

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College
of Arts, Science & Commerce, Pune.
(Autonomous)
Faculty of Science and Technology

Four Year Degree Program

B.Sc. (Cyber Security) Program

With

Major- Cyber Security



Syllabus
For
F.Y. B.Sc. (Cyber Security)

Choice Based Credit System (CBCS)
Syllabus Under National Education Policy (NEP) 2020
with effect from Academic Year 2025-26

B. Sc. (Cyber Security)

1. Name of Program: Cyber Security

2. Introduction:

In today's interconnected world, the proliferation of digital technologies has brought about unprecedented convenience and efficiency. However, this digital transformation has also led to an increase in cyber threats, making cyber security an essential field. Cyber-attacks can cause significant harm to individuals, businesses, and national security. As a result, there is a growing demand for skilled cyber security professionals who can protect sensitive information and critical infrastructure.

The B.Sc. in Cyber Security program is designed to address this demand by providing students with a comprehensive education in the field. Aligned with the National Education Policy (NEP) 2020, this program emphasizes a holistic, flexible, and multidisciplinary approach to education, preparing students for the complexities of the cyber security landscape.

The B.Sc. (Cyber Security) program is for three years duration with six semesters and B.Sc. (Cyber Security) Honors and Research programs are for **four years** duration with eight semesters. It is a full-time degree program. The program will be based on the Choice-Based Credit System comprising 132 credit points for B.Sc. (Cyber Security) and 176 credit points for B.Sc. (Cyber Security) Honors and Research degree.

3. Objectives:

- To Develop Proficiency in Cyber Security: Equip students with the skills to protect Information systems against cyber threats and vulnerabilities.
- To provide hands-on experience with current security technologies and tools.
- To an understanding of the ethical, legal, and societal implications of cyber security practices.
- To encourage innovative problem-solving and critical analysis of security issues.
- To develop an understanding of the global context and cultural dimensions of cyber security

4. Eligibility:

- Higher secondary school certificate (10+2) in science stream or its equivalent examination in Science stream

OR

- Three-year diploma course from the board of technical education conducted by Government of Maharashtra or its equivalent

PO No.	PO Outcomes
PO-1	Become proficient in Linux administration, as it is essential in today's IT environment.
PO-2	Address and take action to meet the cyber security needs of the modern IT world.
PO-3	Cultivate creative abilities, critical thinking, analytical skills, and research capabilities to tackle real-world problems using cyber security expertise.
PO-4	Understand the Concepts of cyber security, Networking and vulnerability testing and statistical methods.
PO-5	Applying the Concepts of Digital Communication and IOT.
PO-6	Identify and evaluate software vulnerabilities and security solutions to mitigate the risk of exploitation.
PO-7	Acquire essential programming languages such as C and Python
PO-8	Integrate ethics and cyber laws to understand the rules and regulations of the current IT environment.
PO-9	To developing regulations and tactics for cyber security
PO-10	Cloud security protects applications, data, and cloud-based infrastructure.
PO-11	Comprehend security concepts such as cyber threat intelligence, block chain in cyber security, communication systems security, malware analysis, vulnerability assessment and penetration testing (VAPT), intrusion detection and prevention systems (IDS & IPS), and cybercrime reporting.

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce,
Pune
(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

SEMESTER-1
Level- 4.5 (First Year)

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Subject 1 (2T+2P)	CYS-101-MJ-TH	Fundamentals of Linux Administration	2		2		20	30	50
	CYS-102-MJ-PR	Practical based on CYS-101-MJ-TH		2		4	20	30	50
Subject 2 (2T+2P)	CYS-103-MJ-TH	Foundations of C programming	2		2		20	30	50
	CYS-104-MJ-PR	Practical based on CYS-103-MJ-TH		2		4	20	30	50
Subject 3 (2T+2P)	CYS-105-MJ-TH	Information Technology	2		2		20	30	50
	CYS-106-MJ-PR	Practical based on CYS-105-MJ-TH		2		4	20	30	50
IKS (2T)	CYS-101-IKS-TH	Computing in ancient India	2		2		20	30	50
GE/OE* (2T)	OE-101-CYS-TH	Office Automation/ Introduction to Google Tools	2		2		20	30	50
SEC (2P)	SEC-101-CYS-PR	Basics of Digital Communication		2		4	20	30	50
AEC (2T)	AEC-101-ENG-TH	ENGLISH	2		2		20	30	50
VEC (2T)	VEC-101-ENV-TH	EVS-I	2		2		20	30	50
TOTAL			14	8	14	16			550

* The subjects offered to other faculty students under OE vertical are **OE-101-CYS - TH** and **OE-102-CYS -TH**.

The students of B.Sc. (Cyber Security) will opt the subjects offered by other faculty given in College GE/OE Basket.

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce,
Pune

(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

SEMESTER- II

Level- 4.5 (First Year)

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Subject 1 (2T+2P)	CYS-151-MJ-TH	Cyber Security Fundamentals	2		2		20	30	50
	CYS-152-MJ-PR	Practical based on CYS-151-MJ-TH		2		4	20	30	50
Subject 2 (2T+2P)	CYS-153-MJ-TH	Python Programming	2		2		20	30	50
	CYS-154-MJ-PR	Practical based on CYS-153-MJ-TH		2		4	20	30	50
Subject 3 (2T+2P))	CYS-155-MJ-TH	Computer Networks	2		2		20	30	50
	CYS-156-MJ-PR	Practical based on CYS-155-MJ-TH		2		4	20	30	50
GE/OE * (2P)	OE-151-CYS-PR	Office Automation/ Introduction to Google Tools		2		4	20	30	50
SEC (2P)	SEC-151-CYS-PR	Statistical Methods-I		2		4	20	30	50
AEC (2T)	AEC-151-ENG-TH	ENGLISH	2		2		20	30	50
VEC (2T)	VEC-151-ENV-TH	EVS-II	2		2		20	30	50
CC (2)	CC-151-PE-TH	University Basket	2		2		20	30	50
TOTAL			14	8	14	16			550

* The subjects offered to other faculty students under OE vertical are **OE-151-CYS -PR** and **OE-152-CYS -PR**.

The students of B.Sc. (Cyber Security) will opt the subjects offered by other faculty given in College GE/OE Basket.

Exit option:

Award of UG Certificate in Major **with 44 credits and an additional 4 credits** as per college guidelines OR Continue with Major and Minor.

ATKT Rules

Minimum number of credits required to take admission to S.Y.B.Sc. (Cyber Security) is 31 credits [70%].

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce,
Pune

(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

SEMESTER- III

Level- 5.0 (Second Year)

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (4T+2P)	CYS-201-MJ-TH	Ethical Hacking-I	2		2		20	30	50
	CYS-202-MJ-TH	Cyber Ethics, Cyber Law & Cyber Policies	2		2		20	30	50
	CYS-203-MJ-PR	Practical based on CYS-201-MJ-TH		2	2		20	30	50
VSC (2T)	CYS-221-VSC-TH	Data Structure using Python	2		2		20	30	50
IKS (2T)	IKS-201-TH	Computations in Ancient India	2		2		20	30	50
FP/OJT/ CEP (2)	CYS-231-FP	Mini Project based on CYS-201-MJ-TH		2		4	20	30	50
Minor (2T+2P)	CYS-241-MN-TH	Web Technology	2		2		20	30	50
	CYS-242-MN-PR	Practical based on CYS-241-MN-TH		2		4	20	30	50
GE/OE (2T)	OE-201-CYS-TH	Principles of OS	2		2		20	30	50
AEC (2T)	AEC-201-ENG-TH	Business Communication-I	2		2		20	30	50
CC (2)	CC-201-PE / NSS / NCC	From CC Basket	2		2		20	30	50
TOTAL			16	6	16	12			550

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce,
Pune

(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

SEMESTER- IV

Level- 5.0 (Second Year)

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (6T+2P)	CYS-251-MJ-TH	Ethical Hacking -II	2		2		20	30	50
	CYS-252-MJ-TH	Cloud Security	2		2		20	30	50
	CYS-253-MJ-PR	Practical Based on CYS-251-TH		2		4	20	30	50
VSC (2T/P)	CYS-271-VSC-PR	Database Management System		2	2		20	30	50
FP/OJT/ CEP (2)	CYS-281-CEP	Project		2		4	20	30	50
Minor (2T+2P)	CYS-291-MN-TH	Advanced Web Technology	2		2		20	30	50
	CYS-292-MN-PR	Practical Based on CYS-291-MN-TH		2		4	20	30	50
GE/OE (2P)	OE-251-CYS-TH	Basic of Python Programming	2		2		20	30	50
SEC (2P)	SEC-251-CYS-PR	NO SQL database (Mango DB)		2		4	20	30	50
AEC (2T)	AEC-251-ENG-TH	Business Communication-II	2		2		20	30	50
CC (2)	CC-251-PE / NSS / NCC	From CC Basket	2		2		20	30	50
TOTAL			14	8	14	16			550

Exit option:

Award of UG Diploma in Major and Minor with **88 credits and an additional 4 credits** core as per college guidelines OR Continue with Major and Minor.

