	Install, Test Router	Week 11/ Turn 1 and 2	Install and test Router	CLO4	2
12	IP Address.	Week 12/ Turn 1 and 2	Assign IP address to the PC connected to the internet.	CLO5	2
13	Configure Connectivity.	Week 13/ Turn 1 and 2	Configure/Test Internet connectivity	CLO5	2
14	Transfer files.	Week 14/ Turn 1 and 2	Use FTP protocol to transfer file from one system to another system.	CLO5	2
15	Configure Firewall.	Week 15/ Turn 1 and 2	Install and configure a Firewall for the network security.	CLO5	2
Total					**30 Hours**

Learning resources

Textbooks:
1. Data Communications and Networking By Behrouz A. Forouzan
2. Data Communications and Networking with TCP/IP Protocol Suite 6th
   Edition by Behrouz A. Forouzan

Reference Books:
1. Computer Networking by Kurose
2. Data Communications Networking by Behrouz A. Forouzan
Online Resources/E-Learning Resources
1. https://www.youtube.com/watch?reload=9&v=aHJElrgj6UA
2. https://www.youtube.com/watch?v=_VRToy-9SD0

Name of the Program	BSc (Cyber Security)	Semester: I	Level: UG
Course Name	Open Elective I- Introduction to Cyber Security	Course Code/ Course Type	UBS105A/OE
Course Pattern	2025	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	20	30	-

Prerequisite: Students should have basic knowledge of Networks.

Course Objectives (CO):	The objectives of Introduction to Cyber Security are: 1. To remember network basics and familiarize on the security of network protocols. 2. To understand the field of digital security and concepts of access control mechanisms. 3. To apply keywords and jargons involved in securing browsers. 4. To examine the need of cyber-attacks and data privacy. 5. To analyze the significance of security methods in the cyber domain.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify the digital security measures taken to protect device from threats 2. Explain the access control mechanism and understand how to protect servers. 3. Explain the importance of network basics and security of network protocols. 4. Analyze the cyber-attacks, learn data privacy issues and preventive measures. 5. Analyze the various attacks in the web interface.

Course Contents and Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Cyber security: Overview of Web-technology, Communication and web technology, Internet and World wide web, Advent of internet, Internet infrastructure for Data transfer and Governance, Regulation of Cyberspace, Concept of Cyber Security, Issues, and challenges of Cyber Security.	CLO1	6
UNIT II		
Networking: Networking Basics-Components, Topology-Bus, Star, Ring, Tree, Types of Networks-LAN, MAN, WAN, GAN, Networking Protocols-HTTP, HTTPS, DNS, TCP/IP, Security of Protocols, Sample application hosted on-premises.	CLO2	6
UNIT III		

Digital Security: Basics of Digital Security, Protecting personal computers and devices, Protecting devices from Virus and Malware, Authentication and Authorization, Need for strong and secure credentials, Protecting servers using physical and logical security, Security of browser to web server interaction.	CLO3	6
UNIT IV		
Cyber Attacks: Introduction, Application security (design, development, and testing), Operations Security, Monitoring, Identifying threats and remediating them, Principles of data Security, Confidentiality, Integrity and Availability, Data Privacy, Data breaches, Preventing attacks and breaches with security controls, Compliance standards, Computer Ethics.	CLO4	6
UNIT V		
Cybercrime and Cyber law: Classification of cybercrimes, Cybercrime targeting computers and mobiles, Cybercrime against women and children, Financial frauds, Social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus operandi, Reporting of cybercrimes, Remedial and mitigation measures, IT Act 2000 and its amendments, Cybercrime and offenses, Organizations dealing with Cybercrime and Cyber security in India, Case studies.	CLO5	6
Total hours		**30**

Learning resources

Textbooks:

1. Cybersecurity For Dummies by Joseph Steinberg
2. Big Breaches: Cybersecurity Lessons for Everyone by Neil Daswani, Moudy Elbayadi

Reference Books:

1. Cybersecurity: The Beginner's Guide by Dr. Erdal Ozkaya
2. Confident Cybersecurity: How to Get Started in Cybersecurity and Futureproof Your Career by Dr. Jessica Barker

Online Resources/E-Learning Resources

1. The Complete Cyber Security Course: Hackers Exposed --- https://www.udemy.com/course
2. Foundations of Cybersecurity----- https://www.coursera.org/

COURSE CURRICULUM

Name of the Program:	BSc (Cyber Security)	Semester: I		Level: UG
Course Name	Introduction to Digital Electronics	Course Code/ Course Type		UBS108B/OE
Course Pattern	2024	Version		1.0
Teaching Scheme				Assessment Scheme

Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	-	-	2	2	20	30	-

Prerequisite: Basic Knowledge of Number system.

Course Objectives (CO):	The objectives of Introduction to Digital Electronics are: 1. To understand the number systems, Binary codes and Complements. 2. To understand the Boolean algebra and simplification of Boolean expressions. 3. To analyze logic processes and implement logical operations using combinational logic circuits. 4. To analyze sequential systems in terms of state machines. 5. To understand characteristics of memory and their classification.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify the various concepts, terminologies of Number system and Codes. 2. Analyze, design and implement combinational logic circuits. 3. Classify different semiconductor memories. 4. Analyze, design and implement sequential logic circuits. 5. Simulate and implement combinational and sequential logic circuits.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Number System and Codes: Decimal, Binary, Hexadecimal,Octal,Codes,BCD, Gray and Excess 3 codes, code conversions,Complements (1's, 2's,9's and 10's),Addition - Subtraction using complement methods.	CLO1	6
UNIT II		
Boolean Algebra and Theorems: Boolean Theorems,De-Morgan's laws,Digital logic gates,Multi-level NAND & NOR gates,Standard representation of logic functions (SOP and POS),Minimization Techniques(Karnaugh Map Method)	CLO2	6
UNIT III		
Combinational Digital Circuits: Address Half & full adder,Subtractor Half and full subtractors,Parallel binary adder,Magnitude Comparator,Multiplexers(4:1))and Demultiplexers (1:4)	CLO3	6
UNIT IV		
Sequential Digital Circuits: Flip Flops,SR,FF,JK,FF,T and D type,FFs,Master-Slave FFs,Excitation tables,Registers,Serial in Serial Out,Parallel In and Parallel Out, Counters Asynchronous,Mod-8,Mod-10	CLO4	6
UNIT V		
Memory Devices: General Memory Operations,ROM,RAM (Static and Dynamic), PROM, EPROM, EEPROM, EAROM.	CLO5	6
Total hours		30

Learning resources

Textbooks:

1. "Herbert Taub and Donald Schilling. "Digital Integrated Electronics" . McGraw Hill.
2. S.K. Bose. "Digital Systems". 2/e. New Age International.

Reference Books:

1. D.K. Anvekar and B.S. Sonade. "Electronic Data Converters : Fundamentals & Applications". TMH.
2. Malvino and Leach. " Digital Principles and Applications". TMG Hill Edition.

Online Resources/E-Learning Resources

1. https://www.agner.org/digital/digital_electronics_agner_fog.pdf
2. 01Title.fm (clarkson.edu)

Name of the Program:	B.Sc (Cyber Security)	Semester: I		Level: UG	
Course Name	Basics of Mathematics	Course Code and Course Type		UBS106/BSC	
Course Pattern	2024	Version		1.0	

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical and Oral
3	-	-	3	3	40	60	-

Prerequisite:

Course Objectives (CO):	The objectives of:
	1. Develop a fundamental understanding of mathematical concepts essential for higher studies.
	2. Learn problem-solving techniques in algebra, trigonometry, calculus, and geometry.
	3. Understand set theory, logic, and functions as foundations of mathematical reasoning.
	4. Apply mathematical concepts in real-world problem-solving.
	5. Strengthen analytical thinking and quantitative reasoning.
Course Learning Outcomes (CLO):	Students will be able to:
	1. Understand fundamental mathematical operations, algebraic expressions, and equations.
	2. Apply concepts of trigonometry and coordinate geometry in problem-solving.
	3. Solve calculus-based problems involving limits, derivatives, and integrals.
	4. Utilize set theory, functions, and logic in mathematical reasoning.
	5. Analyze real-world problems using mathematical tools and techniques.

