SAVITRIBAI PHULE PUNE UNIVERSITY

PUNECHOICE BASED CREDIT SYSTEM

For

B.Sc.

(Cyber and Digital Science)

(Implemented from June 2024)

Savitribai Phule Pune University

B. Sc.(Cyber and Digital Science)

(To be implemented from Academic year 2024-2025)

1. **Name of Program:** Cyber and Digital Science

2. **Introduction:**

Digital and Cyber Forensics is a niche subject of modern studies which shall prepare students for professional work in business and industry, as well as government and law enforcement. Since Cybercrime has been on the rise in recent years, this course offers a special impetus and an excellent launch pad for those who are interested in becoming professionals' crime-fighters with rewarding career options.

Digital infrastructures and information networks have become crucial in any business activity. The information residing on these computers, networks, and in the cloud is a critical asset and should be secured. The impact of data loss or any downtime of the infrastructure is quite high. Hence, there is a need for heightened security measures to protect both infrastructure and data. The student shall learn the techniques to collect, preserve, analyze, and report digital evidence. It also opens a new avenue for research opportunities into forensics and security issues.

In the information era, digital technologies have opened up immense possibilities for economic and social change that is inclusive and sustainable. Designing and deploying digital technologies, analyzing human-computer interaction or big data will produce technological expertise as well as a nuanced understanding of the social, cultural, and economic aspects of the digital society. Students will gain insights into the design of digital technologies, and the policy challenges of deploying such technologies, with a broad-based training that will draw from computer science, engineering, research methods, management, economics and other social sciences, which will equip them with a rigorous

understanding of technologies for development and the development of technologies.

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 strengthen the basics of the subject useful in selecting various career options.
- To make students aware of cybercrime and learn ways to handle them.
- To produce entrepreneurs who can work in the area of Cyber and Digital Forensics.

4. Eligibility:

- Higher secondary school certificate (10+2) or its equivalent examination withEnglish

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 a vocational subject of +2 level(MCVC)

PO No.	PO Outcomes
PO 1	Recognize and be comfortable with Linux administration, as it is important in modern IT environment.
PO 2	Acknowledge and implement action the modern IT world's needs in cyber security
PO 3	Develop creative skills, critical thinking , analytical skills and research to address the real world problems using cyber security skills.
PO 4	Understand the Concepts of cyber security, Networking, Digital Forensics and vulnerability testing and statistical techniques
PO 5	Applying the Concepts of Digital Communication, IOT and Digital Image Processing
PO 6	Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation
PO 7	Learn needful programming languages such as C, Python,
PO 8	Establishing together cyber laws and cyber policies in order to comprehend the rules and regulations of the present IT environment
PO 9	To developing regulations and tactics for cyber security
PO 10	Applications, data, and cloud-based infrastructure are all safeguarded through cloud security.
PO 11	Understand security concepts including cyber threat intelligence, Block chain in cyber security, communication systems security, malware analysis, VAPT, IDS & IPS, and reporting of cybercrimes.

Savitribai Phule Pune University Structure of UG Program as per NEP-2020 Name of Program: - BSc (Cyber and Digital Science) Major Course:- Cyber and Digital Science

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	CDS101MJ	Linux System Administration	2		2		15	35	50
Subject 2	CDS102MJ	Fundamental of C programming	2		2		15	35	50
Subject 3	CDS103MJ	Fundamentals of Computer	2		2		15	35	50
Subject1 Practical	CDS104MJP	Practical based on CDS101MJ		2		4	15	35	50
Subject 2 Practical	CDS105MJP	Practical based on CDS102MJ		2		4	15	35	50
Subject3 Practical	CDS106MJP	Practical based on CDS103MJ		2		4	15	35	50
IKS	CDS101IKS	Computing in ancient India	2		2		15	35	50
GE/OE	OE101CDS	Office Automation/ Introduction to Google Tools	2		2		15	35	50
SEC	SEC101CDS	Fundamentals of Digital Communication (Practical)		2		4	15	35	50
AEC	AEC101MAR/HIN	MIL-I(Hindi) / MIL-I(Marathi)	2		2		15	35	50
VEC	VEC101ENV	EVS-I	2		2		15	35	50
CC	CC101PE/NSS/NCC	University Basket					15	35	50
TOTAL			14	08	16	12			

Level:- 4.5 (First Year) Sem:-II

Course Type	Course Code	Course Code	Course Title		Teaching Scheme Hr/Wee k		Evaluation Scheme andMax Marks		
			TH	PR	TH	PR	CE	EE	Total
Subject 1	CDS151MJ	Fundamentals of Cyber security	2		2		15	35	50
Subject 2	CDS152MJ	Network Security	2		2		15	35	50
Subject 3	CDS153MJ	Python Programming	2		2		15	35	50
Subject 1 Practical	CDS154MJP	Practical based on CDS151MJ		2		4	15	35	50
Subject 2 Practical	CDS155MJP	Practical based on CDS152MJ		2		4	15	35	50
Subject 3 Practical	CDS156MJP	Practical based on CDS153MJ		2		4	15	35	50
GE/OE	OE152CDSP	Office Automation/ Introduction to Google Tools		2		4	15	35	50
SEC	SEC151CDS	Statistical techniques forComputer Science **OR** Advance Excel		2		4	15	35	50
AEC	AEC151MAR/ HIN	MI L-I(Hindi) / MIL-I(Marathi)	2				15	35	50
VEC	VEC151ENV	EVS-II	2		2		15	35	50
CC	CC151PE/NSS/ NCC	University Basket	2				15	35	50
TOTAL			12	10	8	20			

Course Type	Course Code	Course Code	Course Title		Teaching Scheme Hr Week		Evaluation /Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (6+2)	CDS201MJ	Ethical Hacking-I	2		2		15	35	50
	CDS202MJ	Cyber Ethics, Cyber Law & Cyber Policies	2		2		15	35	50
	CDS203MJ	Advance Network Security	2		2		15	35	50
	CDS204MJP	Practical based on CDS201MJ		2		4	15	35	50
VSC(2)	CDS221VSC	Data Structure using Python	2		2		15	35	50
FP/OJT/ CEP(2)	CDS231FP	Mini Projects based on CDS201MJ		2		4	15	35	50
Minor (2+2)	CDS241MN	Web Technology	2		2		15	35	50
	CDS242MNP	Practical based on CDS241MN		2		4	15	35	50
GE/OE (2)	OE201CDS	University Basket	2		2		15	35	50
AEC(2)	AEC201ENG	Principles of OS	2		2		15	35	50
CC(2)	CC201PE/NSS/NCC	University Basket	2				15	35	50
TOTAL			16	06	12	16			