ATKT Rules:

Minimum number of credits required to take admission to T.Y.B.Sc. (Cyber Security) is 44 credits [100%] to be completed from F.Y.B.Sc. (Cyber Security) and at least 22 credits from S.Y.B.Sc. (Cyber Security)

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce,
Pune

(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

SEMESTER- V

Level- 5.5 (Third Year)

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Mandatory (8T+4P)	CYS-301-MJ-TH	Digital Forensic-I	2		2		20	30	50
	CYS-302-MJ-TH	Malware Analysis	2		2		20	30	50
	CYS-303-MJ-TH	Cyber Threat Intelligence	2		2		20	30	50
	CYS-304-MJ-TH	Advanced Network Security	2		2		20	30	50
	CYS-305-MJ-PR	Practical based on CYS-301-MJ-TH		2		4	20	30	50
	CYS-306-MJ-PR	Practical based on CYS-302-MJ-TH		2		4	20	30	50
Major Elective (2T+2P)	CYS-310-MJ-TH	Internet of Things	2		2		20	30	50
	CYS-311-MJ-PR	Practical based on CYS-310-MJ-TH		2		4	20	30	50
	OR								
	CYS-312-MJ-TH	Mobile Forensic	2		2		20	30	50
	CYS-313-MJ-PR	Practical based on CYS-312-MJ-TH		2		4	20	30	50
VSC (2T/P)	CYS-321-VSC-PR	Block Chain		2		4	20	30	50
FP/OJT/ CEP (2FP/CEP)	CYS-331-FP	Project		2		4	20	30	50
Minor (2T)	CYS-341-MN-TH	Statistical Methods	2		2		20	30	50
TOTAL			12	10	12	20			550

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce,
Pune

(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

SEMESTER- VI

Level- 5.5 (Third Year)

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Mandatory (8T+4P)	CYS-351-MJ-TH	Digital Forensic-II	2		2		20	30	50
	CYS-352-MJ-TH	IoT Security	2		2		20	30	50
	CYS-353-MJ-TH	Cyber Crime and Reports	2		2		20	30	50
	CYS-354-MJ-TH		2		2		20	30	50
	CYS-355-MJ-PR	Practical Based on CYS-351-MJ-TH		2		4	20	30	50
	CYS-356-MJ-PR	Practical Based on CYS-352-MJ-TH		2		4	20	30	50
Major Elective (2T+2P)	CYS-360-MJ-TH	Vulnerability Assessment and Penetration Testing	2		2		20	30	50
	CYS-361-MJ-PR	Practical Based on CYS-360-MJ-TH		2		4	20	30	50
	OR								
	CYS-362-MJ-TH	Fin-Tech Cyber Security	2		2		20	30	50
	CYS-363-MJ-PR	Practical Based on CYS-362-MJ-TH		2		4	20	30	50
VSC(2T/P)	CYS-371-VSC-PR	AI and Machine Learning		2		4	20	30	50
FP/OJT/ CEP (4 OJT)	CYS-381-OJT	On Job Training		4		8	20	30	100
TOTAL			12	10	12	20			550

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce,
Pune

(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

SEMESTER- VII

Level- 6 (Fourth Year)

Honors Degree

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks			
			TH	PR	TH	PR	CE	EE	Total	
Major Mandatory (10T+4P)	CYS-401-MJ-TH	Malware Analysis II	2		2		20	30	50	
	CYS-402-MJ-TH	Intrusion Detection and Prevention System	2		2		20	30	50	
	CYS-403-MJ-TH	Digital Image Processing	2		2		20	30	50	
	CYS-404-MJ-TH	Cyber Crime Investigation	2		2		20	30	50	
	CYS-405-MJ-TH	Cyber Threat Intelligence	2		2		20	30	50	
	CYS-406-MJ-PR	Practical Based on CYS-401-MJ-TH		2		4	20	30	50	
	CYS-407-MJ-PR	Practical Based on CYS-402-MJ-TH		2		4	20	30	50	
Major Elective (2T+2P)	CYS-410-MJ-TH	Digital Payments and Its Security	2		2		20	30	50	
	CYS-411-MJ-PR	Practical Based on CYS-410-MJ-TH		2		4	20	30	50	
	OR									
	CYS-412-MJ-TH	Wireless Security	2		2		20	30	50	
	CYS-413-MJ-PR	Practical Based on CYS-412-MJ-TH		2		4	20	30	50	
	OR									
	CYS-414-MJ-TH	IT Act 2000 in Cyberspace	2		2		20	30	50	
	CYS-415-MJ-PR	Practical Based on CYS-414-MJ-TH		2		4	20	30	50	
RM (4T)	CYS-441-RM-TH	Research Methodology	4		4		40	60	100	
TOTAL			16	6	16	12			550	

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce,
Pune

(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

SEMESTER- VIII

Level- 6 (Third Year)

Honors Degree

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks			
			TH	PR	TH	PR	CE	EE	Total	
Major Mandatory (10T+4P)	CYS-451-MJ-TH	Mobile Application And Services	2		2		20	30	50	
	CYS-452-MJ-TH	Incident Handling	2		2		20	30	50	
	CYS-453-MJ-TH	Cyber Security Architecture	2		2		20	30	50	
	CYS-454-MJ-TH	Introduction to Hardware Security	2		2		20	30	50	
	CYS-455-MJ-TH	IT Security Strategy Planning and Leadership	2		2		20	30	50	
	CYS-456-MJ-PR	Practical Based on CYS-451-MJ-TH		2		4	20	30	50	
	CYS-457-MJ-PR	Practical Based on CYS-452-MJ-TH		2		4	20	30	50	
Major Elective (2T+2P)	CYS-460-MJ-TH	Dark web and Cyber warfare	2		2		20	30	50	
	CYS-461-MJ-PR	Practical Based on CYS-460-MJ-TH		2		4	20	30	50	
	OR									
	CYS-462-MJ-TH	DecSecOps	2		2		20	30	50	
	CYS-463-MJ-PR	Practical Based on CYS-462-MJ-TH		2		4	20	30	50	
	OR									
	CYS-464-MJ-TH	Tools and Technology for Cyber Security	2		2		20	30	50	
	CYS-465-MJ-PR	Practical Based on CYS-464-MJ-TH		2		4	20	30	50	
OJT (4 OJT)	CYS-481-OJT	On Job Training		4		8	40	60	100	
TOTAL			12	10	12	20			550	

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce,
Pune

(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

SEMESTER- VII

Level- 6 (Fourth Year)

Honors with Research

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks			
			TH	PR	TH	PR	CE	EE	Total	
Major Mandatory (6T+4P)	CYS-401-MJ-TH	Malware Analysis II	2		2		20	30	50	
	CYS-402-MJ-TH	Intrusion Detection and Prevention System	2		2		20	30	50	
	CYS-403-MJ-TH	Digital Image Processing	2		2		20	30	50	
	CYS-404-MJ-PR	Practical Based on CYS-401-MJ-TH		2		4	20	30	50	
	CYS-405-MJ-PR	Practical Based on CYS-402-MJ-TH		2		4	20	30	50	
Major Elective (2T+2P)	CYS-410-MJ-TH	Digital Payments and Its Security	2		2		20	30	50	
	CYS-411-MJ-PR	Practical Based on CYS-410-MJ-TH		2		4	20	30	50	
	OR									
	CYS-412-MJ-TH	Wireless Security	2		2		20	30	50	
	CYS-413-MJ-PR	Practical Based on CYS-412-MJ-TH		2		4	20	30	50	
	OR									
	CYS-414-MJ-TH	IT Act 2000 in Cyberspace	2		2		20	30	50	
CYS-415-MJ-PR	Practical Based on CDS412MJ		2		4	20	30	50		
FP/OJT/CEP/RP (4 RP)	CYS-431-RP-PR	Research Project		4		8	40	60	100	
RM (4T)	CYS-441-RM-TH	Research Methodology	4		4		40	60	100	
TOTAL			12	10	12	20			550	

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce,
Pune

(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

SEMESTER- VIII

Level- 6 (Fourth Year)

Honors with Research

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks			
			TH	PR	TH	PR	CE	EE	Total	
Major Mandatory (6T+4P)	CYS-451-MJ-TH	Mobile Application And Services	2		2		20	30	50	
	CYS-452-MJ-TH	Incident Handling	2		2		20	30	50	
	CYS-453-MJ-TH	Cyber Security Architecture	2		2		20	30	50	
	CYS-454-MJ-PR	Practical Based on CYS-451-MJ-TH		2		4	20	30	50	
	CYS-455-MJ-PR	Practical Based on CYS-452-MJ-TH		2		4	20	30	50	
Major Elective (2T+2P)	CYS-460-MJ-TH	Dark web and Cyber warfare	2		2		20	30	50	
	CYS-461-MJ-PR	Practical Based on CYS-460-MJ-TH		2		4	20	30	50	
	OR									
	CYS-462-MJ-TH	DecSecOps (Decentralized Security Operations)	2		2		20	30	50	
	CYS-463-MJ-PR	Practical Based on CYS-462-MJ-TH		2		4	20	30	50	
	OR									
	CYS-464-MJ-TH	Tools and Technology for Cyber Security	2		2		20	30	50	
CYS-465-MJ-PR	Practical Based on CYS-464-MJ-TH		2		4	20	30	50		
FP/OJT/CEP/RP (8 RP)	CYS-481-RP-PR	Research Project		8		16	80	120	200	
TOTAL			8	14	8	28			550	

Syllabus of Semester-I

**Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)**

F.Y.B.Sc.(Cyber Security)