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I: Fundamentals of Algebra and Equations		
Number System: Natural Numbers, Integers, Rational & Irrational Numbers, Real Number, Laws of Exponents, Surds, and Logarithms, Algebraic Expressions and Identities, Linear, Quadratic, and Polynomial Equations, Factorization and Simplification Techniques, Matrices and Determinants: Basic Operations, Applications of Algebra in Real Life	CLO 1	9
UNIT II: Trigonometry and Coordinate Geometry		
Trigonometric Ratios and Identities, Heights and Distances: Real-Life Applications of Trigonometry, Sine and Cosine Rules, Circular Functions, Cartesian Plane and Graphs of Equations, Distance Formula, Midpoint Theorem, Section Formula, Equation of Straight Lines, Slopes, and Intercepts, Conic Sections: Circles, Parabolas, Ellipses, Hyperbolas	CLO 2	9
UNIT III: Calculus – Limits, Differentiation, and Integration		
Introduction to Limits: Concept and Properties, Continuity and Differentiability, Basic Differentiation Rules: Chain Rule, Product Rule, Quotient Rule, Applications of Derivatives:	CLO3	9

Maxima, Minima, and Rate of Change, Integration as an Inverse Process of Differentiation, Definite and Indefinite Integrals, Applications of Integration in Area and Volume Calculation		
UNIT IV: Set Theory, Logic, and Functions		
Sets and Subsets: Operations on Sets, Venn Diagrams and Applications, Logical Connectives, Truth Tables, Propositions, and Tautologies, Functions: Types (One-to-One, Onto, Bijective), Composition and Inverse Functions, Relations and Their Properties, Binary Operations and Groups, Applications in Computer Science and Digital Logic	**CLO4**	9
UNIT V: Applications of Mathematics in Real Life		
Probability and Statistics: Basic Concepts, Mean, Median, Mode, Standard Deviation, Permutations and Combinations, Graph Theory: Basics and Applications in Networks, Financial Mathematics: Simple and Compound Interest, Profit and Loss, Geometry in Architecture and Engineering, Mathematical Modeling and Decision Making, Case Studies: Cryptography, AI, Machine Learning, and Data Science	**CLO5**	9
Total Hours		45

Learning resources
Textbooks:

1. R.D. Sharma, Mathematics for Class XI and XII, Dhanpat Rai Publications.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
3. Seymour Lipschutz & Marc Lipson, Discrete Mathematics, Schaum's Outlines, McGraw-Hill.

Reference Books:

1. Shanti Narayan, Differential Calculus, S. Chand Publishing.
2. S.N. Lal, Comprehensive Mathematics for Beginners, McGraw-Hill.
3. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley, 10th Edition.

Online Resources and E-Learning Resources
Online Resources:
1. MIT OpenCourseWare – Mathematics - https://ocw.mit.edu/courses/mathematics/
2. Khan Academy – Mathematics - https://www.khanacademy.org/math
3. Coursera – Mathematics for Machine Learning - https://www.coursera.org/
4. Wolfram MathWorld – Online Mathematics Resource - https://mathworld.wolfram.com/

E-Learning Resources:

1. edX – College Algebra and Problem-Solving (https://www.edx.org/)
2. Udemy – Essential Mathematics for Beginners (https://www.udemy.com/)
3. Pluralsight – Mathematical Foundations for Computing (https://www.pluralsight.com/)
4. NPTEL – Basic Mathematics (https://nptel.ac.in/courses/)

COURSE CURRICULUM

Name of the Program:	BSc (Cyber Security)	Semester: I		Level: UG	
Course Name	Fundamentals of Computer Architecture	Course Code/ Course Type		UBS107/SEC	
Course Pattern	2025	Version		1.0	
Teaching Scheme				**Assessment Scheme**	

Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	-

Prerequisite: Students should have basic Computer Knowledge

Course Objectives (CO):	The objectives of Fundamentals of Computer Architecture are: 1. To remember the Fundamental structure of Computers 2. To understand the various types of Instructions for performing operations. 3. Illustrate the standard input output Interfaces, buses and their types. 4. Highlight the need for different types of Memory systems and their functions. 5. Discuss the processing units and their roles.
Course Learning Outcomes (CLO):	Students would be able to 1. Identify the structure of a computer system. 2. Explain various addressing modes and the role of Input output operations. 3. Illustrate the Input Output Interfaces and their role for memory access. 4. Examine the different memory systems and their functions. 5. Elaborate the role of processing units for performing arithmetic or any other logical operation.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Basic Structure of Computers: Functional unit, Basic Operational Concepts, Bus structures, System Software, Performance, The history of computer development, Machine Instruction and Programs, Instruction and Instruction Sequencing, Register Transfer Notation, Assembly Language Notation, Basic Instruction Types.	CLO1	9
UNIT II		
Addressing Modes: Basic Input/output Operations, The role of Stacks and Queues in computer programming equations, Component of Instructions, Logic Instructions, Shift and Rotate Instructions, Type of Instructions, Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations.	CLO2	9
UNIT III		
Input Output Organization: Accessing I/O Devices, Interrupts, Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses, Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface.	CLO3	9
UNIT IV		

Memory Systems: Basic memory circuits, Memory System Consideration, Read Only memory, ROM, PROM, EPROM, EEPROM, Flash Memory, Cache Memories, Mapping Functions, Magnetic Hard Disks, Optical Disks.	**CLO4**	**9**
UNIT V		
Processing Unit: Fundamental Concepts, Register Transfers, Performing an Arithmetic Or Logic Operation, Fetching a Word from Memory, Micro programmed Control, Microinstruction, Microprogram Sequencing.	**CLO5**	**9**
Total hours		**45**

Learning resources

Textbooks:

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition,McGraw Hill, 2011.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill,2002.

Reference Books:

1. Computer Architecture: Fundamentals and Principles of Computer Design, 2nd Edition, by Joseph D. Dumas

2. Essentials of Computer Organization and Architecture, 5 th Edition, by Linda Null.

Online Learning/E-learning Resources

1. http://www.cs.iit.edu/~virgil/cs470/Book/
2. https://www.cse.iitd.ac.in/~srsarangi/archbook/chapters/intro.pdf

Name of the Program:	BSc(CS)			Semester: I		Level: UG	
Course Name	Applied Communication			Course Code/ Course Type		UEG101/AEC	
Course Pattern	2024			Version		1.0	
Teaching Scheme				**Assessment Scheme**			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	-	2	50	-	-

Prerequisite: Anyone can take this course with basic knowledge of English communication.

Course Objectives (CO):	The objectives of Applied Communication are: 1. To Comprehend the basic English communication components. 2. To Identify the Factors influencing interpersonal communication. 3. To Apply the knowledge of written communication. 4. To Demonstrate English communication in public speaking and presentation. 5. To develop students' understanding of digital communication tools, media literacy skills, and ethical considerations in online communication.
Course Learning Outcomes (CLO):	Students would be able to: 1. Define communication and explain its significance in personal, professional, and societal contexts. 2. Apply interpersonal communication skills in various contexts, such as social interactions, group discussions, teamwork, leadership, and professional settings. 3. Understand the fundamental principles of effective writing, including clarity, coherence, conciseness, and correctness. 4. Reflect on their presentation experiences, seek feedback from peers. 5. Use digital tools for collaboration, communication, and productivity, including project management platforms.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Communication: Definition and models of communication, Importance of effective communication in personal and professional contexts, Basic elements of communication: sender, receiver, message, channel, feedback, Communication barriers and strategies for overcoming them, Verbal and nonverbal communication skills.	CLO 1	6
UNIT II		
Interpersonal Communication: Understanding interpersonal relationships, Factors influencing interpersonal communication: culture, gender, perception, and self-concept, Effective listening skills and techniques, Assertiveness and conflict resolution strategies, Building and maintaining healthy, relationships	CLO 2	6
UNIT III		
Written Communication: Principles of effective writing, clarity, coherence, conciseness and correctness, Types of written communication, emails, memos, letters, reports and resumes, Planning and organizing written documents, Grammar, punctuation and style conventions, Proofreading and editing techniques	CLO3	6
UNIT IV		
Public Speaking and Presentation Skills: Understanding the importance of public speaking, Preparing and organizing a presentation, topic selection, audience analysis and speech outline, Delivery techniques, voice modulation, body language, and eye contact, Overcoming stage fright and anxiety, Handling questions and feedback from the audience	CLO4	6
UNIT V		
Digital Communication and Media Literacy: Overview of digital communication tools, email, social media, instant messaging and video conferencing, Netiquette, and online professionalism, Understanding media messages and sources	CLO5	6
Total Hours		**30 Hours**

