



SAVITRIBAI PHULE PUNE UNIVERSITY

PUNE

CHOICE BASED CREDIT SYSTEM

For

B.Sc. (Cyber Security)

(Implemented from June 2024)

Savitribai Phule Pune University

B. Sc. (Cyber Security)

(To be implemented from Academic year 2024-2025)

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 Program is of Three Years duration with six semesters. It is a Full-Time Degree Program. The program will be based on the Choice-based credit system comprising 140 credit points.

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) or its equivalent examination with English

OR

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

OR

- Higher secondary school certificate (10+2) Examination with English and avocational subject of +2 level (MCVC)

PO No.	PO Outcomes
PO1	Become proficient in Linux administration, as it is essential in today's IT environment.
PO2	Address and take action to meet the cyber security needs of the modern IT world.
PO3	Cultivate creative abilities, critical thinking, analytical skills, and research capabilities to tackle real-world problems using cyber security expertise.
PO4	Understand the Concepts of cyber security, Networking and vulnerability testing and statistical methods.
PO5	Applying the Concepts of Digital Communication and IOT.
PO6	Identify and evaluate software vulnerabilities and security solutions to mitigate the risk of exploitation.
PO7	Acquire essential programming languages such as C and Python
PO8	Integrate ethics and cyber laws to understand the rules and regulations of the current IT environment.
PO9	To developing regulations and tactics for cyber security
PO10	Cloud security protects applications, data, and cloud-based infrastructure.
PO11	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.

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Structure of UG Program as per NEP-2020

Name of Program: - B.Sc.(Cyber Security) Major Course: - Cyber Security

Level:-4.5(First Year) Sem:-I									
Course Type	Course Code	Course Code	Course Title		Teaching Scheme Hr/Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Subject 1	CYS101MJ	Fundamentals of Linux Administration	2		2		15	35	50
Subject 2	CYS102MJ	Foundations of C programming	2		2		15	35	50
Subject 3	CYS103MJ	Information Technology	2		2		15	35	50
Subject1 Practical	CYS104MJP	Practical based on CYS101MJ		2		4	15	35	50
Subject 2 Practical	CYS105MJP	Practical based on CYS102MJ		2		4	15	35	50
Subject3 Practical	CYS106MJP	Practical based on CYS103MJ		2		4	15	35	50
IKS	CYS101IKS	Computing in ancient India	2		2		15	35	50
GE/OE	OE101CYS	Office Automation/ Introduction to Google Tools	2		2		15	35	50
SEC	SEC101CYS	Basics of Digital Communication (Practical)		2		4	15	35	50
AEC	AEC101MAR/ HIN/ENG	MIL-I(Hindi) / MIL-I(Marathi)/ MIL-I(ENGLISH)	2		2		15	35	50
VEC	VEC101ENV	EVS-I	2		2		15	35	50
TOTAL			14	8	14	16			

Level:-4.5(First Year) Sem:-II									
Course Type	Course Code	Course Code	Course Title		Teaching Scheme Hr/Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Subject 1	CYS151MJ	Cyber Security Fundamentals	2		2		15	35	50
Subject 2	CYS152MJ	Computer Networks	2		2		15	35	50
Subject 3	CYS153MJ	Python Programming	2		2		15	35	50
Subject1 Practical	CYS154MJP	Practical based on CYS151MJ		2		4	15	35	50
Subject 2 Practical	CYS155MJP	Practical based on CYS152MJ		2		4	15	35	50
Subject3 Practical	CYS156MJP	Practical based on CYS153MJ		2		4	15	35	50
GE/OE	OE152CYSP	Office Automation/ Introduction to Google Tools		2		4	15	35	50
SEC	SEC151CYS	Statistical Methods-I		2		4	15	35	50
AEC	AEC151MAR/ / HIN/ENG	MIL-I(Hindi) / MIL-I(Marathi)/ MIL-I(ENGLISH)	2		2		15	35	50
VEC	VEC151ENV	EVS-II	2		2		15	35	50
CC	CC151PE/ NSS/ NCC	University Basket	2		2		15	35	50
TOTAL			12	10	12	20			

Semester-I

Savitribai Phule Pune University F.Y.B.Sc.(Cyber Security) Subject Code : CYS101MJ Subject :Fundamentals of Linux Administration		
Teaching Scheme 2 hours / Week	No. of Credits 2	Examination Scheme CE: 15 marks EE: 35 marks
Prerequisites :- Awareness with the Text-Based Console, Command Prompt, Shell Environment And Networking		
Course Objectives: - • To make the students understand the Linux OS • To acquaint them with the rich set of utilities that are essential for system management, file manipulation. • To help they manage a network interface to managing connections and troubleshooting network issues.		
Course Outcomes: - Student will be able to: - 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 SELinux/AppArmor.		
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:		
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		
E-Books and Online Learning Material		
1. https://www.w3schools.com/linux/ Linux Programming and Scripting: https://archive.nptel.ac.in/courses/117/106/117106113/		

Savitribai Phule Pune University F.Y.B.Sc.(Cyber Security) Subject Code : CYS102MJ Subject : Foundations of C programming		
Teaching Scheme 2 hours / Week	No. of Credits 2	Examination Scheme CE: 15 marks EE: 35 marks
Prerequisites None		
Course Objectives: - • 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 :- 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 Books:

- 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.