Subject Code: CYS-101-MJ-TH

Subject: Fundamentals of Linux Administration

Teaching Scheme 2 hours / Week	No. of Credits 2	Examination Scheme CE: 20 marks EE: 30 marks
Prerequisites:- Awareness with the Text-Based Console, Command Prompt, Shell Environment And Networking		
Course Objectives: -		
<ul style="list-style-type: none"> • To make the students understand the Linux OS • To acquaint them with the rich set of utilities that are essential for system management and file manipulation. • To help they manage a network interface to managing connections and troubleshooting network issues. 		
Course Outcomes: - Student will be able to: -		
<ol style="list-style-type: none"> 1. Illustrate Adeptness using the Linux command line and constructing shell scripts. 2. Execute maintenance tasks, including user and system management. 3. Install and configure system services. 4. Deploy and Configure Linux Operating Systems Network-wide 5. To Administer and Operate file permissions and network security aspects. 		
Course Contents		
Chapter 1	Introduction to Linux System Administration	6 hours
Linux Operating System Summary. Linux Infrastructure Management Role. Navigating the Linux File System Basic Command-Line Navigation and Operations		
Chapter 2	Application Deployment and Configuration	7 hours
Linux Installation Techniques Partitioning and Storage Setup. User and Group Configuration Network Implementation and Problem Solving		
Chapter 3	Control Statements and Functions	6 hours
Package Handling with APT and YUM. Kernel Software Upgrades and Rebooting Log File Monitoring and Troubleshooting. System Performance Analysis.		
Chapter 4	System Security and Access Management	6 hours
PAM-Based User Authentication Network Firewalling and IP Address Control SSH Access Controls and Configuration Implementing Mandatory Access Controls with SE Linux/App- Armor.		
Chapter 5	Specialized Linux Administration	5 hours
Cron-Based Task Automation Virtualization and Docker- Based Containers. File and Directory Privileges Data Protection and Recovery Techniques		
Reference Books:		
<ol style="list-style-type: none"> 1. Linux System Administration, by Tom Adelstein, Bill Lubanovic, Released March 2007 Publisher(s): O'Reilly Media, ISBN: 9780596009526. 2. Pro Linux System Administration, by <u>James Turnbull</u>, <u>Dennis Matotek</u>, <u>Peter Lieverdink</u>, publisher(s): Apress, 2009, ISBN: 1430219130, 9781430219132. 3. The Complete Guide to Linux System Administration by James S Walker, Released December 1,2004 Publisher(s):Course Technology Inc,ISBN: 0619216166,9780619216160 		
E-Books and Online Learning Material		
<ol style="list-style-type: none"> 1. https://www.w3schools.com/linux/ Linux Programming and Scripting: https://archive.nptel.ac.in/courses/117/106/117106113/ 		

**Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)**

F.Y.B.Sc.(Cyber Security)

Subject Code: CYS-102-MJ-PR

Subject: Practical Based on CYS-101-MJ-TH

Teaching Scheme 4 hours / Week	No. of Credits 2	Examination Scheme CE: 20 marks EE: 30 marks
--	----------------------------	--

Prerequisites :- Problem solving with Python

Course Objectives: -

- Study the core principles of Linux OS
- Investigate a problem and design an algorithm

Course Outcomes: - Student will be able to :-

1. Deploy and manage a Linux server.
2. Create and administer policies.
3. Configure file services.

Practical:-Fundamentals of Linux System Administration

Assignment 1: Introduction to Linux System Administration

1. Set up a Linux distribution of your choice.
2. Review and illustrate the file system organization through basic shell commands.
3. Add a new user and group, showing user and group management

Assignment 2: Application Deployment and Configuration

1. Select an alternative Linux installation method compared to the previous question
2. Execute manual disk partitioning and file system configuration during installation
3. Configure network parameters and troubleshoot network connectivity

Assignment 3: System Maintenance and Updates

1. Utilize APT or YUM to install, upgrade, and uninstall packages on your system
2. Examine system logs to diagnose a particular problem (e.g., networking, package installation).
3. Track system performance with tools such as top or htop

Assignment 4: Security and Access Control

1. Set up user authentication with PAM. Apply firewall rules with IP tables
2. Protect SSH by changing its configuration settings
3. Use SE Linux or AppArmor to enforce Mandatory Access Control

Assignment 5: Advanced Topics in Linux Administration

1. Configure file and directory permissions for a particular use case
2. Operate a Docker container and give a summary of containerization concepts.
3. Configure file and directory access rights for a particular situation

Assignment 6: Installation and Configuration

1. Select an alternative Linux distribution from the one previously mentioned
2. Execute a complex partitioning layout with distinct partitions for /, /home, and swap, And apply user and group quotas to manage disk space

Assignment 7: System Maintenance and Updates

1. Examine and illustrate the steps for upgrading the Linux kernel.
2. Review system logs to diagnose and fix issues related to kernel updates
3. Apply performance monitoring utilities to find and fix performance slowdowns.

Reference Books:		
-------------------------	--	--

1. Linux System Administration, by Tom Adelstein, Bill Lubanovic, Released March 2007
Publisher(s): O'Reilly Media, ISBN: 9780596009526.
2. Pro Linux System Administration, by James Turnbull, Dennis Matotek, Peter Lieverdink,
publisher(s): Apress, 2009,ISBN: 1430219130,9781430219132.
3. The Complete Guide to Linux System Administration by James S Walker, Released
December 1,2004 Publisher(s): Course Technology Inc, ISBN: 0619216166,9780619216160

**Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)**

F.Y.B.Sc.(Cyber Security)

Subject Code: CYS-103-MJ-TH

Subject: Foundations of C programming

Teaching Scheme 2 hours / Week	No. of Credits 2	Examination Scheme CE: 20 marks EE: 30 marks
Prerequisites None		
Course Objectives: -		
<ul style="list-style-type: none"> • To develop the foundation and terminology of programming in general. • To understand structured programming approach • To implements the algorithms and Programing method in problem-solving techniques C language • To develop programming skills to a level such that problems of reasonable complexity can be tackled successfully. 		
Course Outcomes: - Student will be able to :-		
<ol style="list-style-type: none"> 1. Understand flow of Control sequence as well as logical outputs of the program 2. Implements computational strategies for developing applications 3. Design applications from Simple to Complex using C programming language 		
Course Contents		
Unit 1	Basics of C Programming	6 hours
History of 'C' language, Features of C, Structure of C Program, C Character Set, Identifiers and Keywords, Variables and constants. Data types- Basic data types, enumerated types, Type casting, Declarations, Expressions Operators and Expressions Unary and Binary arithmetic operators, Increment Decrement operators, Relational and logical operators, Bit wise operators, Assignment operators, Comma operator, size of operator, Ternary conditional operator, Precedence and associativity. Input output functions: printf, scanf functions, getchar, putchar, getch functions, gets, puts functions, Escape sequence characters, Format specifiers.		
Unit 2	Control and Iterative structures	4 hours
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).		
Unit 3	Functions	5 hours
Concept of function, Advantages of Modular design, Standard library functions, User defined functions:- declaration, definition, function call, parameter passing (by value), return statement. Recursive functions. Scope of variables and Storage classes.		
Unit 4	Arrays and String	8 hours
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, bound checking, Introductions to Strings: Definition, Declaration, Initialization, String operations. Introduction to pointer : Indirection operator and address of operator, Pointer arithmetic, Dynamic memory allocation Functions and pointers, Dynamic memory allocation		
Unit 5	Structure and Union	4 hours
Introduction to structure, Accessing members structure operation, nested structure and Introduction to Union: Accessing members structure operation, nested structure		
Unit 6	File Handling	3 hours

Introduction to File, file handling concepts, Basic file operations: Reading from and writing to files, Searching ,Updating contents of file

Reference Book:-

1. C: The Complete Reference, Schildt Herbert, 4th edition, McGraw Hill
2. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India
3. The 'C' programming language, Brian Kernighan, Dennis Ritchie, PHI
4. Programming in C ,A Practical Approach, Ajay Mittal , Pearson
5. Programming with C, B. Gottfried, 3rd edition, Schaum's outline Series, Tata McGraw Hill.
6. Programming in ANSI C, E. Balagurusamy, 7th Edition, McGraw Hill.

**Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)**

F.Y.B.Sc.(Cyber Security)

Subject Code: CYS-104-MJ-PR

Subject : Practical Based on CYS-103-MJ-TH

Teaching Scheme
4 hours / Week

No. of Credits
2

Examination Scheme
**CE: 20 marks
EE: 30 marks**

Prerequisites:- None

Course Objectives: -

- To Learn and apply the basic syntax and structure, different data types, control structures, etc. in C programs.
- To Implement user-defined functions and use standard library functions.
- To develop programming skills to a level such that problems of reasonable complexity can be tackled successfully.

Course Outcomes: - Student will be able to :-

1. Build Proficiency in Basic C Syntax and Structure
2. Develop effective Use of Data Types and Variables
3. Develop ability to work with arrays (single and multi-dimensional) and strings, performing operations
4. Demonstrate the ability to perform file input and output operations, reading from and writing to files using appropriate functions.