Learning resources

Textbooks:
1. Communication in Everyday Life: A Social Interpretation" by Steve Duck and David T. McMahan
2. Applied Communication in the 21st Century" by Carole L. Huston and Ronald B. Adler

Reference Books:
1. The SAGE Handbook of Communication and Instruction" edited by Deanna L. Fassett and John T. Warren
2. Communication: Principles for a Lifetime" by Steven A. Beebe, Susan J. Beebe, and Diana K. Ivy

Online Resources/E-Learning Resources

1. https://www.udemy.com/topic/communication-skills/free/
2. https://www.uou.ac.in/sites/default/files/slm/BHMAECC-II.pd

COURSE CURRICULUM

Name of the Program:	BSc(Cyber Security)	Semester: I		Level: UG	
Course Name	Concepts and Application in Science	Course Code/ Course Type		ACIKSSS101	
Course Pattern	2025	Version		1.0	
Teaching Scheme				Assessment Scheme	

Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	50	-	-

Prerequisite: Basic knowledge of science.

Course Objectives (CO):	The objectives of Concepts and Application in Science are: 1. To remember Indian Knowledge Systems: Origin, Evolution and Ontological Approach 2. To understand Indian Knowledge Approaches. 3. To apply Sciences of Life and Mind. 4. To examine Indian Knowledge System Torchbearers – Ancient and Modern 5. To analyse Self-Knowledge for Personal Effectiveness.
Course Learning Outcomes (CLO):	Students would be to: 1. Identify and appreciate the rich heritage that resides in our traditions. 2. Explain the mind/voice dynamic in Indian knowledge systems. 3. Explain the practices that will prepare one for the inner-journey to discover the Self. 4. Analyse the need and importance of Sanskrit in getting to the roots of the philosophical concepts. 5. Analyse the various functions in Indian knowledge systems.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Indian Knowledge System and Vedic Corpus: Introduction to IKS, Need for IKS, Historicity of IKS, Salient aspects of IKS, IKS in ancient India and in modern India. Introduction to Vedas, Four Vedas, Sub-classification of Vedas, Messages in Vedas, Basics of Nirukta and Chandas.	CLO1	6
UNIT II		

Wisdom through the Ages: Puranas, Ithihasas, Nitishastras, Subhasitas,Linguistics, Components of a language,Paṇini's work on Sanskrit grammar,Phonetics in Sanskrit, Role of Sanskrit in natural language processing,Framework for establishing valid knowledge.	**CLO2**	**6**
UNIT III		
Number Systems and Units of Measurement: Salient features of the Indian numeral system, Importance of decimal representation, The discovery of zero and its importance, Unique approaches to represent numbers, Unique aspects of Indian Mathematics, Great mathematicians and their significant contributions in the area of arithmetic, algebra, geometry, trigonometry, combinatorial problems in Chandaḥ-sastra of Pingala	**CLO3**	**6**
UNIT IV		
Knowledge Framework and classifications: Indian scheme of knowledge, The knowledge triangle, Prameya, A vaiśeṣikan approach to physical reality, Dravyas, The constituents of the physical reality	**CLO4**	**6**
UNIT V		
Science and Technology in the Vedic Age and Post-Vedic Records. **Knowledge:** Framework and Classification, Astronomy Encryption Method used in ancient India, Introduction to Yantra Shastra, Vaimanik Shashtra, Agriculture Technologies	**CLO5**	**6**
Total hours		**30**

Activity 1: Comparative Analysis of Traditional and Modern Scientific Methods
Activity 2: Presentation on Indian scientific texts such as the Phonetics in Sanskrit, Astronomy Encryption Method used in ancient India
Learning resources
Textbooks:
1. Health Science: Concepts and Applications, Authors: Jacquelyn Rhine Marshall and Sue C. Roe
2. Introduction to Indian Knowledge Systems: Concepts and Applications by Prof. B Mahadevan
Reference Books: -
1. Introduction to Indian Knowledge System: Concepts and Applications by Pallavi Ghosh
Online Resources/E-Learning Resources
1. https://onlinecourses.swayam2.ac.in/

Name of the Program:	BSc (CS)				Semester: I		Level: UG	
Course Name	UHV-I: Professional Ethics				Course Code/ Course Type		ACUHV101/AC	
Course Pattern	2025				Version		2.0	
Teaching Scheme					**Assessment Scheme**			
Theory	Practical		Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	0		0	0	2	50	-	-
Pre-Requisite: UHV-I								

	The objectives of Universal Human Value- Professional Ethics are:
	1. To make the students understand the importance of ethical behaviour.
	2. To expose the students to the ethical practices to be followed in profession.
	3. To sensitize the students to become responsible persons who will uphold ethics in profession when they pursue their career.
	4. To make students understand Psychological and Philosophical approaches.
	5. To make students understand social responsibility and corporate Sustainability
Course Learning Outcomes (CLO):	Students would be able to:
	1. Equip themselves with an understanding of moral, professional and personal values.
	2. Understand the need of ethics in shaping their profession The learners will hone their decision-making skills.
	3. Refine their business ethics based on psychological and philosophical perspective.
	4. Assess the need for a balance between ecology, and economy.
	5. Equip themselves with a better understanding of themselves and the society they live in and the responsibilities they shoulder in creating a sustainable world.

Descriptors/Topics	CLO	Hours
UNIT I		
Individual and Professional Ethics: Introduction to Professional Ethics, Morals, Values and Ethics – Personal and Professional- Sensé of Professional Ethics – Code of Ethics by NSPE-Making decisions with ethical dimensions–definition–roadmap to ethical decision making–common standards– internal obstacles – bias – empathy	CLO 1	6
UNIT II		
Business Ethics: Philosophical approaches to Business Ethics – ethical reasoning – ethical issues in business - Social Responsibility of Business- conflict of interest–cultural relativism-Ethical Leadership-Resisting un-ethical authority and domination-Global	CLO 2	6

Business Ethics		
UNIT III		
Psychological Approaches: Ethical Theories-Psychological and Philosophical Approaches-Myths about Morality-conflict of interest in psychological perspective - Courage-Integrity – ethical dilemma – Emotional Intelligence (Mahabharata- Iskcon Publications)	**CLO 3**	**6**
UNIT IV		
Workplace Ethics: Ethics in changing domains of Research, academic integrity, intellectual honesty-Role of Engineers and Managers, Ethical issues in Diverse workplace, competition, free will- Confidentiality, employee rights – Intellectual property rights – discrimination	**CLO 4**	**6**
UNIT V		
Safety, Responsibilities and Rights: Ecology, and Economy-Risk benefit analysis and reducing risk SDGs–Corporate social responsibility and Corporate Sustainability - CSR in India - Sustainability Case Studies	**CLO 5**	**6**
Total Hours		**30**

Learning resources
Textbooks:
1. Subramanian. R. Professional Ethics, Oxford Publication,2013.
2. Nagarasan. R. S. Professional Ethics and Human Values. New Age International Publications, 2006.
Reference Book:
Mike W Martin and Roland Schinzinger, Ethics in Engineering,4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi,2014
Online Resources/E-Learning Resources
1. https://www.nspe.org/resources/ethics/code-ethics
2. https://www.toolshero.com/tag/ethical-decision-making/
3. https://pagecentertraining.psu.edu/public-relations-ethics/introduction-to-public-relations-ethics/lesson-1/ethical-theories/
4. https://peer.asee.org/case-studies-in-engineering-ethics.pdf
CIA Guidelines
Online Quiz (Based on MCQ)- 20 marks
Activity (with short Report Submission) - 20 Marks
Academic Sincerity - 10 marks

Few of the suggested activities are Assignments, Debates, Poster presentations, Model making, Group presentation, Field visits and Group Discussions.
Debate Topics
- Ethical Approach versus Realistic Approach
- Individual and Social Approach
- Dilemma between heart and Mind
Activity
- Analyze the wastage (Electricity or any other) at work place? How you managed.
Assignment
- Analyze the code of ethics at work place.
- If you fulfil the duties, rights will automatically fall in place. Justify the statement
References:
1. https://uhv.org.in/
2. https://vvce.ac.in/wp-content/uploads/2021/04/Realising-Aspirations-of-NEP2020-UHV.pdf