Level:-5.0(Second Year)Sem:-IV

Course Type	Course Code	Course Code	Course Title		Teaching Scheme Hr Week		Evaluation /Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (6+2)	CDS251MJ	Ethical Hacking-II	2		2		15	35	50
	CDS252MJ	Cloud Security	2		2		15	35	50
	CDS253MJ	Database Management System	2		2		15	35	50
	CDS254MJP	Practical based on CDS251MJ		2		4	15	35	50
FP/OJT/ CEP(2)	CDS281FP	Mini Projects based on CDS251MJ		2		4	15	35	50
Minor (2+2)	CDS291MN	Advanced Web Technology	2		2		15	35	50
	CDS292MNP	Practical based on CDS291MN		2		4	15	35	50
GE/OE (2)	OE251CDS	University Basket		2		4	15	35	50
SEC(2)	SEC251CDSP	Business Communication		2		4			
AEC(2)	AEC251ENG	NO SQL database(Mongo DB)	2		2		15	35	50
CC(2)	CC251PE/NSS/NCC	University Basket	2		2		15	35	50
TOTAL			12	10	12	20			

Course Type	Course Code	Course Code	Course Title		Teaching Scheme Hr Week		Evaluation /Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (6+4)	CDS301MJ	Digital Forensic-I	2		2		15	35	50
	CDS302MJ	Malware Analysis	2		2		15	35	50
	CDS303MJ	Cyber Threat Intelligence	2		2		15	35	50
	CDS304MJP	Practical based on CDS301MJ		2		4	15	35	50
	CDS305MJP	Practical based on CDS302MJ		2		4	15	35	50
Major Elective (2+2)	CDS306MJ	Block chain	2		2		15	35	50
	CDS307MJP	Practical based on CDS306MJ		2		4	15	35	50
	OR								
	CDS308MJ	Mobile Forensic	2		2		15	35	50
	CDS309MJP	Practical based on CDS308MJ		2		4	15	35	50
VSC(2)	CDS321VSCP	Statistical Method-II		2		4	15	35	50
FP/OJT/ CEP(2)	CDS331FP	Project		2		4	15	35	50
Minor (2+2)	CDS341MN	Internet Of Things	2		2		15	35	50
	CDS342MNP	Practical Based on CDS341MN		2		4	15	35	50
TOTAL			10	12	10	24			

Level:-5.5(Third Year)Sem:-VI

Course Type	Course Code	Course Code	Course Title		Teaching Scheme Hr Week		Evaluation /Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (6+4)	CDS351MJ	Digital Forensic-II	2		2		15	35	50
	CDS352MJ	IOT Security	2		2		15	35	50
	CDS353MJ	Cyber Crime& Reports	2		2		15	35	50
	CDS354MJP	Practical Based on CDS351MJ		2		4	15	35	50
	CDS355MJP	Practical Based on CDS352MJ		2		4	15	35	50
Major Elective (2+2)	CDS356MJ	Vulnerability Assessment& Penetration Testing	2		2		15	35	50
	CDS357MJP	Practical Based on CDS356MJ		2		4	15	35	50
	OR								
	CDS358MJ	Fin-Tech Cyber Security	2		2		15	35	50
	CDS359MJP	Practical Based on CDS358MJ		2		4	15	35	50
FP/OJT/ CEP(2)	CDS381OJT	Hands on Training Project		4		8	30	70	100
Minor (2+2)	CDS391MN	AI and Machine Learning	2		2		15	35	50
	CDS392MNP	Practical Based on CDS391MN		2		4	15	35	50
TOTAL			10	12	10	24			

Level:-6.0(FourthYear)Sem:-VII(Honors)

urse Type	Course Code	Course Code	Course Title		Teaching Scheme Hr Week		Evaluation /Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (10+4)	CDS401MJ	Malware Analysis II	2		2		15	35	50
	CDS402MJ	Intrusion Detection and Prevention System	2		2		15	35	50
	CDS403MJ	Digital Image Processing	2		2		15	35	50
	CDS404MJP	Practical Based on CDS401MJ		2		4	15	35	50
	CDS405MJP	Practical Based on CDS402MJ		2		4	15	35	50
	CDS406MJ	Cyber Crime Investigation	2		2		15	35	50
	CDS407MJ	Cyber Threat Intelligence II	2		2		15	35	50
Major Elective (2+2)	CDS408MJ	Digital Payments and Its Security	2		2		15	35	50
	CDS409MJP	Practical Based on CDS408MJ		2		4	15	35	50
	OR								
	CDS410MJ	Wireless Security	2		2		15	35	50
	CDS411MJP	Practical Based on CDS410MJ		2		4	15	35	50
	OR								
	CDS412MJ	IT Act 2000 in Cyberspace	2		2		15	35	50
	CDS413MJP	Practical Based on CDS412MJ		2		4	15	35	50
Minor(4)	CDS441MN	Research Methodology	4		4		30	70	100
TOTAL			16	06	16	12			

Level:-6.0(Fourth Year)Sem:-VIII(Honors)

Course Type	Course Code	Course Code	Course Title		Teaching Scheme Hr Week		Evaluation /Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (10+4)	CDS451MJ	Mobile Application And Services	2		2		15	35	50
	CDS452MJ	Incident Handling	2		2		15	35	50
	CDS453MJ	Cyber Security Architecture	2		2		15	35	50
	CDS454MJP	Practical Based on CDS451MJ		2		4	15	35	50
	CDS455MJP	Practical Based on CDS452MJ		2		4	15	35	50
	CDS456MJ	Introduction to Hardware Security	2		2		15	35	50
	CDS457MJ	IT Security Strategy Planning and Leadership	2		2		15	35	50
Major Elective (2+2)	tCDS458MJ	Dark web and Cyber warfare	2		2		15	35	50
	CDS459MJP	Practical Based on CDS458MJ		2		4	15	35	50
	OR								
	CDS460MJ	DecSecOps	2		2		15	35	50
	CDS461MJP	Practical Based on CDS460MJ		2		4	15	35	50
	OR								
	CDS462MJ	Tools and Technology for Cyber Security	2		2		15	35	50
	CDS463MJP	Practical Based on		2		4	15	35	50
FP/OJT/CEP(4)	CDS481OJT	OJT		4		4	30	70	100
TOTAL			12	10	12	16			

Level:-6.0(FourthYear)Sem:-VII(Research)