List of Practical:- Foundations of C Programming

1. Write a C program to find a maximum of two numbers using a conditional operator.
2. Write a C Program to find a maximum of three numbers using logical operators.
3. Write a C Program which illustrate increment and decrement operators (Use of Pre and Post increment is expected)
4. Accept dimensions of a cylinder and print the surface area and volume.
5. Write a program to accept an integer and check if it is even or odd.
6. Accept any year as input through the keyboard. Write a program to check whether the year is a leap year or not. (Hint leap year is divisible by 4 and not by 100 or divisible by 400)
7. Accept radius from the user and write a program having menu with the following options and corresponding actions
Options Actions
a. Area of Circle Compute area of circle and print
b. Circumference of Circle Compute Circumference of circle and print
c. Volume of Sphere Compute Volume of Sphere and print
8. Write a program to calculate the sum of digits of a given input number.
9. Write a program to check whether an input number is an Armstrong number or not.
10. Write a program to check whether an input number is palindrome or not.
11. Write a program to generate the following pattern.
5
4 5
3 4 5
2 3 4 5
1 2 3 4 5
12. Write a program to calculate the sum of digits of an input number using a function.
13. Write a program to find the factorial of an input number using a user defined function.
14. Write a program to calculate the sum of all odd elements of a 1-D array.
15. Write a program to sort 1D array elements in ascending order.

- 16.** Write a program to find maximum and minimum elements of a matrix.
- 17.** Write a program to count the occurrences of vowels from an input string.
- 18.** Write a program to display the elements of an array containing n integers in the reverse order using a pointer to the array.
- 19.** Create a structure employee (id, name, salary). Accept details of n employees and write a menu driven
- 20.** Program to perform the following operations. Write separate functions for the different options
Search by name
Search by
id Display
all
- 21.** Create a structure Book (Bno, Bname, Price). Accept details of n Books and write a menu driven program to perform the following operations options.
 - i. Display all Books having price > 500
 - ii. Display Book having maximum price
- 22.** Write a C program to create a file and write contents, save and close the file.

Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)

F.Y.B.Sc.(Cyber Security)

Subject Code: CYS-105-MJ-TH

Subject: Information Technology

Teaching Scheme 2 hours / Week	No. of Credits 2	Examination Scheme CE: 20 marks EE: 30 marks
Prerequisites None		
Course Objectives: -		
<ul style="list-style-type: none"> • To Introduce Students to the Basic Concepts and terminology of computer science. • To Learn Basic Commands of Operating system and application software • To Understand the Basics of data Transmission and Network Security. 		
Course Outcomes: - Student will be able to :-		
<ol style="list-style-type: none"> 1. Learn the fundamental concepts of computer science. 2. Operating Systems Proficiency 3. Differentiate between hardware and software, including understanding operating systems and applications. 		
Course Contents		
Chapter 1	Introduction to Information Technology	8 hours
Definition and Scope of Information Technology, History and evolution of computing (Block Diagram of computer and types of computer), Role of IT in modern society. Types of Programming Languages-Machine Languages, Assembly Languages, High-Level Languages, Translators- Assembler, Compiler, Interpreter Data Organization- Drives, Files, Directories		
Chapter 2	Computer Accessories and Peripherals	7 hours
Primary and Secondary Memory Systems ,Primary storage devices – RAM, ROM, PROM, Cache Memory, and EPROM.Secondary Storage Devices - CD, HD, and Pen drive, Cloud Storage. I/O Devices- Scanners, Digitizers, Plotters, LCD, Plasma Display Pointing Devices –Mouse, Joystick, Touch Screen, Number Systems :-Introduction to Binary,Octal,Hexadecimal System Conversion, Simple Addition, Subtraction, Multiplication, Division		
Chapter 3	Operating System and its Services	5 hours
Evolution of DOS (Disk Operating System),Introduction to Files and directories, Internal and External Commands Batch Files, Types of O.S.		
Chapter 4	Essentials of Internet Networking	4 hours
Introduction to Networking ,Common terminologies: LAN, WAN, Node, Host, Workstation, bandwidth, Interoperability, Network administrator, network security Network Components: Servers, Clients, Communication Media, Types of network: Peer to Peer, Client Server		
Chapter 5	Foundations of Problem Solving	6 hours
Concept: problem-solving, Algorithms and Flowcharts (Definitions, Symbols), Characteristics of an Algorithm Simple Arithmetic Problems, Basic Concepts of Viruses and Threats (Definition, Types and Prevention).		
Reference Books:		
<ol style="list-style-type: none"> 1. Computer Fundamentals by P.K. Sinha &Priti Sinha, 3rd edition, BPB pub. 2. Fundamental of Computers – By V. Rajaraman B.P.B. Publications 3. Computer Networks – By Tanenbaum Tata McGraw Hill Publication 4. How to solve it by Computer – R. G. Dromey 5. Introduction to algorithms – Cormen, Leiserson, Rivest, Stein 		

**Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)**

F.Y.B.Sc.(Cyber Security)

Subject Code: CYS-106-MJ-PR

Subject : Practical Based on CYS-105-MJ-TH

Teaching Scheme
4 hours / Week

No. of Credits
2

Examination Scheme
**CE: 20 marks
EE: 30 marks**

Prerequisites :- None

Course Objectives: -

- To Know the Basics of Information Technology.
- To Understand the Basics of Operating systems & Operating Systems Proficiency

Course Outcomes: - Student will be able to :-

1. Learn the fundamental concepts of Information Technology.
2. 2. Develop the logic of problem-solving

List of Practical:- Information Technology

1. What is the installation process for Windows OS?
2. What is the installation process for the Linux Operating System?
3. Write down the steps for creating a new file in the Windows operating system.
4. Write down the steps of creating a new file in the Linux Operating System
5. What steps are involved in user and group management in Linux?
6. What steps are involved in user and group management in the Windows Operating System.?
7. How do you hide and unhide files in Windows OS?
8. File and folder management in Linux.
9. File and folder management in Windows.
10. Working with any five commands in the command prompt (DOS).
11. Study about any five physical equipment used for networking.
12. Study of different internetworking devices in a computer network.
13. Explain about any five working of basic Networking Commands.
14. Study of basic network management commands
15. What is the method for assigning an IP address to a PC and connecting it to a network?
16. Write the steps to connect the computer to the Local Area Network.
17. Write the steps How to connect Network Printer in Windows.
18. 18. Write the steps To setting Local Area Network Proxy Server.

Reference Book :-

1. Computer Fundamentals by P.K. Sinha &Priti Sinha, 3rd edition, BPB pub.
2. Fundamental of Computers – By V. Rajaraman B.P.B. Publications
3. Computer Networks – By Tanenbaum Tata McGraw Hill Publication
4. How to solve it by Computer – R. G. Dromey
5. Introduction to algorithms – Cormen, Leiserson, Rivest, Stein

**Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)**

F.Y.B.Sc.(Cyber Security)

Subject Code: SEC-101-CYS-PR

Subject: Basics of Digital Communication System

Teaching Scheme 4 hours / Week	No. of Credits 2	Examination Scheme CE: 20 marks EE: 30 marks
<p>Prerequisite: Students are expected to know the concepts studied in following course:</p> <ol style="list-style-type: none"> 1. Analog and Digital Communication 2. Electronics Devices and circuits 3. Mobile communication & Networking 		
<p>Course Objectives: -</p> <ul style="list-style-type: none"> • To make the student familiar with electronic components • To learn number systems and their representation. • To understand basic logic gates, Boolean algebra and K-maps • To learn about various wireless & cellular communication networks. • To study arithmetic circuits, combinational circuits and sequential circuits • To impart knowledge regarding concepts of AM, FM modulation and detection 		
<p>Course Outcomes: - Student will be able to :-</p> <ol style="list-style-type: none"> 1. On completion of the course, students will be able to interpret and summarize the specifications of different passive, active and integrated components required to build electronic circuits. 2. To solve problems on Number systems and their representation 3. To familiarize with logic gates and applications in combinational and sequential circuits. 4. To identify the importance of different blocks in electronic communication systems. 5. Understand the working principles of mobile networks and Contrast different types of telecommunication networks. 		
<p>List of Practical:-SEC-101-CYS-pr:- Basics of Digital Communication System</p>		
<p>Assignment: 1 Introduction to Basic components of Electronics.</p> <ol style="list-style-type: none"> 1. Introduction to electronics, analog and digital communication, Introduction to active and passive components (Registers, capacitors, Inductor, Switch, Transformer, Diode, etc...) Identify, measure value 		
<p>Assignment :2 Introduction to Devices for electronics measurements</p> <ol style="list-style-type: none"> 1. Difference between device and components, Different electronics measurement devices CRO, Function Generator, DMM and its functions. 		
<p>Assignment :3 Study of Logic Gates (Verification of Truth tables)</p> <ol style="list-style-type: none"> 1. Introduction, Logic Gates: AND, OR, NOT, NOR, NAND gates, symbols and their Truth tables. 		
<p>Assignment: 4 Realization of basic gates using universal logic gates. (Verification of Truth tables)</p> <ol style="list-style-type: none"> 1. AND,NOT,OR using NAND/NOR 		
<p>Assignments: 5 Study of Half Adder and Full Adder using Logic Gates.</p> <ol style="list-style-type: none"> 1. Combinational Circuits :Implementation of half adder, full adder 		
<p>Assignment: 6 Study of Decimal to BCD/ (Binary) Converter.</p> <ol style="list-style-type: none"> 1. Number Systems: Decimal, Binary, Octal, Hexadecimal, Binary Coded Decimal number, inter-conversions. 		
<p>Assignment :7 Flip-flops</p> <ol style="list-style-type: none"> 1. Flip-flops SR , D and JK-FF 		
<p>Assignment :8 Study of read and write action of RAM</p> <ol style="list-style-type: none"> 1. Introduction to memory, types Volatile , non-volatile , RAM, ROM, Implementation of RAM 		
<p>Assignment: 9 Study of Communication.</p> <ol style="list-style-type: none"> 1. Elements of Communication system, Types of communication: simplex, half duplex, full duplex, baseband and broadband, Serial communication: asynchronous and synchronous 		