B.Sc.(Cyber Security) 2025 PATTERN

COURSE DETAILS

Semester - II

Name of the Program:	BSc (CS)		Semester: II		Level: UG	
Course Name	Data Structure Using C		Course Code and Course Type		UBS109/MAJM	
Course Pattern	2025		Version		2.0	
Teaching Scheme					**Assessment Scheme**	
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical and Oral
3	-	-	3	3	40	60	-
Prerequisite:							

Course Objectives (CO):	The objectives of:
	1. To introduce foundational concepts of problem-solving using algorithms and flowcharts and relate them to C programming. 2. To build a solid understanding of C language constructs including variables, data types, operators, and control statements. 3. To develop modular programming skills using functions, arrays, and recursion in C. 4. To impart a clear understanding of pointers, structures, and dynamic memory allocation. 5. To enable students to perform string manipulations and file operations using C programming.
Course Learning Outcomes (CLO):	Students will be able to: 1. Design algorithms and flowcharts to solve simple computational problems. 2. Write C programs using control structures, operators, and expressions for logical computation. 3. Apply functions, arrays, and recursion to develop structured and efficient C programs. 4. Utilize pointers and structures to manage complex data and perform dynamic memory operations. 5. Implement string handling and file processing techniques for data management and interaction in C.

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I: Introduction to Programming and Basics of C		
Introduction to problem solving using computers, Problem solving steps, Algorithms-definition, characteristics, examples, advantages and limitations, Flowcharts - definition, notations, examples, advantages and limitations, Comparison with algorithms, History of 'C' language, Features of 'C', Limitations of 'C' , Structure of a 'C' program, 'C' Program development life cycle, Function as building blocks, 'C' tokens, Character set, Keywords, Identifiers	**CLO 1**	9
UNIT II: Control Statements in C		
Variables, Constants (character, integer, float, string, escape sequences, enumeration constant), Data Types (Built-in and user defined data types), Operators, Expressions, types of operators, Operator precedence and Order of evaluation, Character input and output, String input and output, Formatted input and output, Decision making structures:- if ,if-else, switch and conditional operator, Loop control structures:- while ,do while, for, Use of break and continue, Nested structures, Unconditional branching (goto statement), Role of Preprocessor, Format of preprocessor directive, File inclusion directives (#include), Macro substitution directive, argumented and nested macro, Macros versus functions	**CLO 2**	9
UNIT III: Functions and Array in C		
Concept of function, Advantages of Modular design, Standard library functions, User defined functions:- declaration , definition, function call, parameter passing (by value , by reference), return statement, Recursive functions, Scope of variables and Storage classes, Concept of array, Types of Arrays – One, Two and Multidimensional array, Array Operations - declaration, initialization, accessing array elements, Memory representation of two-dimensional array (row major and column major), Passing arrays to function.	**CLO3**	9
UNIT IV: Pointers and Structure		
Introduction to Pointers. Declaration, definition, initialization, dereferencing, Pointer arithmetic, Relationship between Arrays & Pointers- Pointer to array, Array of pointers, Multiple indirection (pointer to pointer), Functions and pointers- Passing pointer to function, returning pointer from function, Function pointer, Dynamic memory management- Allocation(malloc(),calloc()), Resizing(realloc()), Releasing(free()), Memory leak, dangling pointers. Types of pointers, Concept of structure, definition and initialization, use of typedef, Accessing structure members, Nested Structures, Arrays of Structures, Structures and functions- Passing each member of structure as a separate argument, Passing structure by value / address, Pointers and structures.	**CLO4**	9
UNIT V: String and File Handling		
String Literals, string variables, declaration, definition, initialization, Syntax and use of predefined string functions, Array of strings, Strings and Pointers
Command line arguments, Introduction to streams, Types of files, Operations on text files, Standard library input/output functions, Random access to files.	**CLO5**	9
Total Hours		45

Learning resources
Reference Books:

4. **"Let Us C"** by Yashavant Kanetkar
   - Publisher: BPB Publications
   - ISBN: 978-9387289903
5. **"Programming in ANSI C"** by E. Balagurusamy
   - Publisher: McGraw Hill
   - ISBN: 978-1259004612
6. **"The C Programming Language"** by Brian W. Kernighan and Dennis M. Ritchie
   - Publisher: Pearson Education
   - ISBN: 978-0131103627

Online Resources and E-Learning Resources

4. **C Programming Tutorials - GeeksforGeeks**
   - https://www.geeksforgeeks.org/c-programming-language/
5. **C Programming Documentation - TutorialsPoint**
   - https://www.tutorialspoint.com/cprogramming/index.htm
6. **C Programming Guide - Programiz**
   - https://www.programiz.com/c-programming

Name of the Program:	BSc (CS)	Semester: II		Level: UG	
Course Name	Data Structure Using C Lab.	Course Code/ Course Type		UBS110/MAJM	
Course Pattern	2025	Version		2.0	
Teaching Scheme				**Assessment Scheme**	

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	2	-	2	4	25	-	25

Prerequisite: Basic Computers is required.

Course Objectives (CO):	The objectives of Programming Concepts Using C Language are: - 6. To understand the fundamentals of C programming and problem-solving techniques. 7. To develop logic building and implement decision-making and looping constructs in C. 8. To apply functions, arrays, and recursion for structured programming. 9. To demonstrate the use of pointers, structures, and dynamic memory allocation in C. 10. To develop file handling and string manipulation skills using C for real-world applications.
Course Learning Outcomes (CLO):	Students would be able to: 6. Write simple programs using fundamental C concepts like data types, variables, operators, and expressions. 7. Implement decision control and iterative structures in C to solve logical problems. 8. Apply modular programming concepts using functions, arrays, and recursion. 9. Demonstrate knowledge of pointers, memory management, and structured data types. 10. Perform file handling operations and implement string manipulations using C language features.

Course Contents/Syllabus:
Practical Plan

Activity Number	Assignment/Practical/Activity Title	Week Number/Turn	Details	CLO	Hours
1	**Introduction to Programming and Basics of C**	Week 1 / Turn 1 and 2	**Problem 1:** Write a C program to display "Welcome to C Programming" on the screen. **Problem 2:** Write a C program to display your name, roll number, and course details.	CLO 1	4
2	**Introduction to Programming and Basics of C**	Week 2/ Turn 1 and 2	**Problem 1:** Write a program to demonstrate the use of arithmetic, relational, and logical operators. **Problem 2:** Convert temperature from Fahrenheit to Celsius and vice versa using mathematical expressions. **Problem 3:** Write a C program that contains syntax errors and debug it using an IDE.	CLO 1	4
3	**Introduction to Programming and Basics of C**	Week 3/ Turn 1 and 2	**Problem 1:** Draw a flowchart and write an algorithm to find the largest of three numbers. Then, implement the program in C. **Problem 2:** Draw a flowchart and write a C program to calculate the area and circumference of a circle.	CLO 1	4
4	**Control Statements in C**	Week 4/Turn 1 and 2	**Problem 1:** Write a program to check whether a given number is even or odd using an if-else statement. **Problem 2:** Develop a program that determines if a person is eligible to vote based on their age.	CLO 2	4
5	**Control Statements in C**	Week 5/ Turn 1 and 2	**Problem 1:** Write a C program to implement a simple calculator using switch case. **Problem 2:** Write a C program to print the factorial of a number using a for loop. **Problem 3:** Develop a program that takes a student's marks as input and assigns grades using the conditional operator.	CLO 2	4
6	**Control Statements in C**	Week 6/	**Problem 1:** Write a program to print the multiplication table of a given number using a for loop.	CLO 2	4