Course Type	**Course Code**	**Course Code**	**Course Title**		**Teaching Scheme Hr Week**		**Evaluation /Scheme and Max Marks**		
			TH	PR	TH	PR	CE	EE	Total
Major Core (10+4)	CDS401MJ	Malware Analysis II	2		2		15	35	50
	CDS402MJ	Intrusion Detection and Prevention System	2		2		15	35	50
	CDS403MJ	Digital Image Processing	2		2		15	35	50
	CDS404MJP	Practical Based on CDS401MJ		2		4	15	35	50
	CDS405MJP	Practical Based on CDS402MJ		2		4	15	35	50
Major Elecetive (2+2)	CDS406MJ	Digital Payments and Its Security	2		2		15	35	50
	CDS407MJP	Practical Based on CDS406MJ		2		4	15	35	50
	OR								
	CDS408MJ	Wireless Security	2		2		15	35	50
	CDS409MJP	Practical Based on CDS408MJ		2		4	15	35	50
	OR								
	CDS410MJ	IT Act 2000 in Cyberspace	2		2		15	35	50
	CDS411MJP	Practical Based on CDS410MJ		2		4	15	35	50
FP/OJT/ CEP/RP(4)	CDS431RP	Research Project		4		8	30	70	100
Minor (4)	CDS451MN	Research Methodology	4		4		30	70	100
TOTAL			12	10	12	20			

Level:-6.0(Fourth Year)Sem:-VIII(Research)

Course Type	**Course Code**	**Course Code**	**Course Title**		**Teaching Scheme Hr Week**		**Evaluation /Scheme and Max Marks**		
			TH	PR	TH	PR	CE	EE	Total
Major Core (10+4)	CDS451MJ	Mobile Application And Services	2		2		15	35	50
	CDS452MJ	Incident Handling	2		2		15	35	50
	CDS453MJ	Cyber Security Architecture	2		2		15	35	50
	CDS454MJP	Practical Based on CDS451MJ		2		4	15	35	50
	CDS455MJP	Practical Based on CDS452MJ		2		4	15	35	50
Major Elective (2+2)	CDS456MJ	Dark web and Cyber warfare	2		2		15	35	50
	CDS457MJP	Practical Based on CDS456MJ		2		4	15	35	50
	OR								
	CDS458MJ	DecSecOps	2		2		15	35	50
	CDS459MJP	Practical Based on CDS458MJ		2		4	15	35	50
	OR								
	CDS460MJ	Tools and Technology for Cyber Security	2		2		15	35	50
	CDS461MJP	Practical Based on CDS460MJ		2		4	15	35	50
FP/OJT/ CEP(8)	CDS481FP	Research Project		8		16	30	70	100
TOTAL			08	14	08	28			

Savitribai Phule Pune University
F.Y.B.Sc.(Cyber and Digital Science)

Subject Code : CDS101MJ
Subject :Linux System Administration

Teaching Scheme	No. of Credits	Examination Scheme
2 hours / week	2	CE: 15 marks EE: 35 marks

Prerequisites

1. Familiarity with the terminal, shell, and command line interface

Course Objectives: -

- To make the students understand the Linux OS
- To acquaint them with the basic utilities of Linux
- To help them manage a network using Linux OS

Course Outcomes: - Student will be able to: -

1. Demonstrate proficiency using the Linux command line and constructing shell scripts.
2. Perform maintenance tasks, including user and system management.
3. Install and configure system services.
4. To install and implement Linux Operating Systems across the network.
5. To manage and handle file permissions and other security aspects.

Course Contents

Chapter 1	**Introduction to Linux System Administration**	**6 hours**

Overview of Linux Operating System.
Role of a Linux System Administrator.
Understanding the Linux File System.
Basic Shell Commands and Navigation.

Chapter 2	**Installation and Configuration**	**7 hours**

Linux Installation Methods.
Partitioning and File System Setup.
User and Group Management.
Network Configuration and
Troubleshooting.

Chapter 3	**Control Statements and Functions**	**6 hours**

Package Management with APT and YUM.
Kernel Updates and System Reboots.
Log File Analysis and Troubleshooting.
Monitoring System Performance.

Chapter 4	Security and Access Control	5 hours
User Authentication with PAM. Firewalls and IP tables. Secure Shell (SSH) Configuration. Implementing SE Linux/App Armor for Mandatory Access Control.		
Chapter 5	**Advanced Topics in Linux Administration**	**5 hours**
Automated Task Scheduling with Cron. Virtualization and Containerization (e.g. Docker). File and Directory Permissions. Backup and Recovery Strategies.		

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/
2. Linux Programming and Scripting: https://archive.nptel.ac.in/courses/117/106/117106113/

CDS-102MJ : Fundamentals of C Programming

Teaching Scheme2 Lectures / week	No. of Credits: 2	Examination Scheme CE :15 marks EE: 35 marks

Prerequisites: None

Course Objectives: -

1. To develop the basic concepts and terminology of programming in general.
2. To implements the algorithms and program in C language
3. To develop programming skills to a level such that problems of reasonable complexitycan be tackled successfully.

Course Outcomes: - Student will be able to :-

1. Devise computational strategies for developing applications
2. Develop applications (Simple to Complex) using C programming language

Course Contents

Unit 1	C fundamentals	8 Lectures

History of 'C' language, Features of C, Structure of C Program, C Character Set, Identifiersand 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 associatively.

Unit 2	Input Output Statements	5 lectures

Input output functions:
printf, scanf functions, getchar, putchar, getch functions, gets, puts functions, Escapesequence characters, Format specifiers

Unit 3	Control and Iterative structures	15 Lectures

Decision making structures:- if, if-else, switch and conditional operator,
Loop controlstructures:- while ,do while, for, Use of break and continue,
Nested structures, Unconditional branching (goto statement).

Unit 4	Functions	16 Lectures

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.

Unit 5	Arrays	16 Lectures

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

Reference Books:

1. C: the Complete Reference, Schildt Herbert, 4th edition, McGraw Hill
2. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard
    a. 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, 3rdedition, 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 and Digital Science)
Subject Code : CDS103MJ

Subject : Fundamentals of Computers

Teaching Scheme	No. of Credits	Examination Scheme
2 hours / week	2	CE :15 marks EE: 35 marks

Prerequisites

Course Objectives: -

- To study the basics of Computer System
- To learn how to configure computer devices
- To Learn Basic Commands of Operating system and application software

Course Outcomes: -

On completion of the course**, student will be able to–**

- Learn the fundamental concepts of computer science.
- Develop the logic of problem solving.
- Explain the needs of hardware and software required for a computation task.