<p>Assignment:10 Study of Pulse code Modulation 1. Need of modulation and demodulation, Digital Modulation technique-PCM.</p>
<p>Assignment :11 Error detection and correction using Hamming Code 1. Error detection, Error correction methods, hamming code, limitation</p>
<p>Assignment :12 Study of Mobile hardware (Study Experiment) 1. Basic block diagram of mobile hardware, applications of each block</p>
<p>Assignment :13 Mobile communication(GSM)(Study Experiment) 1. Basic cellular systems, cells, Concept of frequency reuse channels, Handoff GSM system architecture</p>
<p>Assignment :14 Computer Network Component(Study Experiment) 1. Computer network components : Cables, Connectors, Routers, Switches, Ethernet and related interfacing cards</p>
<p>Assignment :15 Configuration of IP & MAC(Study Experiment) 1. To study Configuration of IP and MAC address and to study Local Area Network setup</p>
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Modern Digital and Analog Communication Systems, B.P. Lathi and Z. Ding (adapted by H. M. Gupta) Oxford University Press 4th Edition. 2. Communication Systems, Simon Haykin, John Wiley and Sons, 4th Edition 3. Principles of Communication Systems, Herbut Taub, Donald L. Schilling and Goutam Sara, Tata McGraw Hill, 4th Edition.
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Digital Communications: Fundamentals and Applications, Bernard Sklar, PHPTR NJ. 2. Analog and Digital Communication, T.L. Singal, McGraw Hill Education. 3. Modern Digital Electronics 5th Edition. R P Jain. 4. Digital Principles and Applications - Malvino and Leach, TMG Hill Edition.

Syllabus of Semester-II

Haribhai V. Desai College of Arts, Science and Commerce, Pune (Autonomous) F.Y.B.Sc.(Cyber Security) Subject Code: CYS-151-MJ-TH Subject : Cyber Security Fundamentals		
Teaching Scheme 2 hours / Week	No. of Credits 2	Examination Scheme CE: 20 marks EE: 30 marks
Prerequisites:- 1. Fundamentals of Computers 2. Fundamentals of networking		
Course Objectives: - <ul style="list-style-type: none"> • The purpose of this course is to arm students with the technical know-how and abilities required to safeguard and defend computer networks and systems. • In order to grow, pupils must be able to recognize contemporary computer security flaws. 		
Course Outcomes: - Student will be able to: - 1. Course Outcomes: - Students will be able to measure performance and troubleshoot Cyber Security Systems: - Analyze and evaluate an organization's needs for cyber security. 2. To outline the latest activities pertaining to cyberspace.		
Course Contents		
Chapter 1	Introduction to Cyber security	5 hours
Overview of Cyber security: Definition and significance of cyber security Evolution and historical context of cyber security. Cyber Threat Landscape Understanding the current threat landscape. Types of cyber threats: malware, phishing, ransom ware, etc. Defense-in-depth and layered security Risk Management in Cyber security Identifying and assessing cyber security risks Strategies for risk mitigation and management. Legal and Ethical Considerations Overview of cyber security laws and regulations Ethical responsibilities in Cyber security.		
Chapter 2	Fundamentals of Security and Networking	8 hours
Essentials Fundamentals:- Overview of networking principles Fundamentals of network protocols and TCP/IP. Types of Network Attacks, Eaves dropping, man-in-the-middle, and real-world instances and case studies are some examples of network attack types. Common Network Attacks: Technologies for Network Security Security of Wireless Networks. Wireless Network Security: Wireless network risks Protecting wireless networks against unwanted access Protecting Network Equipment, Securing Network Devices: Best practices for securing routers, switches, and other devices Implementing access controls and monitoring. Key Principles of Cyber security Confidentiality, integrity, Availability (CIA Triad)		
Chapter 3	System Security for Operating Systems	8 hours
Fundamentals of Security for Operating Systems: Important operating system security features, Access controls and user account management Patch Administration. Antivirus and Malware: The significance of software upgrades techniques for handling patches in an efficient manner Antivirus and Malware Protection Defense Antivirus software's function in cyber security Assessing and choosing antiviral medicines. Secure Boot and Encryption Using encryption to secure data establishing a safe boot procedure Security of Endpoints		

Chapter 4	Web Application Security	5 hours
<p>Web Application Security Basics: online application vulnerabilities, The best methods for safe coding. Secure Web Browsing: safeguards and safe browsing practices, Identifying and preventing phishing attempts, HTTPS and SSL/TLS: Importance of encrypted communication on the web, Configuring and implementing SSL/TLS for websites. Web Security Policies and Compliance: Developing and enforcing web security policies Compliance with industry standards (e.g., PCI DSS) Web Security Tools and Testing: Introduction to web security tools (e.g., OWASP ZAP) Conducting security assessments and penetration testing</p>		
Chapter 5	Security Best Practices and Emerging Trends	4 hours
<p>Training and Awareness of Security: The importance of cyber security education in creating security-conscious organizational culture. Response to and Management of Incidents, Formulating a plan for responding to incidents carrying out simulations and drills for incident response. Basics of Cloud Security: Understanding the security implications in cloud environments The shared responsibility concept and best practices. Information Exchange and Threat Intelligence: The role of threat intelligence in cyber security Participating in information-sharing communities. Cyber security's Future Trends: Examining new technology and issues Learning new things constantly and changing to counter threats.</p>		
Reference Books:		
<ol style="list-style-type: none"> 1. Computer Security Basics by by <u>Rick Lehtinen</u> , Publisher : O'Reilly Media; 2nd edition 2. Fundamentals of Computer Security by <u>Josef Pieprzyk</u> ,<u>Thomas Hardjono</u> ,<u>Jennifer Seberry</u> , Publisher: Springer; Softcover reprint of hardcover 1st ed. 2003 edition (1 December 2010), 3. Cryptography and Network Security,Publisher:Mc Graw Hill. 4. Computer Networking And the Internet ,Publisher:Harshall Kulkarni. 5. Data Communication and Computer Networks Publisher:Rajnesh Agrawal,Bharat Bhushan Tiwari 6. Cyber Cops, Cyber Criminal & Internet. Publisher:Deepti Chopra & Keith Merrill 		
E-Books and Online Learning Material		
<ol style="list-style-type: none"> 2. https://www.w3schools.com/linux/ Linux Programming and Scripting: https://archive.nptel.ac.in/courses/117/106/117106113/ 		

<p style="text-align: center;">Haribhai V. Desai College of Arts, Science and Commerce, Pune (Autonomous) F.Y.B.Sc.(Cyber Security) Subject Code: CYS-155-MJ-TH Subject: Computer Networks</p>		
Teaching Scheme 2 hours / Week	No. of Credits 2	Examination Scheme CE: 20 marks EE: 30 marks
<p>Course Objectives: -</p> <ul style="list-style-type: none"> • To understand basic terms of computer networks and the internet environment. • Become familiar with layered communication architectures (OSI and TCP/IP). 		
<p>Course Outcomes: - Student will be able to: -</p> <ol style="list-style-type: none"> 1. To familiarize the student with the basic taxonomy and terminology of computer networks. 2. To prepare the student for advanced courses in computer networking. 3. To understand data transmission across the network. 4. Gather knowledge of various types of networks and topologies. 5. Get an overview of the Internet, its applications and various browsers available to access the Internet. 6. Connect to the Internet using various modes of connections/devices available. 		
Course Contents		
Chapter 1	Networking Fundamentals	9 Hours
<ol style="list-style-type: none"> 1.1 Beginnings of Networking and data communication, ARPnet 1.2 Understanding Network Basics (N/W Components, N/W Device Roles) 1.3 Network Topologies : Bus, Ring, Star and Mesh Topologies 1.4 Transmission Modes (Simplex, Half Duplex, Full Duplex) 1.5 Types of Computer Networks (PAN, LAN, MAN, WAN) 1.6 Network Architectures (Centralized, Decentralized and Distributed) 1.7 Difference between Internet, Intranet and Extranet 		
Chapter 2	Physical Layer Principles	7 Hours
<ol style="list-style-type: none"> 2.1 Network Models: TCP/IP protocol suite, OSI Model 2.2 Switching: Packet , Message and Circuit Switching 2.3 Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission. 2.4 Analog and Digital signal, Analog to Digital transmission 2.5 Bandwidth utilization: Multiplexing and Spectrum Spreading 		
Chapter 3	Basics of Data Link Layer	7 Hours
<ol style="list-style-type: none"> 3.1 Function of data link layer, 3.2 Data framing techniques: Character Count, Character stuffing, Bit stuffing 3.3 Link layer addressing, Data Link layer design Issue 3.4 Error detection and correction : Parity, Checksum 3.5 Elementary data link protocol: Stop and wait, Sliding window protocol-Go back N:ARQ, Selective repeat ARQ 3.6 MAC Sub layer 3.7 Random Access Protocol: ALOHA, CSMA, CSMA/CD, CSMA/CA 3.8 Data link layer devices: Bridges, Switches 		