		Turn 1 and 2	**Problem 2:** Implement a program that calculates the sum of the first N natural numbers using a while loop. **Problem 3:** Write a C program to check whether a number is prime using while or do-while loop.		
7	**Functions and Array in C**	Week 7/ Turn 1 and 2	**Problem 1:** Write a C program to calculate the sum of digits of a number using a function. **Problem 2:** Write a C program to calculate the GCD of two numbers using recursion.	CLO 3	4
8	**Functions and Array in C**	Week 8/Turn 1 and 2	**Problem 1:** Write a C program to find the average of elements in an array. **Problem 2:** Write a program to perform a linear search in an array.	CLO 3	4
9	**Functions and Array in C**	Week 9/ Turn 1 and 2	**Problem 1:** Write a C program to perform matrix addition/subtraction. **Problem 2:** Write a C program to pass an array to a function and find the largest element.	CLO 3	4
10	**Pointers and Structure**	Week 10/ Turn 1 and 2	**Problem 1:** Write a C program to demonstrate pointer arithmetic operations. **Problem 2:** Write a C program to swap two numbers using call by reference.	CLO 4	4
11	**Pointers and Structure**	Week 11/ Turn 1 and 2	**Problem 1:** Write a C program using structures to store and display student information (name, roll no, marks). **Problem 2:** Write a C program to demonstrate an array of structures.	CLO 4	4
12	**Pointers and Structure**	Week 12/ Turn 1 and 2	**Problem 1:** Write a C program using pointers and structures to calculate the total and average marks of students. **Problem 2:** Write a program using an array of structures to store and display data of 5 employees.	CLO 4	4
13	**String and File Handling**	Week 13/ Turn 1 and 2	**Problem 1:** Write a C program to implement predefined string functions like strlen(), strcpy(), strcmp(), strcat(). **Problem 2:** Write a C program to read and write a string using pointers.	CLO 5	4

14	**String and File Handling**	Week 14/ Turn 1 and 2	**Problem 1:** Write a C program to accept command-line arguments and print them. **Problem 2:** Write a C program to write data to a file and read it back.	CLO 5	4
15	**String and File Handling**	Week 15/ Turn 1 and 2	**Problem 1:** Write a C program to perform random access operations on a file. **Problem 2:** Write a C program to **count the number of characters, words, and lines** in a file.	CLO 5	4
Total					**60 hours**

Learning resources

Textbooks:

1. E Balagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill
2. P. K. Sinha & Priti Sinha: Computer Fundamentals.
3. Kamthane: Programming with ANSI and TURBO C (Pearson Education)

Reference Books:

1. Henry Mullish & Hubert L.Cooper: The Spirit of C, Jaico
2. Ashok N Kamthane: Programming with ANS and Turbo C, Pearson
3. V. Rajaraman: Programming in C.

Online Resources/E-Learning Resources

    3.   https://onlinecourses.nptel.ac.in/noc20_cs913
    4.   https://www.programiz.com/c-programming

COURSE CURRICULUM

Name of the Program:	BSc (Cyber Security)	Semester: II		Level: UG
Course Name	Unix & Shell Programming	Course Code and Course Type		UBS111/MAJM
Course Pattern	2025	Version		1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical and Oral
3	-	-	3	3	40	60	-

Prerequisite: Fundamentals of Operating System.

Course Objectives (CO):	The objectives of Unix & Shell Programming: -
	1. To Understand the history, architecture, and features of UNIX, and become proficient in its command-line interface.
	2. To Explore the UNIX file system, including file types, directory organization, and efficient file navigation techniques.
	3. To Learn the basics of shell scripting and its practical applications in automating tasks and managing processes.
	4. To Gain in-depth knowledge of shell programming constructs, control statements, and special commands for problem-solving.
	5. To Study processes and signals in UNIX, including process management, identifiers, scheduling, and handling inter-process communication.
Course Learning Outcomes (CLO):	Students will be able to:
	1. To Demonstrate a clear understanding of UNIX architecture, its environment, and command structures to perform basic system operations effectively.
	2. To Apply knowledge of the UNIX file system to manage directories, files, and paths using both absolute and relative referencing techniques.
	3. To Develop and execute shell scripts to automate repetitive tasks and improve system efficiency using logical operators and conditions.
	4. To Utilize advanced shell programming concepts such as control statements, redirection, and handling positional parameters to write robust programs.

	5. To Analyze and manage processes and signals in UNIX, including creating and controlling processes, handling system signals, and ensuring efficient system resource utilization.	

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I		
INTRODUCTION OF UNIX: Brief history, Unix Components/Architecture. Features of Unix. The UNIX Environment and UNIX Structure, Posix and Single Unix specification. The login prompt. General features of Unix commands/ command structure. Command arguments and options. Understanding of some basic commands such as echo, printf, ls,date, passwd, cat, cal, date, calendar.	CLO1	9
UNIT II		
UNIX FILE SYSTEM: Basic file types/categories, Organization of files. Hidden files. Standard directories. Parent child relationship, The home directory and the HOME variable, Reaching required files- the PATH variable, Relative and absolute pathnames, Directory commands – pwd, cd, mkdir, rmdir commands, The dot (.) and double dots (..) notations to represent present and parent directories and their usage in relative path names. File related commands –mv, rm, cp, wc and od commands.	CLO 2	9
UNIT III		
INTRODUCTION TO THE SHELL SCRIPTING: Introduction to Shell Scripting, Shell Scripts, read, Command Line Arguments, Exit Status of a Command, The Logical Operators && and ||, exit, if, and case conditions, expr, sleep and wait, while, until, for, $, @, redirection.	CLO3	9
UNIT IV		
SHELL PROGRAMMING: Ordinary and environment variables, Command line arguments. exit and exit status of a command. Logical operators for conditional execution, The if, while, for and case control statements, The set and shift commands and handling positional parameters. Simple shell program examples. File inodes and the inode structure.	CLO4	9
UNIT V		
PROCESS AND SIGNALS: Introduction, Process, process identifiers, process structure, process table, viewing processes, system processes, process scheduling, starting new processes, waiting for a process, zombie processes, orphan process, fork, vfork, exit, wait, waitpid, unreliable signals, interrupted system calls, kill, raise, alarm, pause, a bort, system, sleep functions, signal sets.	CLO5	9
Total Hours		45

Learning Resources: -

Textbooks

1. Unix Concepts & Applications 4rth Edition, Sumitabha Das, Tata McGraw Hill References:
2. Unix Shell Programming, Yashwant Kanetkar
3. Introduction to UNIX by M G Venkatesh Murthy.

Reference Books:
1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.

Online Resources/E-Learning Resources
1. https://www.coursera.org/learn/linux-fundamentals
2. https://linuxsimply.com/
3. https://www.geeksforgeeks.org/introduction-linux-shell-shell-scripting/

COURSE CURRICULUM

Name of the Program:	BSc (Cyber Security)		Semester:		Level: UG	
Course Name	Unix & Shell Programming Lab		Course Code/ Course Type		UBS112/MAJM	
Course Pattern	2025		Version		1.0	
Teaching Scheme					**Assessment Scheme**	
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	2	-	2	4	25	-	25
Prerequisite:							

Course Objectives (CO):	The objectives of Unix & Shell Programming Lab: - 1. To Equip students with the ability to efficiently use essential Linux commands to manipulate files, directories, and data. 2. To Develop a strong foundation in writing and executing shell scripts using positional parameters, arithmetic, and logical operations. 3. To Foster problem-solving skills by implementing decision-making structures and loops to automate repetitive tasks. 4. To Enable students to perform data handling operations using commands for real-world applications. 5. To Engage students with hands-on programming tasks like array manipulation, and more, to build confidence in applying their knowledge.
Course Learning Outcomes (CLO):	Students would be able to: 1. To Demonstrate the use of file and directory manipulation commands to manage the file system effectively. 2. To execute interactive programs with user inputs. 3. To utilize conditional statements to solve decision-based problems. 4. To Employ commands for filtering, analyzing and sorting textual data. 5. To Solve mathematical problems or perform bitwise operations via shell scripts.