Course Contents

Chapter 1	**Introduction to Computers**	**8 hours**

Introduction, Characteristics of Computers, Block diagram of computer
Types of computers and features- Mini Computers, Micro Computers, Mainframe Computers, Super Computers, Laptops and Tablets
Types of Programming Languages- Machine Languages, Assembly Languages, High Level Languages
Translators- Assembler, Compiler, Interpreter Data Organization- Drives, Files, Directories

Chapter 2	**Introduction to Computer Peripherals**	**7 hours**

Primary And Secondary storage devices
Primary storage devices – RAM, ROM, PROM, EPROM
Secondary Storage Devices - CD, HD, Pen drive
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
Dos – History Files and Directories Internal and External Commands Batch Files Types of O.S.		
Chapter 4	**Internet Network**	**4 hours**
Network definition Common terminologies: LAN, WAN, Node, Host, Workstation, bandwidth, Interoperability, Network administrator, network security Network Components: Severs, Clients, Communication Media Types of network: Peer to Peer, Clients Server		
Chapter 5	**Introduction to Problem Solving**	**6 hours**
Concept: problem solving Problem solving techniques (Trial & Error, Brainstorming, Divide & Conquer) Steps in problem solving (Define Problem, Analyze Problem, Explore Solution) Algorithms and Flowcharts (Definitions, Symbols) Characteristics of an algorithm Simple Arithmetic Problems		

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 Tennenbum Tata MacGrow Hill Publication
4. How to solve it by Computer – R. G. Dromy
5. Introduction to algorithms – Cormen, Leiserson, Rivest, Stein

E-Books and Online Learning Material

https://www.geeksforgeeks.org/computer-fundamentals-tutorial/
https://www.javatpoint.com/computer-fundamaentals

Savitribai Phule Pune University
F.Y.B.Sc.(Cyber and Digital Science)
Practical based on CDS 101MJ
Linux System Administration(CDS104MJP)

Teaching Scheme	No. of Credits	Examination Scheme
4 hours / week	2	CE: 15 marks EE: 35 marks

Prerequisites

1. **Problem solving with Python**

Course Objectives: -

- To analyze fundamentals of the Linux operating system.
- To analyses a problem and devise an algorithm to solve it.

Course Outcomes: - Student will be able to: -

- Implement and administer a Linux Server.
- Setup and manage policies.
- Implement File Services.

Course Contents

Linux System Administration

Assignment 1: Introduction to Linux System Administration

1. Install a Linux distribution of your choice.
2. Explore and explain the file system hierarchy using basic shell Commands.
3. Create a new user and group, demonstrating user and group management.

Assignment 2: Installation and Configuration

1. Choose a different Linux installation method than in Question 1.
2. Perform a manual partitioning and file system setup during the installation.
3. Configure network settings and troubleshoot any connectivity issues.

Assignment 3: System Maintenance and Updates

1. Use APT or YUM to install, update, and remove packages on your system.
2. Analyze system logs to troubleshoot a specific issue (e.g., networking, package installation).
3. Monitor system performance using tools like top or htop.

Assignment 4: Security and Access Control

1. Configure user authentication using PAM. Implement firewall rules using IP tables.
2. Secure SSH by modifying its configuration file.
3. Implement either SE Linux or App Armor for Mandatory Access Control.

Assignment 5: Advanced Topics in Linux Administration

1. Schedule automated tasks using Cron.
2. Install and run a Docker container, explaining the basics of containerization.
3. Set up file and directory permissions for a specific scenario.

Assignment 6: Installation and Configuration

1. Choose a different Linux distribution than in Question 2.
2. Perform an advanced partitioning scheme, including separate partitions for /, /home, and swap.Implement user and group quotas on specific directories to manage disk space usage.

Assignment 7: System Maintenance and Updates

1. Explore and demonstrate the process of upgrading the Linux kernel.
2. Analyze logs to identify and troubleshoot issues related to kernel updates.
3. Use performance monitoring tools to identify and rectify a performance bottleneck on the system

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, PeterLieverdink,publisher(s): Apress, 2009,ISBN: 1430219130,9781430219132.
3. The Complete Guide to Linux System Administration by James S Walker, Released December 1,2004
4. Publisher(s):Course Technology Inc,ISBN: 0619216166,9780619216160

Savitribai Phule Pune University
F.Y.B.Sc.(Cyber and Digital Science) Title:
Practical based on CDS 102MJ
Fundamentals of C Programming (CDS105MJP)

Teaching Scheme4 hours / week	No. of Credits2	Examination Scheme CE: 15 marks EE: 35 marks

Course Objectives: -

1. To analyze fundamentals of the Basic C Programming.
2. To learn flow chart and algorithms
3. To develop the basic concepts and terminology of programming in general.

Course Outcomes: - Student will be able to: -

1. Explore algorithmic approaches to problem solving
2. Develop modular programs using control structures and arrays in 'C'.

Practical 1*:*Use of data types, simple operators(expressions)

1. Accept temperatures in Fahrenheit(F)and print it in Celsius(C)and Kelvin (K)(Hint: C=5/9(F-32),K=C+273.15)
2. Accept initial velocity(u),acceleration(a)and time(t).Print the final velocity (v)and the distance (s) travelled. (Hint: $v = u + at$, $s = u + at^2$)
3. To calculate the area of square, rectangle, circle.
4. Accept two numbers and print arithmetic and harmonic mean of the two numbers(Hint:AM= (a+b)/2 , HM = ab/(a+b))
5. Accept three dimensions length (l), breadth(b) and height(h) of a cuboid andprint surface area and volume (Hint : surface area=2(lb+lh+bh), volume = lbh)

Practical 2*:*Use of decision making statements (if and if-else, nested structures)

1. Write a program to accept an integer and check if it is even or odd.
2. To find the maximum of two numbers and minimum of three numbers.
3. Writeaprogramtoacceptthreenumbersandcheckwhetherthefirstisbetween the other two numbers. Ex: Input 20 10 30. Output: 20 is between 10 and 30
4. Accept a character as input and check whether he character is a digit.(Check if it isin the range '0' to '9' both inclusive)
5. Writeaprogramtoacceptanumberandcheckifitisdivisibleby5and7.

Practical 3:Use of decision making statements (switch case)

1. Accept a single digit from the user and display it in words. For example, if digitentered is 9, display Nine.
2. Write a program, which accepts two integers and an operator as a character (+ - * /), performs the corresponding operation and displays the result.
3. Accept radius from the user and write a program having menu with the followingoptions and corresponding actions

	Actions
1.AreaofCircle	Compute area of circle and print
2.Circumferenceof Circle	Compute Circumference of circle and print
3.Volumeof Sphere	Compute Volume of Sphere and print

Practical 4:Use of simple loops, nested loops

1. Write a program that accepts a number and prints its first digit. Refer sample code1given above. Execute the program for different values.
2. Write a program that accepts numbers continuously as long as the number is positiveandprintsthesumofthenumbersread.Refersamplecode2given above. Execute the program for different values.
3. Write a program to accept n and display its multiplication table. Refer to samplecode3given above.
4. Writeaprogramtodisplayallprimenumbersbetween1andn.(n from user).

