SAVITRIBAI PHULE PUNE

UNIVERSITY (FORMERLY UNIVERSITY OF PUNE)

Four Year Degree Program in Bachelor of Science(B.Sc)

with

Major : Cyber and Digital Science

(Faculty of Science & Technology)

Syllabi for

(For colleges Affiliated to Savitribai Phule Pune University)

Choice Based Credit System (CBCS) Syllabus

Under National Education Policy (NEP)

To be Implemented from Academic Year 2024-25

Savitribai Phule Pune University

B. Sc.(Cyber and Digital Science)

(To be implemented from Academic year 2024-2025)

Name of Program: Cyber and Digital Science

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.

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.

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 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	Credits		Teaching Scheme Hr/Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Subject 1	CDS-101-MJ	Linux System Administration	2		2		15	35	50
Subject 2	CDS-102-MJ	Fundamental of C programming	2		2		15	35	50
Subject 3	CDS-103-MJ	Fundamentals of Computer	2		2		15	35	50
Subject 1 Practical	CDS-104-MJP	Practical based on CDS101MJ		2		4	15	35	50
Subject 2 Practical	CDS-105-MJP	Practical based on CDS102MJ		2		4	15	35	50
Subject 3 Practical	CDS-106-MJP	Practical based on CDS103MJ		2		4	15	35	50
IKS	CDS-101-IKS	Computing in ancient India	2		2		15	35	50
GE/OE	OE-101-CDS	Office Automation/ Introduction to Google Tools	2		2		15	35	50
SEC	SEC-101-CDS	Fundamentals of Digital Communication(Practical)		2		4	15	35	50
AEC	AEC-101-MAR/HIN/ENG	MIL-I(Hindi) / MIL-I(Marathi) / English	2		2		15	35	50
VEC	VEC-101-ENV	EVS-I	2		2		15	35	50
TOTAL			14	08	14	16	165	385	550

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

Course Type	Course Code	Course Code	Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Subject 1	CDS-151-MJ	Fundamentals of Cyber security	2		2		15	35	50
Subject 2	CDS-152-MJ	Network Security	2		2		15	35	50
Subject 3	CDS-153-MJ	Python Programming	2		2		15	35	50
Subject 1 Practical	CDS-154-MJP	Practical based on CDS151MJ		2		4	15	35	50
Subject 2 Practical	CDS-155-MJP	Practical based on CDS152MJ		2		4	15	35	50
Subject 3 Practical	CDS-156-MJP	Practical based on CDS153MJ		2		4	15	35	50
GE/OE	OE-152-CDSP	Office Automation/ Introduction to Google Tools		2		4	15	35	50
SEC	SEC-151-CDS	Statistical techniques for Computer Science **OR** Advance Excel		2		4	15	35	50
AEC	AEC-151-MAR/HIN/ENG	MI L-I(Hindi) / MIL-I(Marathi)/MIL-I English	2				15	35	50
VEC	VEC-151-ENV	EVS-II	2		2		15	35	50
CC	CC-151 - T/P	University Basket	2		2		15	35	50
TOTAL			12	10	10	20	165	385	550

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

Course Type	Course Code	Course Title	Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (4+2)	CDS-201-MJ	Ethical Hacking-I	2		2		15	35	50
	CDS-202-MJ	Cyber Ethics, Cyber Law & Cyber Policies	2		2		15	35	50
	CDS-203-MJP	Practical based on CDS201MJ		2		4	15	35	50
VSC(2)	CDS-221-VSC	Data Structure using Python		2		4	15	35	50
IKS	IKS-200-T	Indian Knowledge System in Computing	2		2		15	35	50
FP/OJT/CEP(2)	CDS-231-FP	Mini Projects		2		4	15	35	50
Minor (2+2)	CDS-241-MN	Web Technology	2		2		15	35	50
	CDS-242-MNP	Practical based on CDS241MN		2		4	15	35	50
GE/OE(2)	OE-201-CDS-T OE-202-CDS-T OE-203-CDS-T OE-204-CDS-T	AI for Everyone I / Web design I / Digital Marketing I/ Introduction to Cyber Security	2		2		15	35	50
AEC(2)	AEC-201-T	From University Basket	2		2		15	35	50
CC(2)	CC-201-T/P	From University Basket	2		2		15	35	50
Total			14	08	14	16	165	385	550