Course Contents/Syllabus: Practical Plan

Activity Number	Assignment/Practical/Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Use of basic Unix Shell Commands.	Week 1/ Turn 1 and 2	ls, mkdir, rmdir, cd, cat, banner, touch, file	CLO1	4
2	Use of basic Unix Shell Commands	Week 2/ Turn 1 and 2	wc, sort, cut, grep, dd, dfspace, du, ulimit	CLO1	4
3	Unix Shell Commands	Week 3/ Turn 1 and 2	I Node Commands,	CLO2	4
4	Unix Shell Commands	Week 4/ Turn 1 and 2	Piping Commands	CLO1, CLO2	4
5	Shell Script	Week 5/ Turn 1 and 2	Interactive shell script	CLO2	4
6	Shell Script	Week 6/ Turn 1 and 2	Positional parameters	CLO2, CLO3	4
7	Shell Script	Week 7/ Turn 1 and 2	Arithmetic Operations Logical operators	CLO3	4
8	Shell Script	Week 8/ Turn 1 and 2	If-then-fi, if-then-else-fi	CLO3	4
9	Shell Script	Week 9/ Turn 1 and 2	case structure	CLO3	4
10	Shell Script	Week 10/ Turn 1 and 2	While for loop	CLO4	4
11	Shell Script	Week 11/ Turn 1 and 2	Check if Two Strings are Equal	CLO4,CLO5	4
12	Shell Script	Week 12/ Turn 1 and 2	Perform Bitwise Operation Based on User Input	CLO5	4

13	Shell Script	Week 13/ Turn 1 and 2	Print Numbers From 5 to 1 Print the Multiplication Table of a Number	CLO5	4
14	Shell Script	Week 14/ Turn 1 and 2	Calculate the Sum of Digits of a Given Number. Calculate the Factorial of a Number.	CLO5	4
15	Shell Script	Week 15/ Turn 1 and 2	Find the Smallest and Largest Elements in an Array. Calculate the Average of an Array of Numbers.	CLO5	4
Total					**60 hrs.**

Textbooks

1. Unix Concepts & Applications 4rth Edition, Sumitabha Das, Tata McGraw Hill References:

2. Unix Shell Programming, Yashwant Kanetkar

3. Introduction to UNIX by M G Venkatesh Murthy.

Reference Books:

1. Linux System Programming, Robert Love, O'Reilly, SPD.

2. Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.

Online Resources/E-Learning Resources

1. https://www.coursera.org/learn/linux-fundamentals
2. https://linuxsimply.com/
3. https://www.geeksforgeeks.org/introduction-linux-shell-shell-scripting/

Name of the Program:	B.Sc (Cyber Security)	Semester: II		Level: UG	
Course Name	Foundation of Cryptography	Course Code and Course Type		UBS114	
Course Pattern	2024	Version		1.0	

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical and Oral
2	-	-	2	2	20	30	-

Prerequisite:	
Course Objectives (CO):	The objectives of: 1. Understand the fundamental principles and goals of cryptography. 2. Explore classical and modern cryptographic algorithms. 3. Analyze cryptographic techniques used for confidentiality, integrity, and authentication. 4. Evaluate cryptographic attacks and countermeasures. 5. Study real-world applications of cryptography in secure systems.
Course Learning Outcomes (CLO):	Students will be able to: 1. Explain the core concepts of cryptography and its role in security. 2. Compare different encryption and decryption techniques. 3. Apply cryptographic methods to ensure confidentiality, integrity, and authentication. 4. Analyze cryptographic vulnerabilities and attack vectors. 5. Evaluate cryptographic protocols used in real-world applications.

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I: Introduction to Cryptography		
Basics of Cryptography: Definition, Goals, and Principles, Evolution of Cryptography: From Classical to Modern Techniques, Types of Cryptographic Systems: Symmetric vs. Asymmetric Cryptography, Key Concepts: Confidentiality, Integrity, Authentication, and Non-Repudiation, Applications of Cryptography in Secure Communication	CLO 1	6
UNIT II: Classical Cryptography and Number Theory		
Classical Encryption Techniques: Caesar Cipher, Vigenère Cipher, Playfair Cipher, Cryptanalysis of Classical Ciphers, Introduction to Number Theory: Modular Arithmetic, Prime Numbers, Euler's Theorem, Greatest Common Divisor (GCD), Extended Euclidean Algorithm, Fermat's Theorem and Chinese Remainder Theorem (CRT)	CLO 2	6
UNIT III: Modern Symmetric Cryptography		
Block Ciphers vs. Stream Ciphers, Data Encryption Standard (DES) and Triple DES (3DES), Advanced Encryption Standard (AES) and Key Expansion, Modes of Operation: ECB, CBC,	CLO3	6

CFB, OFB, CTR, Cryptanalysis Techniques: Brute Force, Differential and Linear Cryptanalysis		
UNIT IV: Public-Key Cryptography and Digital Signatures		
Concept of Public and Private Keys, RSA Algorithm: Key Generation, Encryption, and Decryption, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography (ECC), Digital Signatures and Hash Functions (SHA-256, MD5)	CLO4	6
UNIT V: Cryptographic Protocols and Real-World Applications		
Message Authentication Codes (MACs) and HMAC, Digital Certificates and Public Key Infrastructure (PKI), Transport Layer Security (TLS) and Secure Sockets Layer (SSL), Blockchain and Cryptocurrency Cryptography, Case Studies: Cryptography in Secure Email, VPNs, and E-Banking	CLO5	6
Total Hours		30

Learning resources

Textbooks:
1. William Stallings, *Cryptography and Network Security: Principles and Practice*, Pearson, 7th Edition.
2. Behrouz A. Forouzan, *Cryptography and Network Security*, McGraw-Hill, 3rd Edition.
3. Douglas R. Stinson, *Cryptography: Theory and Practice*, CRC Press, 4th Edition.

Reference Books:
1. Bruce Schneier, *Applied Cryptography: Protocols, Algorithms, and Source Code in C*, Wiley, 2nd Edition.
2. Alfred J. Menezes, Paul C. van Oorschot, Scott A. Vanstone, *Handbook of Applied Cryptography*, CRC Press.
3. Jonathan Katz & Yehuda Lindell, *Introduction to Modern Cryptography*, CRC Press, 2nd Edition

Online Resources and E-Learning Resources

Online Resources:

1. Cryptography Tutorials – Khan Academy - https://www.khanacademy.org/computing/computer-science/cryptography
2. MIT OpenCourseWare – Cryptography and Security - https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-875-cryptography-and-security-fall-2005/
3. NIST (National Institute of Standards and Technology) Cryptography Guidelines - https://csrc.nist.gov/
4. IACR (International Association for Cryptologic Research) - https://www.iacr.org

E-Learning Resources:

1. Coursera – Cryptography by Stanford University (https://www.coursera.org/learn/crypto)
2. edX – Applied Cryptography (https://www.edx.org/course/applied-cryptography)
3. Udacity – Introduction to Cryptography (https://www.udacity.com/course/intro-to-cryptography--cs387)
4. Pluralsight – Cryptographic Fundamentals (https://www.pluralsight.com/courses/cryptographic-fundamentals)

Name of the Program:	B.Sc (Cyber Security)	Semester: II		Level: UG	
Course Name	Discrete Mathematics	Course Code and Course Type		UBS115	
Course Pattern	2025	Version		1.0	

Teaching Scheme					Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical and Oral	
2	-	-	2	2	20	30	-	

Prerequisite:

Course Objectives (CO):	The objectives of:
	1. Understand fundamental concepts of logic, sets, and proof techniques.
	2. Learn combinatorial principles and their applications.
	3. Study relations, functions, and their role in computing.
	4. Explore graph theory and its applications in networks and cybersecurity.
	5. Apply discrete structures to real-world computing problems.
Course Learning Outcomes (CLO):	**Students will be able to:**
	1. Apply propositional and predicate logic to mathematical reasoning.
	2. Utilize combinatorial techniques to solve counting problems.
	3. Analyze relations and functions for problem-solving in computer science.
	4. Implement graph theory concepts in real-world applications.
	5. Use discrete mathematical structures in algorithm and system design

Course Contents and Syllabus:

Descriptors and Topics	CLO	Hours
UNIT I: Logic and Proof Techniques		
Propositional Logic: Logical Connectives, Truth Tables, Tautologies, Contradictions, Predicate Logic: Universal and Existential Quantifiers, Logical Equivalences, Methods of Proof: Direct, Indirect, Contradiction, and Mathematical Induction, Set Theory: Operations, Venn Diagrams, Cardinality, Power Set, Applications of Logic in Digital Circuits and Cybersecurity	CLO 1	6
UNIT II: Combinatorics and Counting Principles		
Fundamental Counting Principle, Permutations, and Combinations, Pigeonhole Principle and Its Applications, Inclusion-Exclusion Principle, Binomial Theorem and Pascal's Triangle, Recurrence Relations and Generating Functions	CLO 2	6
UNIT III: Relations, Functions, and Algebraic Structures		
Types of Relations: Reflexive, Symmetric, Transitive, Equivalence Relations, Functions:	CLO3	6