Practical 5:Use of standard library functions and menu driven programs

1. Write a program, which accepts a character from the user and checks if it is an alphabet, digit or punctuation symbol. If it is an alphabet, check if It is uppercase or lowercase and then change the case.
2. Write a menu driven program to perform the following operations till the user selects Exit.
   Acceptappropriatedataforeachoption.Usestandardlibraryfunctionsfrommath.h
   i. Sine ii. Cosine iii. Logic .e^x v. Square Root vi. Exit
3. Accept two complex numbers from the user (real part, imaginary part).Write amenu driven program to perform the following operations till the user selects Exit.
   i. ADD ii. SUBTRACT iii. MULTIPLY iv. EXIT

Practical 6:Use of user defined and recursive functions)

1. Write a function is Even, which accepts an integer as parameter and returns 1ifthenumberiseven, and 0otherwise. Use this function in main to accept n numbers and check if they are even or odd.
2. Write a function, which accepts a character and integer n as parameter and displays the next n characters.
3. Write are cursive C function to calculate the GCD of two numbers.
4. Write a recursive C function to calculate the factorial of the number.

Practical 7:Use of arrays(1-darrays)and functions

1. Write a program to accept n numbers in an array and calculate the average
2. Write a program to accept n numbers in an array and sort the array.
3. Write a program to accept n numbers in the range of 1 to 25 and count thefrequency of occurrence of each number.

Practical 8: Use of multidimensional array(2-darrays)and functions

1. Write a program to accept a matrix A of size m X n and store its transpose in matrix B. Display matrix B. Write separate functions.
2. Write a program to add and multiply two matrices. Write separate functions to accept, display, add and multiply the matrices. Perform necessary checks beforeadding and multiplying the matrices.

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, 3rdedition, Schaum's outline Series, TataMcGraw Hill.
6. Programming in ANSI C, E. Balagurusamy, 7th Edition, McGraw Hill.

Savitribai Phule Pune University
F.Y.B.Sc.(Cyber and Digital Science)
Title: Practical based on CDS 103MJ

Fundamentals of Computers (CDS106MJP)

Teaching Scheme	No. of Credits	Examination Scheme
4 hours / week	2	CE: 15 marks EE: 35 marks

Course Objectives: -

1) To Know the Basics of Computers.
2) To Understand the Basics of Operating systems

Course Outcomes: - Student will be able to: -

1. Learn the fundamental concepts of computer science.
2. Develop the logic of problem solving

List of Sample practical's: Fundamentals of Computers

1. Write down the steps of installing Windows Operating System.
2. Write down the steps of installing Linux Operating System.
3. Write down the steps of creating a new file in Windows Operating System.
4. Write down the steps of creating a new file in Linux Operating System
5. Write down the steps for User Account and Group Management in Linux Operating System.
6. Write down the steps for User Account and Group Management in Windows Operating System.
7. Write down the steps to Hide the file and unhide the file in Windows Operating System.
8. File and folder management in Linux.
9. File and folder management in Windows.
10. Working with any five commands in 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. Write the steps to Assigning IP address to the PC and Connect to the computer.
16. Write the steps to connect the computer in Local Area Network.

17. Write the steps How to connect a network printer in Windows.

18. Write the steps How to setting to Local Area Network proxy Server.

Reference Books:

1. Fundamental of Computers – By V. Rajaraman B.P.B. Publications
2. Fundamental of Computers – By P. K. Sinha
3. Computer Today- By Suresh Basandra
4. Unix Concepts and Application – By Sumitabha Das
5. Computer Networks – By Tennenbum Tata MacGrow Hill Publication

Savitribai Phule Pune University F.Y. B.Sc.(Cyber and Digital Science) Subject Code : CDS101IKS Subject : Computing in Ancient India		
Teaching Scheme 2 hours / week	No. of Credits 2	Examination Scheme CE :15 marks EE: 35 marks

- **Title of the Paper:** Computing in Ancient India
- **Subject Code: IKS**
- **Number of Credits:** 2
- **Total number of Student Contact Hours:** 30 hours
- **Session Duration:** 1 Hour
- **Pre-requisites**:
  - None
- **Objectives:**
  - Discuss the rich heritage of mathematical temper of Ancient India
  - Promote joyful learning of HISTORY
- **Contents:**

Unit No	Unit Contents	Total No of Lectures	Text Books
1	Introduction and Overview of Ancient Science	**5**	**T1**
2	Binary numbers in Indian Antiquity	**8**	**T1**
3	The Katapayadi formula and modern hashingtechnique	**8**	**T1**
4	Panian Grammar and Formal language structures in theory and Indian logic	**8**	**T1**
5	Planets in Vedic Literature	**1**	**T1**

- **Outcomes:**

With successful completion of this course, students will:

1. Improved critical thinking
2. New learning from Ancient India

- **Textbooks:**

1. T.R.N. Rao, Subhash Kak, *Computing in Ancient India*, The Centre for Advanced ComputerStudies, University of Southwestern Louisiana, 1998, ISBN 0-9666512-0-0

Savitribai Phule Pune University

BSc(Cyber and Digital Science)

Skill Enhancement Course

SEC 101 CDS Fundamentals of Digital Communication (Practical)

Teaching Scheme	No. of Credits	Examination Scheme
Practical:4 hours / week	2	CA: 15 marks UA: 35 marks

Prerequisite: Students are expected to know the concepts studied in following course:

1. Analogue and Digital Communication
2. Electronics Devices and circuits
3. Mobile communication

Course Objectives:

- To make the student familiar with electronic components
- To learn the steps in electronic circuits through simulation and hardware implementation.
- To learn about various wireless & cellular communication networks.
- To make students familiar with mathematical interpretation related to the fundamentals of analog and digital communication systems.
- To impart knowledge regarding concepts of AM, FM modulation and detection.

Course Outcomes:

- 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.
- To solve problems on Number systems and their representation
- To familiarize with logic gates and applications in combinational and sequential circuits.
- To identify the importance of different blocks in electronic communication systems.
- Understand the working principles of mobile networks and Contrast different types of telecommunication networks.

Title: SEC 101 CDS Fundamentals of Digital Communication

Assignment : 1 Introduction to Basic components of Electronics.

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

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.

Assignments :4 Study of Half Adder and Full Adder using Logic Gates.

1. Combinational Circuits :Implementation of half adder, full adder

Assignment :5 Study of Decimal to BCD/ (Binary) Converter.