Chapter 4	Core Network Layer	7 Hours
4.1 Function of network layer 4.2 Network service type: virtual circuit and datagram 4.3 Routing algorithm: shortest path routing, Flooding , Distance vector routing, Link state routing, hierarchical routing 4.4 Congestion control: algorithm and congestion prevention policies 4.5 Internet protocols: Ip frame format, IP addressing, subnets 4.6 Internet control protocols: ICMP, ARP, DHCP 4.7 Internetworking: network layer device-router		
Reference Books:		
1. Computer Networks and Internets, 5th Edition, Douglas E. Comer, Pearson 2. Networking Basics, 2nd Edition, Patrick Ciccarelli, Christina Faulkner, Jerry Fitzgerald, Alan Dennis, David Groth and Toby Skandier with Frank Miller, Wiley 3. Internetworking with TCP/IP, Volume I, 5th Edition, Douglas E. Comer, PHI. 4. Internetworking with TCP/IP, Volume II, 3rd Edition, Douglas E. Comer, D.L. Stevens, PHI 5. TCP/IP Illustrated, Eastern Economy Edition, N.P. Gopalan, B. Siva Selvan, PHI 6. Computer Networking by Ed Tittel, McGraw Hills Companies		

Haribhai V. Desai College of Arts, Science and Commerce, Pune (Autonomous) F.Y.B.Sc.(Cyber Security) Subject Code: CYS-153-MJ-TH Subject: Python Programming		
Teaching Scheme 2 hours / Week	No. of Credits 2	Examination Scheme CE: 20 marks EE: 30 marks
Prerequisites: - Knowledge of procedure oriented programming language.		
Course Objectives: - <ul style="list-style-type: none"> • To define the structure and components of a Python program. Also, Gain a solid understanding of Python syntax and semantics. • To acquaint with data types, input/output statements, decision making, looping and functions in Python. • Learn and implement various data structures such as lists, tuples, dictionaries, and sets in Python programs. • Develop proficiency in writing reusable and modular code using functions in Python. • Gain a solid understanding of OOP principles and concepts. • Understand the importance of modules and packages in Python. 		
Course Outcomes: - Student will be able to: - <ol style="list-style-type: none"> 1. Devise algorithms, implement, test, debug and execute programs in the Python language. 2. Demonstrate Python programming skills for problems that require the writing of well documented programs including use of the logical constructs of the language. 3. Apply the problem-solving skills using different data structures in Python. 4. Develop an application using functions, classes and built-in modules of Python. 		
Course Contents		
Chapter 1	Foundational of Python Programming	7 hours
Python Basics: History, Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Structure of python program, Simple Python Program, Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Conditional statements -If, If-Else, nested if-else, Examples. Looping -For, While, Nested loops, Examples Control Statements -Break, Continue, Pass.		
Chapter 2	Python Data Structures	7 hours
String Manipulation -Concept, Declaration, Accessing String, Basic Operations, String Slices, Function and Methods, Examples. Lists -Introduction, accessing list, operations, working with lists, function & methods. Tuple -Introduction, Accessing tuples, operations working, function & methods, Examples. Set - concept, declaration, inserting, updating, deleting and accessing elements, Set operations Dictionaries -Introduction, Accessing values in dictionaries, working with dictionaries, properties, function, Examples. Python data structure conversion Functions -Defining a function, calling a function, types of function, function arguments, anonymous function, global & local variable, Examples.		

Chapter 3	Modules and Packages	5 hours
<p>Built in Modules: Importing modules in python program, Working with Random Modules. E.g. - built-ins module like time, date time, calendar, random, math, sys, statistics, collections, OS etc</p> <p>Packages:- Predefined Packages, User defined Packages</p>		
Chapter 4	Object Oriented Concepts	6 hours
<p>Object oriented programming concept: Classes and Objects–Classes as User Defined Data Type, Objects as Instances of Classes, Creating Class and Objects, Creating Objects By Passing Values, Variables, class variables, instance variables, class methods and static methods, Python Constructor, Data hiding.</p> <p>Inheritance:– Create a parent class and child class, add the <code>__init__()</code> function, use <code>super()</code> function, adding variables and functions</p> <p>Types of Inheritance: - Single inheritance, multilevel inheritance, multiple inheritance, hybrid inheritance, hierarchical inheritance</p> <p>Polymorphism: – function polymorphism and class polymorphism</p>		
Chapter 5	Arrays and Libraries	5 hours
<p>Concept of Array: Creating and accessing Array elements, Slicing python array, changing and adding array, element, removing python element</p> <p>Array Operations - Traverse, Insertion, Deletion, Search and Update Built-in Array methods</p> <p>Introduction to Python libraries: Statistical Analysis - NumPy, SciPy, Pandas, StatsModels</p> <p>Data Visualization-Matplotlib</p>		
Reference Books:		
<ol style="list-style-type: none"> 1. Beginning Python: From Novice to Professional, Magnus Lie Hetland, Apress 2. Beginning Programming with Python for Dummies Paperback – 2015 by John Paul Mueller 		
E-Books and Online Learning Material		
<ol style="list-style-type: none"> 1. https://www.javatpoint.com/python-tutorial 2. https://www.tutorialspoint.com/python/index.htm 3. https://www.geeksforgeeks.org/python-programming-language/ 4. https://www.w3schools.com/python/default.asp 		

**Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)**

F.Y.B.Sc.(Cyber Security)

Subject Code: CYS-152-MJ-PR

Subject:- Practical Based on CYS-151-MJ-TH

Teaching Scheme 4 hours / Week	No. of Credits 2	Examination Scheme CE: 20 marks EE: 30 marks
Course Objectives: - <ul style="list-style-type: none">• To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.• To develop students can identify the current Computer security and breaches.		
Course Outcomes: - Student will be able to: - <ol style="list-style-type: none">1. Understand and explore the basics of Computer Networks and Various Protocols2. Administrate a network and schedule flow of information.3. Examine the network security issues in Mobile and ad hoc networks.4. Demonstrate the TCP/IP and OSI fashions with merits and demerits.5. Evaluate the shortest path by using Routing algorithms.		
Practical Assignment 1: Introduction to cyber Security <ol style="list-style-type: none">1. Set up a basic network topology using virtualization software.2. Implement and configure a firewall to control incoming and outgoing traffic.3. Use network monitoring tools to identify and analyze network activities.		
Practical Assignment 2: Web application security and networking <ol style="list-style-type: none">1. Identify and fix common vulnerabilities in a web application (e.g., SQL injection, cross-site scripting).2. Configure SSL/TLS for a website to ensure secure communication.3. Use web security tools like OWASP ZAP to perform security assessments.4. Secure a Wi-Fi network by implementing WPA2/WPA3 encryption.5. Configure a wireless intrusion detection system (WIDS) to monitor wireless traffic.6. Investigate and respond to a simulated wireless security incident.		
Practical Assignment 3: System Security for OS <ol style="list-style-type: none">1. Harden the Windows/Linux operating system by configuring user accounts and access controls.2. Implement security measures such as enabling firewalls and updating system patches.3. Use antivirus software to scan for and remove potential threats.		
Practical Assignment 4: Strengthening Endpoint Security, Incident response and Management. <ol style="list-style-type: none">1. Install and configure endpoint security solutions on different operating systems.2. Conduct malware analysis on a provided sample and propose mitigation strategies.<ol style="list-style-type: none">3. Implement and test device encryption on a selected device.4. Develop an incident response plan for a simulated security incident.5. Simulate a security incident and follow the incident response plan.6. Conduct a post-incident analysis and propose improvements to the plan.		
Practical Assignment 5: Best Practices and Trends in Cyber security <ol style="list-style-type: none">1. Design and deliver a brief security awareness presentation.2. Create and conduct a phishing simulation to assess user awareness.3. Evaluate the effectiveness of security training materials.		

Practical Assignment 6: Incident Response and Management

1. Develop an incident response plan for a simulated security incident.
2. Simulate a security incident and follow the incident response plan.
3. Conduct a post-incident analysis and propose improvements to the Plan

Practical Assignment 7: Security Awareness and Training

1. Design and deliver a brief security awareness presentation.
2. Create and conduct a phishing simulation to assess user awareness.
3. Evaluate the effectiveness of security training materials.

Practical Assignment 8: Security Best Practices and Emerging Trends

1. Explore and implement security best practices for cloud environments.
2. Securely configure an IoT device and assess its security.
3. Research and present on emerging trends in cyber security.

Reference Books:

1. Computer Security Basics by Rick Lehtinen , Publisher : O'Reilly Media; 2nd edition (23 June 2006); CBS PUBLISHERS & DISTRIBUTORS PVT. LTD 01149347068, ISBN-10 : 0596006691, 978-0596006693.
2. Fundamentals of Computer Security by Josef Pieprzyk ,Thomas Hardjono ,Jennifer Seberry , Publisher Springer; Softcover reprint of hardcover 1st ed. 2003 edition (1 December 2010), ISBN : 3642077137, 978-3642077135.

**Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)**

F.Y.B.Sc.(Cyber Security)

Subject Code: CYS-156-MJ-PR

Subject: Practical Based on CYS-153-MJ-TH

Teaching Scheme
4 hours / Week

No. of Credits
2

Examination Scheme
CE: 20 marks EE: 30 marks

Course Objectives: -

- To prepare students with basic networking concept.
- To understand process of data communication using protocols and standards
- To learn various topologies and applications of network.
- To understand the concept of network layer, transport layer and application layer

Course Outcomes: - Student will be able to: -

1. Understand the concept of OSI Reference Model and TCP/IP.
2. To know the components of the Network Security.
3. Understand top down approach of data communication from one user to another user
4. To detect the IP address and route.

Assignment No 1: Implement following commands in Linux in python and write their output :

1. hostname
2. hostname-d
3. hostname-f
4. hostname-I
5. ping
6. netstat
7. netstat -a
8. dig
9. host
10. netstat -at
11. netstat-au
12. netstat -l

Assignment No 2: Implement following commands in Linux in python and write their output :

1. netstat-lt
2. netstat-lu
3. netstat-s
4. netstat-st
5. iwconfig
6. netstat -su
7. traceroute, tracepath
8. ifconfig
9. ifconfig-a
10. ifconfigeth()

Assignment No 3: Study the following Network Devices in Detail and write their functions:

1. Repeater
2. Hub
3. \Switch
4. Bridge
5. Router
6. Gateway

Assignment No 4 Router Basic Commands and Security Configuration

1. CISCO IOS Configuration Router Basic Commands
2. Security Configuration, Operation and Verification in IOS, Running and Start-up Configuration

Assignment No 5 Static Routing

1. Configure Static Routing Configuration in Sample Network

Assignment No 6 Dynamic Routing using Protocols

1. Configuring Dynamic Routing using RIPv1 and RIPv2 Protocol
2. Configuring Dynamic Routing using OSPF Protocol

Assignment No 7 Remote Management using Network Protocols

1. Configuring and Verifying TELNET and SSH

Assignment No 8 Switch Configuration

1. Configure and verify Switch Configuration
2. Configuring and verifying Access Control List.

Assignment No 9 Data Encryption

1. Encrypt data using Cryptographic Tools –Truecrypt
2. Implementation of Steganography

Assignment No 10 Network Security Configuration

1. Configuring Firewall
2. Configuring VPN

Reference Books:

1. Behrouz A Forouzan, Cryptography and Network Security , McGraw-Hill Education, 2011
2. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning
3. William Stallings, Network Security Essentials: Applications and Standards, Prentice HallIndia,4th Edition
4. Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud” William StallingsPublisher: Addison-Wesley 2015
5. William Stallings, Cryptography and Network Security: Principles and Standards, PrenticeHallIndia, 3rd Edition, 2003

**Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)**

F.Y.B.Sc.(Cyber Security)

Subject Code: CYS-154-MJ-PR

Subject: Practical course based on CYS-155-MJ-TH

Teaching Scheme
4 hours / week

No. of Credits
2

Examination Scheme
CE: 20 Marks EE: 30 Marks

Course Objectives:

1. To define the structure and components of a Python program.
2. To learn how to use Lists, Tuples, Sets and Dictionaries in Python programs.
3. To design object oriented programs using classes in Python.
4. How to download libraries and its use in the programs.

Course Outcomes: On completion of the course, student will be able to –

1. Devise algorithms, implement, test, debug and execute programs in the Python language.
2. Apply the problem-solving skills using different data structures in Python.
3. Develop an application using functions, classes and built-in modules of Python.
4. Develop an application using packages
5. Apply python libraries in the program for statistical operation, scientific operation.

Assignment 1: Write a Python program to:

1. Function to find the sum of digits of a number.
2. A function that generates all the factors of a number.

Assignment 2: Write a Python program to:

1. Function to find GCD/LCM of 2 numbers.
2. To find the largest among 3 numbers

Assignment 3: Write a Python program to:

1. To find factorial of a given number.
2. To check prime number

Assignment 4: Write a Python program to:

1. To count repeated characters in a string. Sample string: the quick brown fox jumps over the lazy dog. Expected output: o-4, e-3, u-2, h-2, r-2, t-2
2. Get a string from a given string where all occurrences of its first character have been changed to '\$', except the first character itself.

Assignment 5: Write a Python program to:

1. Change a given string to a new string where the first and last characters have been exchanged.
2. Remove the nth index character from a non-empty string

Assignment 6: Write a Python program to:

1. Shuffle and print a specified list.
2. Merge two python dictionaries.

Assignment 7: Write a Python program to:

1. Sort(ascending and descending) dictionary by value.
2. Accept a string and calculate the number of digits, letters and other characters.

Assignment 8: Write a Python program to:

1. Function to concatenate two strings.
2. Write a program that takes two digits m(row) and n(column) as input and generates a two-dimensional array. Read the elements and display the array.

Assignment 9: Write a Python program to:

1. Write a program that accepts a range of numbers (n to m) and list down all the even/odd numbers to be printed in a comma separated sequence.
2. Convert decimal to binary using recursion.

Assignment 10: Write a Python program to:

1. Calculate the number of upper-case letters and lower-case letters in a string. Import the module to calculate number of upper-case letters and lower-case letters from a string input by the user.
2. Take a list and return a new list with unique elements of the first list. Import the module and input a list to find the unique elements in a list

Assignment 11: Write a Python program to:

1. Program to display Fibonacci series using recursion.
2. To display power of 2 using anonymous function

Assignment 12: Write a Python program to:

1. To generate Fibonacci terms using generator function.
2. Define a class Employee having members id, name, department, salary. Create a subclass called manager with member bonus. Define methods accept and display in both the classes. Create n objects of the manager class and display the details of the manager having the maximum total salary (salary+bonus).

Assignment 13: Write a Python program to:

1. Using class, which has two methods get_String and print_String. get_String accept a string from the user and print_String print the string in upper case.
2. Using package to calculate area and volume of cube and sphere

Assignment 14: Write a Python program to:

1. To find the repeated items of a tuple
2. To compute element-wise sum of given tuples. Original lists: (1, 2, 3, 4) (3, 5, 2, 1) (2, 2, 3, 1)
3. Element-wise sum of the said tuples: (6, 9, 8, 6)

Assignment 15: Write a Python program to:

1. To accept string and remove the characters which have odd index values of given string using user defined function.
2. To create a class Rectangle with data member's length, width and methods area, perimeter which can compute the area and perimeter of rectangle.

Assignment 16: Write a Python program to:

1. Create a list a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] and write a python program that prints out all the elements of the list that are greater than 10
2. To define the class person having members name, address. Create a subclass called Employee with members staffed salary. Create 'n' objects of the Employee class and display all the details of the employee.

Assignment 17: Write a Python program to:

1. Define a class named Shape and its subclass(Square/ Circle). The subclass has an init function which takes an argument (Length /radius). Both classes should have methods to calculate area and volume of a given shape.
2. To create a class Circle and Compute the Area and the circumferences of the circle.(use parameterized constructor)

Assignment 18: Write a Python program to:

1. To generate and print a dictionary which contains a number (between 1 and n) in the form(x,x*x).
Sample Dictionary (n=5) Expected Output: {1:1, 2:4, 3:9, 4:16, 5:25}
2. Write a Python script to Create a Class which Performs Basic Calculator Operations.

Assignment 19: Write a Python program to:

1. To find the sum of all elements of an array
2. To find largest element in the array.

Assignment 20: Write a Python program to:

1. To find the occurrence of a particular number in array
2. Merge two sorted array as a new array.

Reference Books:
1 Beginning Python: From Novice to Professional, Magnus Lie Hetland, Apress 2 Beginning Programming with Python for Dummies Paperback – 2015 by John Paul Mueller
E-Books and Online Learning Material
1 https://www.javatpoint.com/python-tutorial 2 https://www.tutorialspoint.com/python/index.htm

Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)

F.Y.B.Sc.(Cyber Security)

Subject Code: SEC-151-CYS-PR

Subject: Statistical Methods-I

Teaching Scheme

4 hours / week

No. of Credits

2

Examination Scheme

CE: 20 Marks EE: 30 Marks

Prerequisites

1. To get good idea to brush up on the foundational knowledge you'll need in the course and you may refresh your algebraic skills in advance

Course Objectives: -

1. To tabulate and make frequency distribution of the given data.
2. To use various graphical and diagrammatic techniques and interpret.
3. To compute various measures of central tendency, dispersion,
4. To compute the relation between variables and prediction values using correlation and regression.

Course Outcomes: - Student will be able to: -

1. Handling raw data and understand the nature of the data
2. How to represent data by graphical methods.
3. Set up and Install the system services.
4. Predict the values in correlation & regression and interpret to make decisions.

Course Contents

Chapter 1	Data Condensation and Graphical methods	7 hours
------------------	--	----------------

- Types of data, Types of variable constant, attribute.
- Methods of classification.
- Frequency Distribution - Discrete and Continuous frequency distribution.
- Graphs & Diagrams - Histogram, Frequency polygon, Frequency curve,
- Pie-Diagram, Bar Diagram, Multiple bar Diagram, Sub-divided bar diagram,
- Percentage bar diagram.
- Construction of frequency distribution,
- Diagrams and graphs using MS Excel/Python.

Chapter 2	Measures of Central Tendency	8 hours
------------------	-------------------------------------	----------------

- Concept and meaning of Measure of Central Tendency, Requirements of good Measure of Central Tendency.
- Arithmetic Mean (A.M), Median, Mode for discrete and continuous frequency distribution, Merits & Demerits, Empirical Relation between mean, median and mode.
- Measures of central tendency using MS Excel/python. Numerical Problems.