Injective, Surjective, Bijective Functions, Composition of Functions, Partially Ordered Sets (Posets) and Lattices, Group Theory: Properties of Groups, Rings, and Fields, Applications in Cryptography and Error Detection		
UNIT IV: Graph Theory and Its Applications		
Introduction to Graphs: Definitions, Terminology, Representations (Adjacency Matrix, List), Types of Graphs: Directed, Undirected, Weighted, Bipartite, Planar Graphs, Graph Traversal Algorithms: BFS, DFS, Trees and Their Properties: Spanning Trees, Minimum Spanning Tree (Prim's & Kruskal's), Applications in Network Security, Routing Algorithms, and Web Graphs	CLO4	6
UNIT V: Applications of Discrete Mathematics in Computing		
Boolean Algebra and Its Applications in Digital Logic Design, Finite State Machines and Regular Languages, Complexity Classes: P, NP, and NP-Complete Problems, Applications in Data Structures and Algorithms, Case Studies: Cybersecurity, AI, Blockchain, and Cryptography	CLO5	6
Total Hours		30

Learning resources

Textbooks:
1. **Kenneth H. Rosen**, *Discrete Mathematics and Its Applications*, McGraw-Hill, 8th Edition.
2. **Richard Johnsonbaugh**, *Discrete Mathematics*, Pearson, 8th Edition.
3. **C.L. Liu & D.P. Mohapatra**, *Elements of Discrete Mathematics*, McGraw-Hill, 4th Edition.

Reference Books:

1. **J.P. Tremblay & R. Manohar**, *Discrete Mathematical Structures with Applications to Computer Science*, McGraw-Hill.
2. **Norman L. Biggs**, *Discrete Mathematics*, Oxford University Press, 2nd Edition.
3. **Ralph P. Grimaldi**, *Discrete and Combinatorial Mathematics: An Applied Introduction*, Pearson, 5th Edition.

Online Resources and E-Learning Resources

Online Resources:

1. **MIT OpenCourseWare – Discrete Mathematics** - https://ocw.mit.edu/courses/mathematics/
2. **Khan Academy – Discrete Mathematics** - https://www.khanacademy.org/
3. **Coursera – Discrete Mathematics for Computer Science** - https://www.coursera.org/
4. **Discrete Mathematics Video Lectures (NPTEL)** - https://nptel.ac.in/courses/

E-Learning Resources:

1. **edX – Introduction to Discrete Mathematics** (https://www.edx.org/)
2. **Udemy – Discrete Mathematics for Computer Science** (https://www.udemy.com/)
3. **Pluralsight – Discrete Mathematics Fundamentals** (https://www.pluralsight.com/)

Name of the Program:	BSc(Cyber Security)	Semester : II		Level: UG
Course Name	UHV I: Professional Ethics	Course Code/ Course Type		ACUHV101/AC
Course Pattern	2025	Version		1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	-	2	50	-	-

Pre-Requisite: UHV-I

Course Objectives (CO):	The objectives of Universal Human Value- Professional Ethics are: 1. To make the students understand the importance of ethical behaviour. 2. To expose the students to the ethical practices to be followed in profession 3. To sensitize the students to become responsible persons who will uphold ethics in profession when they pursue their career 4. To make students understand Psychological and Philosophical approaches 5. To make students understand social responsibility and corporate Sustainability
Course Learning Outcomes (CLO):	Students would be able to: 1. Equip themselves with an understanding of moral, professional and personal values. 2. Understand the need of ethics in shaping their profession The learners will hone their decision-making skills. 3. Refine their business ethics based on psychological and philosophical perspective. 4. Assess the need for a balance between ecology, and economy. 5. Equip themselves with a better understanding of themselves and the society they live in and the responsibilities they shoulder in creating a sustainable world.

Descriptors/Topics	CLO	Hours
UNIT I		
Individual and Professional Ethics: Introduction to Professional Ethics, Morals, Values and Ethics – Personal and Professional- Sensé of Professional Ethics – Code of Ethics by NSPE-Making decisions with ethical dimensions–definition–roadmap to ethical decision making–common standards– internal obstacles – bias – empathy	CLO 1	6
UNIT II		
Business Ethics: Philosophical approaches to Business Ethics – ethical reasoning – ethical issues in business - Social Responsibility of Business- conflict of interest–cultural relativism-Ethical Leadership-Resisting un-ethical authority and domination-Global Business Ethics	CLO 2	6
UNIT III		
Psychological Approaches: Ethical Theories-Psychological and Philosophical Approaches-Myths about Morality-conflict of interest in psychological perspective - Courage-Integrity – ethical dilemma – Emotional Intelligence (Mahabharata- Iskcon Publications)	CLO 3	6
UNIT IV		
Workplace Ethics: Ethics in changing domains of Research–academic integrity–intellectual honesty-Role of Engineers and Managers-Ethical issues in Diverse workplace – competition – free will- Confidentiality – employee rights – Intellectual property rights – discrimination	CLO 4	6
UNIT V		
Safety, Responsibilities and Rights: Ecology, and Economy-Risk benefit analysis and reducing risk SDGs–Corporate social responsibility and Corporate Sustainability - CSR in India - Sustainability Case Studies	CLO 5	6
Total Hours		30

Learning resources

Textbooks:

1. Subramanian. R. Professional Ethics, Oxford Publication,2013.
2. Nagarasan. R. S. Professional Ethics and Human Values. New Age International Publications, 2006.

Reference Book:

1. Mike W Martin and Roland Schinzinger, *Ethics in Engineering*,4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi,2014

Online Resources/E-Learning Resources

1. https://www.nspe.org/resources/ethics/code-ethics
2. https://www.toolshero.com/tag/ethical-decision-making/
3. https://pagecentertraining.psu.edu/public-relations-ethics/introduction-to-public-relations-ethics/lesson-1/ethical-theories/
4. https://peer.asee.org/case-studies-in-engineering-ethics.pdf

CIA Guidelines

Online Quiz (Based on MCQ)– 20 marks

Activity (with short Report Submission) -   20 Marks

Academic Sincerity - 10 marks

Few of the suggested activities are Assignments, Debates, Poster presentations, Model making, Group presentation, Field visits and Group Discussions.

Few of suggested topics related to **UHV1- Professional Ethics** are:

Debate Topics

- Ethical Approach versus Realistic Approach
- Individual and Social Approach
- Dilemma between heart and Mind

Activity

- Analyze the wastage (Electricity or any other) at work place? How you managed.

Assignment

- Analyze the code of ethics at work place
- If you fulfil the duties, rights will automatically fall in place. Justify the statement

Name of the Program:	BSc(Cyber Security)	Semester: II		Level: UG	
Course Name	Concepts and Application in Science	Course Code/ Course Type		ACIKSSS102	
Course Pattern	2025	Version		1.0	
Teaching Scheme				Assessment Scheme	

Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	50	-	-

Prerequisite: Basic knowledge of science.