Savitribai Phule Pune University F.Y.B.Sc.(Cyber Security) Subject Code : CYS103MJ Subject : Information Technology		
Teaching Scheme 2 hours / Week	No. of Credits 2	Examination Scheme CE: 15 marks EE: 35 marks
Prerequisites None		
Course Objectives: - • 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 :- 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:		
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		

Savitribai Phule Pune University F.Y.B.Sc.(Cyber Security) Subject Code : CYS104MJP Subject : Practical Based on CYS101MJ		
Teaching Scheme 4 hours / Week	No. of Credits 2	Examination Scheme CE: 15 marks EE: 35 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 SELinux 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		
Savitribai Phule Pune University F.Y.B.Sc.(Cyber Security) Subject Code : CYS105MJP Subject : Practical Based on CYS102MJ		

Teaching Scheme 4 hours / Week	No. of Credits 2	Examination Scheme CE: 15 marks EE: 35 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<table><tr><td>Options</td><td>Actions</td></tr><tr><td>a. Area of Circle</td><td>Compute area of circle and print</td></tr><tr><td>b. Circumference of Circle</td><td>Compute Circumference of circle and print</td></tr><tr><td>c. Volume of Sphere</td><td>Compute Volume of Sphere and print</td></tr></table> 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<table><tr><td>Search by name</td></tr><tr><td>Search by id</td></tr><tr><td>Display all</td></tr></table> 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			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	Search by name	Search by id	Display all
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												
Search by name													
Search by id													
Display all													

ii. Display Book having maximum price		
22. Write a C program to create a file and write contents, save and close the file.		
23. Write a C program to read file contents and display on console.		
Savitribai Phule Pune University		
Reference Books:	F.Y.B.Sc.(Cyber Security)	
Subject Code : CYS106MJP		
Subject : Practical Based on CYS103MJ		
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	No. of Credits	Examination Scheme
4 hours/Week	2	
3. The 'C' programming language, Brian Kernighan, Dennis Ritchie, PHI	CE: 15 marks	
4. Programming in C, A Practical Approach, Ajay Mittal, Pearson	EE: 35 marks	
Prerequisites : Problem solving with Python		
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. 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. Write the steps To setting Local Area Network Proxy Server.		
Reference Books:		
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		

Assignment: 1 Introduction to Basic components of Electronics.

- Introduction to electronics, analog and digital communication, Introduction to active and passive components (Registers, capacitors, Inductor, Switch, Transformer, Diode, etc...) Identify, measure value

Savitribai Phule Pune University F.Y.B.Sc.(Cyber Security) Subject Code : SEC 101 CYS Subject : Basics of Digital Communication System (Practical)		
Teaching Scheme 4 hours / Week	No. of Credits 2	Examination Scheme CE: 15 marks EE: 35 marks
Prerequisite: Students are expected to know the concepts studied in following course: 1. Analog and Digital Communication 2. Electronics Devices and circuits 3. Mobile communication & Networking		
Course Objectives: - • 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		
Course Outcomes: - Student will be able to :- 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.		
List of Practical:-SEC101CYS:- Basics of Digital Communication System		
Assignment :2 Introduction to Devices for electronics measurements 1. Difference between device and components, Different electronics measurement devices CRO, Function Generator, DMM and its functions.		
Assignment :3 Study of Logic Gates (Verification of Truth tables) 1. Introduction, Logic Gates: AND, OR, NOT, NOR, NAND gates, symbols and their Truth tables.		
Assignment: 4 Realization of basic gates using universal logic gates. (Verification of Truth tables) 1. AND,NOT,OR using NAND/NOR		
Assignments: 5 Study of Half Adder and Full Adder using Logic Gates. 1. Combinational Circuits :Implementation of half adder, full adder		
Assignment: 6 Study of Decimal to BCD/ (Binary) Converter. 1. Number Systems: Decimal, Binary, Octal, Hexadecimal, Binary Coded Decimal number, inter- conversions.		
Assignment :7 Flip-flops 1. Flip-flops SR , D and JK-FF		
Assignment :8 Study of read and write action of RAM 1. Introduction to memory, types Volatile , non-volatile , RAM, ROM, Implementation of RAM		
Assignment: 9 Study of Communication. 1. Elements of Communication system, Types of communication: simplex, half duplex, full duplex, baseband and broadband, Serial communication: asynchronous and synchronous		
Assignment:10 Study of Pulse code Modulation 1. Need of modulation and demodulation, Digital Modulation technique-PCM.		
Assignment :11 Error detection and correction using Hamming Code 1. Error detection, Error correction methods, hamming code, limitation		
Assignment :12 Study of Mobile hardware (Study Experiment) 1. Basic block diagram of mobile hardware, applications of each block		
Assignment :13 Mobile communication(GSM)(Study Experiment) 1. Basic cellular systems, cells, Concept of frequency reuse channels, Handoff GSM system architecture		
Assignment :14 Computer Network Component(Study Experiment) 1. Computer network components : Cables, Connectors, Routers, Switches, Ethernet and related interfacing cards		

Assignment :15 Configuration of IP & MAC(Study Experiment)

1. To study Configuration of IP and MAC address and to study Local Area Network setup

Text Books:

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.