1. Number Systems: Decimal, Binary, Octal, Hexadecimal, Binary Coded Decimal number,inter-conversions.

Assignment :6 Study of read and write action of RAM

1. Introduction to memory, types Volatile , non volatile , RAM, ROM, Implementation of RAM

Assignment:7 Study of Amplitude Modulation

1. Elements of Communication system, Types of communication: simplex, half duplex, full duplex, baseband and broadband, Serial communication: asynchronous and synchronous, Modulation ,types(AM)

Assignment:8 Study of Pulse code Modulation

1. Need of modulation and demodulation, Digital Modulation technique-PCM.

Assignment :9 Error detection and correction using Hamming Code

1. Error detection, Error correction methods, hamming code, limitation

Assignment :10 Study of Mobile hardware (Study Experiment)

1. Basic block diagram of mobile hardware, applications of each block

Assignment :11 Mobile communication(GSM)(Study Experiment)

1. Basic cellular systems, cells, Concept of frequency reuse channels, Handoff GSMsystem architecture

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 Saha, 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

Semester -II

Savitribai Phule Pune University
F.Y.B.Sc.(Cyber and Digital Science)
Subject Code : CDS151MJ

Subject :Fundamentals of Cyber Security

Teaching Scheme	No. of Credits 2	Examination Scheme
2 hours / week		CE: 15 marks EE: 35 marks

Prerequisites

1. **Computers Basics**
2. **Basics of networking**

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: -

- Analyze and evaluate the cyber security needs of an organization.
- Measure the performance and troubleshoot cyber security systems.
- To introduce the current cyber related activities

Course Contents

Chapter 1	**Introduction to Cybersecurity**	**5 hours**

Overview of Cybersecurity
Definition and significance of cyber securityEvolution and historical context of cyber security
Cyber Threat Landscape
Understanding the current threat landscape
Types of cyber threats: malware, phishing, ransomware, etc.
Key Principles of Cybersecurity
Confidentiality, integrity, availability (CIA Triad)Defense-in-depth and layered security
Risk Management in Cybersecurity
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 cybersecurity

Chapter 2	Basics of Networking and Security	8 hours

Networking Fundamentals
Introduction to networking concepts Basics of TCP/IP and network protocols
Common Network Attacks
Types of network attacks: eavesdropping, man-in-the-middle, DoSReal-world examples and case studies
Network Security Technologies
Firewalls, intrusion detection/prevention systems (IDS/IPS)Virtual Private Networks (VPNs) for secure communication
Wireless Network Security
Risks associated with wireless networks
Securing Wi-Fi networks against unauthorized access
Securing Network Devices
Best practices for securing routers, switches, and other devicesImplementing access controls and monitoring

Chapter 3	Operating System Security	8 hours

Basics of Operating System Security Key security features in operating systems User account management and access controls
Patch Management
Importance of software updates
Strategies for effective patch management
Antivirus and Anti-malware Protection
Role of antivirus software in Cybersecurity Evaluating and selecting antivirus solutions
Encryption and Secure Boot
Securing data through encryption Ensuring a secure boot process
Endpoint Security

Chapter 4	Web Security	5 hours

Web Application Security Basics
Common vulnerabilities in web applicationsBest practices for secure coding
Secure Web Browsing
Safe browsing habits and precautions
Recognizing and avoiding phishing attacks
HTTPS and SSL/TLS
Importance of encrypted communication on the web
Configuring and implementing SSL/TLS for websites

Web Security Tools and Testing

Introduction to web security tools (e.g., OWASP ZAP)

Conducting security assessments and penetration testing

Web Security Policies and Compliance

Developing and enforcing web security policies

Compliance with industry standards (e.g., PCI DSS)

Chapter 5	**Security Best Practices and Emerging Trends**	**4 hours**

Security Awareness and Training

Importance of cybersecurity education

Creating a security-aware organizational culture

Incident Response and Management

Developing an incident response plan

Conducting incident response exercises and simulations

Cloud Security Fundamentals

Understanding security considerations in cloud environments

Shared responsibility model and best practices

Threat Intelligence and Information Sharing

Role of threat intelligence in cyber security

Participating in information sharing communities

Future Trends in Cybersecurity

Exploring emerging technologies and challenges

Continuous learning and adapting to evolving threats

Reference Books:

1. Computer Security Basics by 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.

CDS-152 MJ : Network Security		
Teaching Scheme 2 Lectures / week	**No. of Credits:2**	**Examination Scheme** CE :15 marks EE: 35 marks

Prerequisites: Computer Fundamentals and Networking

Course Objectives: -

1. To prepare students with basic networking concept.
2. To understand process of data communication using protocols and standards
3. To learn various topologies and applications of network.
4. 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.

Course Contents

Unit 1	**Network Fundamental and Security**	**Lectures 10**

Introduction to OSI Model with all layers
TCP/IP Protocol Suite

Introduction Attacks on Computers and Computer Security

1. Need for Security
2. Security Attacks (Active and Passive attacks)
3. Services and Mechanisms
4. Network Security
5. Network Security Model
6. Internet Standards and RFCs
7. Symmetric Key Cryptography
8. Introduction to Modern Symmetric Key Ciphers- DES, Blowfish, IDEA, AES, RC5,
9. Modes of operation of Modern Symmetric Key Ciphers
10. Asymmetric Key Cryptography – RSA
11. Digital signatures and Digital Certificates
12. Certificate Authority and key management Kerberos
13. X.509 Directory Authentication Service.

Unit 2	**User Authentication and security at Application and Transport Layer**	**Lectures 6**

Pretty Good Privacy (PGP) and S/MIME.

User Authentication

1. Remote User-Authentication Principles
2. Remote User-Authentication Using Symmetric Encryption
3. Remote User-Authentication Using Asymmetric Encryption

Application Layer Security:
1. Email privacy: PGP and S/MIME
2. SSL Architecture –Handshake ,Change Cipher Space, Alert And Record Protocols
3. SSL Message Formats – Transport Layer Security

Transport Level Security:
Transport Layer Security, HTTPS, Secure Shell (SSH)

Unit 3	Network Layer Security and IP Security	Lectures 8

Network Layer Security:
1. Modes – Two Security Protocols
2. Security Association
3. Security Policy
4. Internet Key Exchange
5. System Security: Description
6. Buffer Overflow And Malicious Software(Viruses and Related Threats, Virus Counter measures,)
7. Malicious Programs

IP Security:
1. Overview of IP Security (IPSec)
2. IP Security Architecture
3. Modes of Operation
4. Security Associations (SA)
5. Authentication Header (AH)
6. Encapsulating Security Payload (ESP)
7. Internet Key Exchange

Unit 5	Firewall And security in Mobile and IoT	Lectures 7

Firewalls:
1. The Need for firewalls
2. Firewall Characteristics
3. Types of Firewalls
4. Firewall Design principles
5. Trusted Systems
6. Intruders
7. Intrusion Detection Systems.
8. Firewall Biasing, Firewall location and configuration
9. Virtual Private Networks

Security In Mobile And Iot:
1. Security and Threats To SDN
2. Cloud Security
3. Security Issues and Risks
4. Data Protection
5. Security As A Service
6. Addressing Cloud Security
7. IOT
8. Security Framework

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 and Digital Science)

Subject Code: CDS153MJ
Subject: Python Programming

Teaching Scheme	No. of Credits	Examination Scheme
2 hours / week	2	CE: 15 Marks UE: 35 Marks

Prerequisites:

- Knowledge of procedure oriented programming language.