Chapter 3	Measures of Dispersion	7 hours
------------------	-------------------------------	----------------

- Concept and meaning of Measure of dispersion, Requirements of good Measure of dispersion.
- Types of Measure of Dispersion- Range, Coefficient of Range, Standard Deviation (S.D.), Variance, Coefficient of Variation (C.V)
- Measures of dispersion using MS Excel/Python, Numerical Problems

Chapter 4	Correlation & Regression	8 hours
------------------	-------------------------------------	----------------

- Concept of Correlation, Types of correlation.
- Scatter Diagram, Karl- Pearson correlation coefficient
- Numerical Problems on Correlation, Concept of regression, lines of regression equation of Y on X and X on Y. Regression coefficients, properties of regression coefficients, Correlation, Regression using MS-Excel/Python Numerical problems on Regression.

Reference Books:

1. Fundamental of Mathematical Statistics, S.C.Gupta and V.K.Kapoor, Sultan Chand & Sons, New Delhi.
2. Statistical Methods, George W. Snedecor, William G, Cochran, John Wiley & sons
3. Fundamentals of Applied Statistics (3rd Edition), Gupta and Kapoor, S.Chand and Sons, New Delhi, 1987.
4. Draper, N. R. and Smith, H. (1998). Applied Regression Analysis, John Wiley, ThirdEdition

E-Books and Online Learning Material

1. <http://eclm.unipune.ac.in/Search.aspx?subid=480&catid=1>.
2. <http://ndl.iitkgp.ac.in/>

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

Eligibility:

- Higher secondary school certificate (10+2) in science stream or its equivalent examination in Science stream

OR

- Three-year diploma course from the board of technical education conducted by Government of Maharashtra or its equivalent

Objectives:

- To Develop Proficiency in Cyber Security: Equip students with the skills to protect Information systems against cyber threats and vulnerabilities.
- To provide hands-on experience with current security technologies and tools.
- To an understanding of the ethical, legal, and societal implications of cyber security practices.
- To encourage innovative problem-solving and critical analysis of security issues.
- To develop an understanding of the global context and cultural dimensions of cyber security

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

Workload

1. Each theory credit is equivalent to 15 clock hours of teaching (i.e. for 2 Credits – 30 Clock Hours) and each practical credit is equivalent to 30 clock hours (i.e. for 2 Credits – 60 Clock Hours) of teaching in a semester.
2. There is 15 weeks of teacher-student interaction during the semester.
3. The 15 week is divided into 12 weeks teaching and 3 weeks for continuous assessment including preparation time to students during the semester.
4. The workload will be calculated based on 12 weeks teaching only.
5. For the purpose of computation of work-load the following mechanism may be adopted as per UGC guidelines.
6. Workload as per credit is as follows:
 - i. 1 Credit = 1 Theory period of one hour duration per week.
 - ii. 1 Credit = 1 Tutorial period of one hour duration per week.
 - iii. 1 Credit = 1 Practical period of two-hour duration per week.
7. Each theory Lecture time for FY, SY, TY is of 60 min. (3 Lectures per week for 2 credit courses)
8. Each practical session time for FY/ SY /TY is of 4 hour i.e. 240 min.

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

Credit Framework

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

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

Reference Books

1. Linux System Administration & Fundamentals

1. *Linux System Administration* – Tom Adelstein, Bill Lubanovic, O'Reilly Media
2. *Pro Linux System Administration* – James Turnbull, Dennis Matotek, Peter Lieverdink, Apress
3. *The Complete Guide to Linux System Administration* – James S. Walker
4. *The Complete Reference* – Schildt Herbert, McGraw Hill

2. Programming (C & Python)

1. *A Structured Programming Approach Using C* – Behrouz A. Forouzan, Richard F. Gilberg
2. *The C Programming Language* – Brian Kernighan, Dennis Ritchie, PHI
3. *Programming in ANSI C* – E. Balagurusamy, McGraw Hill
4. *Programming with C* – B. Gottfried, Schaum's Outline Series, McGraw Hill
5. *Beginning Python: From Novice to Professional* – Magnus Lie Hetland, Apress
6. *Beginning Programming with Python for Dummies* – John Paul Mueller

3. Computer Fundamentals & Algorithms

1. *Computer Fundamentals* – P.K. Sinha & Priti Sinha, BPB
2. *Fundamentals of Computers* – V. Rajaraman, BPB
3. *Introduction to Algorithms* – Cormen, Leiserson, Rivest, Stein
4. *How to Solve It by Computer* – R. G. Dromey

4. Computer Networks & Communication

1. *Computer Networks* – Andrew Tanenbaum, McGraw Hill
2. *Computer Networks and Internets* – Douglas E. Comer, Pearson
3. *Internetworking with TCP/IP, Volume I* – Douglas E. Comer, PHI
4. *Networking Basics* – Patrick Ciccarelli, Christina Faulkner, Wiley
5. *TCP/IP Illustrated* – N.P. Gopalan, B. Siva Selvan, PHI

5. Cyber Security & Cryptography

1. *Computer Security Basics* – Rick Lehtinen, O'Reilly Media
2. *Fundamentals of Computer Security* – Josef Pieprzyk, Thomas Hardjono, Jennifer Seberry, Springer
3. *Cryptography and Network Security* – Behrouz A. Forouzan, McGraw Hill
4. *Network Security and Cryptography* – Bernard Menezes, CENGAGE Learning
5. *Network Security Essentials: Applications and Standards* – William Stallings, Prentice Hall
6. *Cryptography and Network Security: Principles and Standards* – William Stallings, Prentice Hall

6. Digital & Communication Systems

1. *Digital Communications: Fundamentals and Applications* – Bernard Sklar, PH PTR
2. *Analog and Digital Communication* – T.L. Singal, McGraw Hill
3. *Modern Digital Electronics (5th Edition)* – R.P. Jain

7. Statistical Analysis & Applied Statistics

1. *Fundamental of Mathematical Statistics* – S.C. Gupta and V.K. Kapoor, Sultan Chand & Sons
2. *Fundamentals of Applied Statistics (3rd Edition)* – Gupta and Kapoor, S. Chand & Sons

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

Examination Pattern

1. Exam pattern is 60-40 i.e. Semester End Examination (SEE) is of 60 % and Continuous Internal Assessment is of 40 %.

Theory, Practical/Project: -

Continuous Internal Assessment (CIA): 40 % [20 Marks]

1. Written Test- 25 % [5 Marks]
2. Presentation/Assignment: - 25% [5 Marks]
3. Project/Activity Oriented Learning: -50 % [10 Marks]

Semester End Examination (SEE): - 60 % [30 Marks]

2. For Internal examination, written test should be conducted of 15 marks for 2 credits.

Paper Pattern

Internal Examination

(15 Marks Examination converted into 5 Marks for final assessment)

Que-1: Choose correct option (MCQs) (10-MCQs with Multiple Options) – **5 Marks.**

Que-2: Answer the following questions (Short answer questions) (any 3 out of 5)- **6 Marks**

Que-3: Answer the following questions (Short answer Definition/Problems/Diagram) (any 1 out of 2)– **4 Marks.**

External Examination

Que-1: [5 Marks]

Answer the following questions (Short answer/Definition/Problems/Diagram, etc.) (Any 5 out of 7)

Que-2: [10 Marks]

A] Answer the following questions (Short answer questions- 2 Que out of 3) [6 Marks]

B] Answer the following questions (Long answer questions/Problems- 1 Que out of 2) [4 Marks]

Que-3: [10 Marks]

A] Answer the following questions (Short answer questions- 2 Que out of 3) [6 Marks]

B] Answer the following questions (Long answer questions/Problems- 1 Que out of 2) [4 Marks]

Que-4: [5 Marks]

Write a short notes on following (2 out of 3)

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce, Pune
(Autonomous)

Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Cyber Security)

Major Course: - Cyber Security

Completion of Degree

1. A student who earns 44 credits at First year with additional 4 credits core NSQF Course/Internship shall be eligible for the award of UG Certificate in Major subject. OR May continues with Major and Minor.
2. A student who earns 88 credits at Second year with additional 4 credits core NSQF Course/Internship shall be eligible for the award of UG Diploma in Major subject with Minor (Selected at SY). OR May continues with Major and Minor.
3. A student who earns 132 credits at Third year shall be eligible for the award of UG Degree in Major subject with Minor (Selected at SY). OR May continues with Major and Minor.
4. A student who earns 176 credits in Four years shall be eligible for the award of UG Honors or Honors with Research in Major subject with Minor (Selected at SY).

Award of Degree:

CGPA will be calculated for students who completed 132/176 credits, grades are given as per the following table.

Sr. No.	Grade Letter	Grade Point	Marks
1.	O (Outstanding)	10	90<= Marks <= 100
2.	A+ (Excellent)	9	75<= Marks <= 89
3.	A (Very Good)	8	60<= Marks <= 74
4.	B+ (Good)	7	55<= Marks <= 59
5.	B (Above Average)	6	50<= Marks <= 54
6.	C (Average)	5	45<= Marks <= 49
7.	D (Pass)	4	40<= Marks <= 40
8.	F (Fail)	0	Marks <40
9.	AB (Absent)	0	-