Reference Books:

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.

Semester -II

Savitribai Phule Pune University F.Y.B.Sc.(Cyber Security) Subject Code : CYS151MJ Subject :Cyber Security Fundamentals		
Teaching Scheme 2 hours / Week	No. of Credits 2	Examination Scheme CE: 15 marks EE: 35 marks
Prerequisites :- 1. Fundamentals of Computers 2. Fundamentals of networking		
Course Objectives: - - 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: - - Course Outcomes: - Students will be able to measure performance and troubleshoot Cyber Security Systems: - Analyze and evaluate an organization's needs for cyber security. - 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
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		
Chapter 5	Security Best Practices and Emerging Trends	4 hours
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.		
Reference Books:		
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:Rajnish Agrawal,Bharat Bhushan Tiwari 6. Cyber Cops, Cyber Criminal & Internet. Publisher:Deepti Chopra & Keith Merrill		
E-Books and Online Learning Material		
2. https://www.w3schools.com/linux/ Linux Programming and Scripting: https://archive.nptel.ac.in/courses/117/106/117106113/		

Savitribai Phule Pune University F.Y.B.Sc.(Cyber Security) Subject Code : CYS152MJ Subject :Computer Networks		
Teaching Scheme 2 hours / Week	No. of Credits 2	Examination Scheme CE: 15 marks EE: 35 marks
Course Objectives: - • To understand basic terms of computer networks and the internet environment. • Become familiar with layered communication architectures (OSI and TCP/IP).		
Course Outcomes: - Student will be able to: - 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
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
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
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 Cicarelli, 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		

Savitribai Phule Pune University F.Y.B.Sc.(Cyber Security) Subject Code : CYS153MJ Subject : Python Programming		
Teaching Scheme 2 hours / Week	No. of Credits 2	Examination Scheme CE: 15 marks EE: 35 marks
Prerequisites: - Knowledge of procedure oriented programming language.		
Course Objectives: - - 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: - - Devise algorithms, implement, test, debug and execute programs in the Python language. - Demonstrate Python programming skills for problems that require the writing of well documented programs including use of the logical constructs of the language. - Apply the problem-solving skills using different data structures in Python. - 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
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 Packages:- Predefined Packages, User defined Packages		
Chapter 4	Object Oriented Concepts	6 hours
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. Inheritance:- Create a parent class and child class, add the __init__() function, use super() function, adding variables and functions Types of Inheritance: - Single inheritance, multilevel inheritance, multiple inheritance, hybrid inheritance, hierarchical inheritance Polymorphism: – function polymorphism and class polymorphism		
Chapter 5	Arrays and Libraries	5 hours
Concept of Array: Creating and accessing Array elements, Slicing python array, changing and adding array, element, removing python element Array Operations - Traverse, Insertion, Deletion, Search and Update Built-in Array methods Introduction to Python libraries: Statistical Analysis - NumPy, SciPy, Pandas, StatsModels Data Visualization -Matplotlib		
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 3. https://www.geeksforgeeks.org/python-programming-language/ 4. https://www.w3schools.com/python/default.asp		

Savitribai Phule Pune University F.Y.B.Sc.(Cyber Security) Cyber Security Fundamentals : (CYS154MJP) Practical Based on CYS151MJ		
Teaching Scheme 4 hours / Week	No. of Credits 2	Examination Scheme CE: 15 marks EE: 35 marks
Course Objectives: - • 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: - 1. Understand and explore the basics of Computer Networks and Various Protocols 2. 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 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 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 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. 1. Install and configure endpoint security solutions on different operating systems. 2. Conduct malware analysis on a provided sample and propose mitigation strategies. 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 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.

Savitribai Phule Pune University F.Y.B.Sc.(Cyber Security) Computer Networks : (CYS155MJP) Practical Based on CYS152MJ		
Teaching Scheme 4 hours / Week	No. of Credits 2	Examination Scheme CE: 15 marks EE: 35 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 Hall India, 4th Edition
4. Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud” William Stallings Publisher: Addison-Wesley 2015
5. William Stallings, Cryptography and Network Security: Principles and Standards, Prentice Hall India, 3rd Edition, 2003

Savitribai Phule Pune University F.Y. B.Sc.(Cyber Security) Practical course based on CYS153MJ Python Programming (CYS156 MJP)		
Teaching Scheme 4 hours / week	No. of Credits 2	Examination Scheme CE: 15 Marks EE: 35 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)

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

Savitribai Phule Pune University F.Y. B.Sc.(Cyber Security) SEC151CYS- Statistical Methods-I		
Teaching Scheme 4 hours / week	No. of Credits 2	Examination Scheme CE: 15 Marks EE: 35 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, Third Edition

E-Books and Online Learning Material

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