Course Objectives:

1. To define the structure and components of a Python program.
2. To acquaint with data types, input/output statements, decision making, looping and functions in Python.
3. To learn how to use Lists, Tuples, Sets and Dictionaries in Python programs.
4. To design object- oriented programs using classes in Python.

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. 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	**Fundamentals of Python Programming**	**6 hours**

Introduction to Python
Features and Applications of Python
Comments, identifiers and reserved words in Python
Data types in Python, Data type conversion
Python print function and input function
Python operators (arithmetic, comparison, assignment, bitwise, logical, Membership,identity), operator precedence
Indentation in Python
Conditional Statements, loop statements, control statements (break, continue, pass)

Chapter 2	**Built-in Data Structures in Python**	**8 hours**

Python List - concept, declaration, inserting, updating, deleting and accessing elements, built-in operators and functions, indexing and slicing elements

Python Tuple - concept, creating and accessing elements, Tuple operators and built-in Tuple functions

Python Set - concept, declaration, inserting, updating, deleting and accessing elements, Set operations

Python Dictionary - concept, declaration, inserting, updating, deleting elements and

different ways of accessing Dictionary elements, built-in functions, Dictionary properties

Python data structure conversion

Chapter 3	Strings and Arrays	6 hours

Concept of String
Types of String (Single quotes, Double quotes, Triple quotes)
Creating and accessing String
String operators
Python standard String handling functions
Concept of Array
Creating and accessing Array elements
Array Operations (Traverse, Insertion, Deletion, Search and Update)
Built-in Array methods

Chapter 4	Functions and Object Oriented Concepts	6 hours

Defining and calling function
Function arguments - required arguments, default arguments, keyword arguments, variable-length arguments
Scope of variable - basic rules
Order of arguments (positional & keyword)
void function and lambda functions
Recursion
Object oriented programming concept
Python Classes and Objects, accessing members
Python Constructor
Data hiding
Class variables, instance variables, class methods and static methods

Chapter 5	Introduction to Python modules and Libraries	4 hours

Introduction to built in modules in Python(OS, random, math, datetime, calendar, sys, collections, statistics)
Introduction to Python libraries (NumPy, Pandas, 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/

Savitribai Phule Pune University
F.Y.B.Sc.(Cyber and Digital Science)
Practical course based on CDS151MJ

Fundamentals of Cyber Security
(CDS154MJP)

Teaching Scheme	No. of Credits	Examination Scheme
4 hours / week	2	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: -

- Understand and explore the basics of Computer Networks and Various Protocols
- Administrate a network and schedule flow of information .
- Examine the network security issues in Mobile and ad hoc networks.
- Demonstrate the TCP/IP and OSI fashions with merits and demerits.
- Evaluate the shortest path by using Routing algorithms.

Course Contents

Practical Assignment 1: Network Security Basics:

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: Operating System Security

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 3: Web Security

1. Identify and fix common vulnerabilities in a web application (e.g., SQL injection, cross-sitescripting).
2. Configure SSL/TLS for a website to ensure secure communication.
3. Use web security tools like OWASP ZAP to perform security assessments.

Practical Assignment 4: Wireless Network Security

1. Secure a Wi-Fi network by implementing WPA2/WPA3 encryption.
2. Configure a wireless intrusion detection system (WIDS) to monitor wireless traffic.
3. Investigate and respond to a simulated wireless security incident.

Practical Assignment 5: Endpoint Security

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.

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 cybersecurity.

Reference Books:

1. Computer Security Basics by 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 and Digital Science)
Practical course based on CDS152MJ

Network Security (CDS155MJP)

Teaching Scheme4 hours / week	No. of Credits 2	Examination Scheme CE: 15 marks EE: 35 marks

Course Contents

Course Objectives: -

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

Course Outcomes: - Student will be able to :-

5. Understand the concept of OSI Reference Model and TCP/IP.
6. To know the components of the Network Security.
7. Understand top down approach of data communication from one user to another user
8. 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()

11. nslookup
12. telnet

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 *04 :* Study of LAN environment:

Study the concept of MAC addresses, IP addresses.

A. Find out in formation about the network in your lab and fill in details below:

1. Total Number of computers in your lab:
2. Finddetailsofany5computers:

MAC address	IPaddress	LANspeed	hostname

1. Are the IP addresses assigned to the machines statically or dynamically?
2. Does the network have a DHCP server?
3. If yes, what is the address of the server?

Assignment No 5 Router Basic Commands and Security Configuration

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

Assignment No 6 Static Routing

1. Configure Static Routing Configuration in Sample Network

Assignment No 7 Dynamic Routing using Protocols

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

Assignment No 8 Remote Management using Network Protocols

1. Configuring and Verifying TELNET and SSH

Assignment No 9 Switch Configuration

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

Assignment No 10 Data Encryption

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

Assignment No 11 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 Stallings Publisher: Addison-Wesley 2015
5. William Stallings, Cryptography and Network Security: Principles and Standards, PrenticeHall India, 3rd Edition, 2003

Savitribai Phule Pune University
F.Y. B.Sc.(Cyber and Digital Science)
Practical course based on CDS153MJ

Python Programming (CDS156 MJP)

Teaching Scheme4 hours / week	No. of Credits2	Examination Scheme CE: 15 marks EE: 35 marks

Course Contents

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.

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.

Assignment 1: Write a Python program to:

1. Get a string from a given string where all occurrences of its first character have been changed to '$', except the first character itself.

Assignment 2: Write a Python program to:

1. Change a given string to a new string where the first and last characters have been exchanged.

Assignment 3: Write a Python program to:

1. Remove the nth index character from a non-empty string.

Assignment 4: Write a Python program to:

1. Sort(ascending and descending) dictionary by value.

Assignment 5: Write a Python program to:

1. Shuffle and print a specified list.

Assignment 6: Write a Python program to:

1. Merge two python dictionaries.

Assignment 7: Write a Python program to:

1. Accept a string and calculate the number of digits, letters and other characters.

Assignment 8: Write a Python program to:

1. 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.

Assignment 10: Write a Python program to:

1. A function that generates all the factors of a number.

Assignment 11: Write a Python program to:

1. Function to find the sum of digits of a number.

Assignment 12: Write a Python program to:

1. Function to find GCD/LCM of 2 numbers.

Assignment 13: Write a Python program to:

1. Function to concatenate two strings.

Assignment 14: Write a Python program to:

1. Program to display Fibonacci series using recursion.

Assignment 15: Write a Python program to:

1. Convert decimal to binary using recursion.

Assignment 16: 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.