Course Objectives (CO):	The objectives of Concepts and Application in Science are: 1. To remember Indian Knowledge Systems: Origin, Evolution and Ontological Approach 2. To understand Indian Knowledge Approaches. 3. To apply Sciences of Life and Mind. 4. To examine Indian Knowledge System Torchbearers – Ancient and Modern 5. To analyse Self-Knowledge for Personal Effectiveness.
Course Learning Outcomes (CLO):	Students would be to: 1. Identify and appreciate the rich heritage that resides in our traditions. 2. Explain the mind/voice dynamic in Indian knowledge systems. 3. Explain the practices that will prepare one for the inner-journey to discover the Self. 4. Analyse the need and importance of Sanskrit in getting to the roots of the philosophical concepts. 5. Analyse the various functions in Indian knowledge systems.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Indian Knowledge System and Vedic Corpus: Introduction to IKS, Need for IKS, Historicity of IKS, Salient aspects of IKS, IKS in ancient India and in modern India. Introduction to Vedas, Four Vedas, Sub-classification of Vedas, Messages in Vedas, Basics of Nirukta and Chandas.	CLO1	6
UNIT II		
Wisdom through the Ages: Puranas, Ithihasas, Nitishastras, Subhasitas,Linguistics, Components of a language,Paṇini's work on Sanskrit grammar,Phonetics in Sanskrit, Role of Sanskrit in natural language processing,Framework for establishing valid knowledge.	CLO2	6
UNIT III		
Number Systems and Units of Measurement: Salient features of the Indian numeral system,		

Importance of decimal representation, The discovery of zero and its importance, Unique approaches to represent numbers, Unique aspects of Indian Mathematics, Great mathematicians and their significant contributions in the area of arithmetic, algebra, geometry, trigonometry, combinatorial problems in Chandaḥ-sastra of Pingala	CLO3	6
UNIT IV		
Knowledge Framework and classifications: Indian scheme of knowledge, The knowledge triangle, Prameya, A vaiśeṣikan approach to physical reality, Dravyas, The constituents of the physical reality	CLO4	6
UNIT V		
Science and Technology in the Vedic Age and Post-Vedic Records. **Knowledge:** Framework and Classification, Astronomy Encryption Method used in ancient India, Introduction to Yantra Shastra, Vaimanik Shashtra, Agriculture Technologies	CLO5	6
Total hours		30

Activity 1: Comparative Analysis of Traditional and Modern Scientific Methods

Activity 2: Presentation on Indian scientific texts such as the Phonetics in Sanskrit, Astronomy Encryption Method used in ancient India

Learning resources

Textbooks:

1. Health Science: Concepts and Applications, Authors: Jacquelyn Rhine Marshall and Sue C. Roe

2. Introduction to Indian Knowledge Systems: Concepts and Applications by Prof. B Mahadevan

Reference Books: -

1.   Introduction to Indian Knowledge System: Concepts and Applications by Pallavi Ghosh
         Online Resources/E-Learning Resources

   2.   https://onlinecourses.swayam2.ac.in/

COURSE CURRICULUM

Name of the Program:	BSc (Cyber Security)		Semester: II		Level: UG	
Course Name	Cyber Laws		Course Code/ Course Type		UBS116A/OE	
Course Pattern	2025		Version		1.0	
Teaching Scheme				Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	-	-	2	2	20	30	-

Prerequisite: Students should have basic Knowledge of Cyber.

Course Objectives (CO):	The objectives of Introduction to Cyber Laws are: 1. To remember the fundamental concepts of Cyber Laws 2. To understand the role of Regulatory Framework in Cyber Laws. 3. To demonstrate the different cybercrimes. 4. To compare different types of e-commerce issues. 5. To examine various IPR Issues with respect to Cyber Laws.
Course Learning Outcomes (CLO):	Students would be able to: 1. Memorize the basics of Cyber Laws. 2. Discuss the framework about cyber crimes. 3. Examine the different cybercrimes and their objectives. 4. Classify the different types of issues associated with e-commerce. 5. Review the various IPR issues.

Course Contents/Syllabus:

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Cyber Law: Introduction about the cyberspace,Regulation of cyberspace,Introducing cyber law, Scope of Cyber laws,e-commerce,online contracts, IPRs(copyright, trademarks and software patenting),e-taxation,e-governance and cybercrimes, Cyber law in India with special reference to Information Technology Act 2000	CLO1	6
UNIT II		
Regulatory Framework: International Legal Regime, International legal regime relating to Cyber Crimes, European Convention on Cyber Crimes, Hague Convention on Jurisdiction and Foreign Judgments,Jurisdiction Agreement, International legal regime relating to E-Commerce.	CLO2	6
UNIT III		
Cyber Crimes: Introduction to computer crime and cybercrimes,Classification of cybercrimes,Distinction between cybercrime and conventional crimes, Reasons for commission of	CLO3	6

cyber crime,Cyber forensic, Cyber criminals and their objectives, Cyber stalking,Cyber pornography,Forgery and Fraud,Crime related to IPRs,Cyber terrorism,computer vandalism etc.		
UNIT IV		
E-Commerce: Definition of E-commerce, Types of E-commerce, Important Issues in Global E-commerce,Application of conventional territory-based law to E-commerce Taxation, Intellectual Property Rights, International Trade, Commercial law and standards, Dispute resolution	CLO4	6
UNIT V		
IPR Issues: Copyright Issues in Cyberspace Linking, Inlining,Framing,Protection of content on web site,International Treaties,Trademark Issues in cyberspace,Domain Name Dispute,Cybersquatting,Uniform Dispute Resolution Policy,Meta-tags and Keywords.	CLO5	6
Total hours		30

Learning resources

Textbooks:
1. Cyber Law" by Dr Pavan Duggal
2. Cybersecurity Law, Standards and Regulations By Schreider Tari

Reference Books:
1. "Information Technology Law and Practice" by Vakul Sharma and Seema Sharma
2. Cybersecurity Law by Jeff Kosseff John Wiley & Sons, Inc.

Online Resources/E-Learning Resources
1. https://www.legalbites.in/cyber-space-meaning-regulation-scope/
2. https://lawbhoomi.com/

COURSE CURRICULUM
Course Contents/Syllabus:

Name of the Program:	BSc (Cyber Security)	Semester: II		Level: UG	
Course Name	E-Commerce	Course Code/ Course Type		UBS116B/OE	
Course Pattern	2025	Version		1.0	
Teaching Scheme				Assessment Scheme	
Theory	Practical	Tutorial	Total Credits	Hrs.	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	-	-	2	2	20	30	-

Prerequisite: Students should have basic Knowledge of commerce.

Course Objectives (CO):	The objectives of Introduction to E-commerce are: 1. To Recognize the need of e-commerce. 2. Illustrate the different frameworks of e-commerce. 3. Identify the various types of e-commerce applications. 4. Analyze the types of electronic data security mechanisms used in e-commerce applications. 5. Discuss the e-marketing techniques used.
Course Learning Outcomes (CLO):	Students would be able to: 1. List out the applications of e-commerce. 2. Explain the network services used in e-commerce. 3. Demonstrate the various modes of payments used in e-commerce applications. 4. Analyze the different security and Privacy Implementation. 5. Plan various techniques used for e marketing.

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction:E-Commerce,Meaning,Advantages & Limitations,Traditional & Contemporary Model, Impact of E-Commerce on Business Models,Classification of E Commerce,B2B,B2C,C2B,C2C,B2E,Applications of Ecommerce,E-Commerce Organization Applications.	CLO1	6
UNIT II		
Framework of E-Commerce: Application Services,Interface Layers,Secure Messaging,Middleware Services and Network Infrastructure ,Site Security Firewalls & Network Security,TCP/IP,HTTP ,Secured HTTP ,SMTP ,SSL.	CLO2	6
UNIT III		
Consumer Oriented e-commerce Applications: Introduction,Mercantile Process Model,Consumers Perspective and Merchant's Perspective,Electronic Payment Systems,Legal Issues & Digital Currency,E-Cash & E-Cheque,Electronic Fund Transfer (EFT),Advantages and Risks,Digital Token Based E-Payment System.		

	CLO3	6
UNIT IV		
Electronic Data Interchange: Introduction,EDI Standards,Types of EDI,EDI Applications in Business,Legal Security and Privacy issues of EDI,EDI Software Implementation	CLO4	6
UNIT V		
E-Marketing Techniques: Introduction,New Age of Information,Based Marketing,Influence on Marketing,Search Engines & Directory Services, Charting the OnLine Marketing Process,Chain Letters,Applications of 5P's (Product, Price, Place, Promotion, People).	CLO5	6
Total hours		30

Learning resources

Textbooks:

1. Frontiers of Electronic Commerce: Ravi Kalakota, Andrew B Whinston, Pearson
2. E-Commerce: Tulasi Ram Kandula, HPH.
3. E-Commerce: An Indian Perspective: P.T. Joseph, S.J, PHI

Reference Books:

1. E-Commerce & Mobile Commerce Technologies: Pandey, SaurabhShukla, S. Chand
2. Electronic Commerce: Pete Loshin / John Vacca, Firewall Media
3. E-Commerce, Strategy, Technologies And Applications : David Whiteley, Tata Mcgraw Hill

Online Resources/E-Learning Resources

1. https://www.edx.org/learn/ecommerce
2. https://www.coursera.org/professional-certificates/google-digital-marketing-ecommerce