Assignment 17: Write a Python program to:

1. 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 18: Write a Python program to:

1. Capitalize each word in a file.

Assignment 19: Write a Python program to:

1. Delete comment lines from a file.

Assignment 20: Write a Python program to:

1. Search a word and replace with another word for all the occurrences.

Assignment 21: Write a Python program to:

1. A program to read a file in reverse order. The last sentence should be read first and continue till the first sentence is read.

Assignment 22: Write a Python program to:

1. Insert a sentence into a specified position of a file

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 and Digital Science)
Subject Code : SEC151CDS
Subject : Statistical techniques for Computer Science

Teaching Scheme	No. of Credits	Examination Scheme
2 hours / week	2	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. Install and configure system services.
4. Predict the values in correlation & regression and interpret to take decision.

Course Contents

Chapter 1	**Data Condensation and Presentation of Data**	**7 hours**

Raw data, variable, discrete variable, continuous variable, constant, attribute with illustration. Classification, 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) for discrete and continuous frequency distribution, Merits & Demerits

Median for discrete and continuous frequency distribution, Merits & Demerits

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- Absolute & Relative Measure 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 Analysis (for bivariate data)	8 hours

Concept and meaning of Correlation, Types of correlation.
Methods to study Correlation: Scatter Diagram, Karl- Pearson correlation coefficient
Numerical Problems on Correlation
Concept and meaning 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. Statistical Methods, George W. Snedecor, William G, Cochran, John Wiley &sons
2. Fundamentals of Applied Statistics (3rd Edition), Gupta and Kapoor, S.Chand and Sons, New Delhi, 1987.
3. 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/

Savitribai Phule Pune University
F.Y.B.Sc.(Cyber and Digital Science)

Subject Code : SEC151CDS
Subject : Advance Excel

Teaching Scheme	No. of Credits	Examination Scheme
2 hours / week	2	CE: 15 marks EE: 35 marks

Prerequisites

- **1.** Understanding and using the AutoFilter feature
- **2.** Knowing what a PivotTable is and how to build one

Course Objectives: -

- Acquire knowledge of data validation, conditional formatting, and charting techniques to improve data visualization.
- Develop advanced Excel skills to enhance efficiency and reduce risk in data management and analysis.

Course Outcomes: - Student will be able to: -

- Creation, management, and formatting pivot tables and pivot charts
- Students will be able to Create pivot tables and pivot charts.

Course Contents

Chapter 1	**Advanced Functions and Formulas**	**5 hours**

1. Introduction to Advanced Excel Functions*
2. Overview of advanced functions: VLOOKUP, HLOOKUP, INDEX, MATCH, OFFSET,etc.
3. Application scenarios for each function. Nested Functions and Formula Auditing*
4. Creating nested functions for complex calculations.
5. Utilizing the Formula Auditing tools for error checking and tracing.Array Formulas*
6. Understanding array formulas and their applications. Building and using array formulas for efficient data analysis.
7. Data Validation and Dynamic Lists* Implementingdata validation rules for data accuracy.
8. Creating dynamic dropdown lists for enhanced data entry.Practical Assignment: Advanced Functions*
9. Solve real-world business problems using advanced Excel functions. Design and implement formulas for data analysis and decision-making.

Chapter 2	Data Analysis and Pivot Tables	8 hours

1. Importing and Transforming DataImporting data from external sources.
2. Transforming and cleaning data using Power Query.Pivot Tables Basics*
3. Introduction to Pivot Tables and Pivot Charts. Creating basic Pivot Tables for data summarization.Advanced Pivot Table Techniques*
4. Grouping and filtering data in Pivot Tables.
5. Using calculated fields and items for custom calculations.Slicers and Timelines*
6. Creating and using slicers for interactive data analysis.Implementing timelines for date-based filtering.
7. Practical Assignment: Data Analysis with Pivot Tables* Analyze a dataset using Pivot Tables and advanced techniques.
8. Create dynamic dashboards with multiple Pivot Tables and visualizations.

Chapter 3	Advanced Data Visualization	8 hours

1. Conditional Formatting*
2. Applying advanced conditional formatting rules. Creating heatmaps and data bars for visual analysis.
3. Sparklines and Trendlines*
4. Implementing sparklines for compact data visualizations.Adding trendlines to analyze data trends.
5. Custom Charts and Graphs*
6. Creating custom charts with advanced formatting options.Combining different chart types in a single chart.
7. Power View and Power Map*
8. Introduction to Power View for interactive data exploration.Utilizing Power Map for geographical data visualization.
9. Practical Assignment: Data Visualization Project*
10. Design and implement a comprehensive data visualization project.
11. Present insights using advanced Excel charts and visualizations.

Chapter 4	Excel Automation with Macros	5 hours

1. Introduction to Macros and VBA*
2. Overview of Excel Macros and Visual Basic for Applications (VBA).Recording and editing basic macros.
3. Variables and Control Structures in VBA*Declaring and using variables in VBA.
4. Implementing control structures: loops and conditional statements.User Forms and Interactivity*
5. Creating user forms for data input.Adding interactivity to macros.
6. Error Handling and Debugging* Implementing error handling in VBA. Debugging and troubleshooting macros.
7. Practical Assignment: Macro Automation Project*
8. Develop and implement a macro to automate a specific business process.Test and debug the macro for efficiency.

Chapter 5	Advanced Excel Tips and Tricks	4 hours

1. Excel Shortcuts and Productivity Hacks*
2. Essential keyboard shortcuts for efficient Excel usage.Productivity hacks for everyday tasks.
3. Advanced Data Validation Techniques* Dynamic data validation using named ranges.
4. Creating cascading dropdown lists for complex data entry.
5. Advanced Charting Techniques* Advancedformatting options for Excel charts.
6. Creating combination charts and dual-axis charts.
7. Collaborative Editing and Review* Enabling and using track changes in Excel. Collaborative editing with multiple users. Practical Assignment: Excel Mastery Project*
8. Apply advanced Excel skills to solve a complex problem or analyze a substantial dataset.
9. Present the findings using a combination of charts, formulas, and data visualizations

Reference Books:

1. Mastering Advanced Excel, by published by BPB Publications ,ISBN NO: 935551865X, 978-9355518651
2. Advanced Excel with VBA Macros, by Swarup Das, publisher Blue Rose Publishers; 1st edition(6 October 2020), ISBN NO: 9390380316 , 978-9390380312.

E-Books and Online Learning Material

3. https://trumpexcel.com/learn-excel/-- Learn Excel.