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

Course Type	Course Code	Course Title	Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (4+2)	CDS-251-MJ	Ethical Hacking-II	2		2		15	35	50
	CDS-252-MJ	Advance Network Security	2		2		15	35	50
	CDS-253-MJP	Practical based on CDS251MJ		2		4	15	35	50
VSC(2)	CDS-271-VSC-P	Database management system		2		4	15	35	50
FP/OJT/ CEP(2)	CDS-281-FP	Mini Projects		2		4	15	35	50
Minor (2+2)	CDS-291-MN	Advanced Web Technology	2		2		15	35	50
	CDS-292-MNP	Practical based on CDS291MN		2		4	15	35	50
GE/OE(2)	OE-251-CDS-T OE-252-CDS-T OE-253-CDS-T	AI for Everyone II / Web design II / Digital Marketing II	2		2		15	35	50
SEC(2)	SEC251CDSP	Principals of operating System	2		2		15	35	50
AEC(2)	AEC-251-T	From University Basket	2		2		15	35	50
CC(2)	CC-251-T/P	From University Basket	2		2		15	35	50
Total			14	8	14	16	165	385	550

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

Course Type	Course Code	Course Code	Credits		Teaching Scheme Hr Week		Evaluation /Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (6+4)	CDS-301-MJ	Digital Forensic-I	2		2		15	35	50
	CDS-302-MJ	Malware Analysis	2		2		15	35	50
	CDS-303-MJ	Cyber Threat Intelligence	2		2		15	35	50
	CDS-304-MJP	Practical based on CDS301MJ		2		4	15	35	50
	CDS-305-MJP	Practical based on CDS302MJ		2		4	15	35	50
Major Elective (2+2)	CDS-306-MJ	Blockchain	2		2		15	35	50
	CDS-307-MJP	Practical based on CDS306MJ		2		4	15	35	50
	OR								
	CDS-308-MJ	Mobile Forensic	2		2		15	35	50
	CDS-309-MJP	Practical based on CDS308MJ		2		4	15	35	50
VSC(2)	CDS-321-VSCP	Statistical Method-II		2		4	15	35	50
FP/OJT/ CEP(2)	CDS-331-FP	Project		2		4	15	35	50
Minor (2+2)	CDS-341-MN	Internet Of Things	2		2		15	35	50
	CDS-342-MNP	Practical Based on CDS341MN		2		4	15	35	50
TOTAL			10	12	10	24	165	385	550

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

Course Type	Course Code	Course Code	Credits		Teaching Scheme Hr Week		Evaluation /Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (6+4)	CDS-351-MJ	Digital Forensic-II	2		2		15	35	50
	CDS-352-MJ	IOT Security	2		2		15	35	50
	CDS-353-MJ	Cyber Crime& Reports	2		2		15	35	50
	CDS-354-MJP	Practical Based on CDS351MJ		2		4	15	35	50
	CDS-355-MJP	Practical Based on CDS352MJ		2		4	15	35	50
Major Elective (2+2)	CDS-356-MJ	Vulnerability Assessment& Penetration Testing	2		2		15	35	50
	CDS-357-MJP	Practical Based on CDS356MJ		2		4	15	35	50
	OR								
	CDS-358-MJ	Fin-Tech Cyber Security	2		2		15	35	50
	CDS-359-MJP	Practical Based on CDS358MJ		2		4	15	35	50
FP/OJT/ CEP(2)	CDS-381-OJT	Hands on Training Project		4		8	30	70	100
Minor (2+2)	CDS-391-MN	AI and Machine Learning	2		2		15	35	50
	CDS-392-MNP	Practical Based on CDS391MN		2		4	15	35	50
TOTAL			10	12	10	24	165	385	550

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

urse Type	Course Code	Course Code	Credits		Teaching Scheme Hr Week		Evaluation /Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (10+4)	CDS-401-MJ	Malware Analysis II	2		2		15	35	50
	CDS-402-MJ	Intrusion Detection and Prevention System	2		2		15	35	50
	CDS-403-MJ	Digital Image Processing	2		2		15	35	50
	CDS-404-MJP	Practical Based on CDS401MJ		2		4	15	35	50
	CDS-405-MJP	Practical Based on CDS402MJ		2		4	15	35	50
	CDS-406-MJ	Cyber Crime Investigation	2		2		15	35	50
	CDS-407-MJ	Cyber Threat Intelligence II	2		2		15	35	50
Major Elective (2+2)	CDS-408-MJ	Digital Payments and Its Security	2		2		15	35	50
	CDS-409-MJP	Practical Based on CDS408MJ		2		4	15	35	50
	OR								
	CDS-410-MJ	Wireless Security	2		2		15	35	50
	CDS-411-MJP	Practical Based on CDS410MJ		2		4	15	35	50
	OR								
	CDS-412-MJ	IT Act 2000 in Cyberspace	2		2		15	35	50
	CDS-413-MJP	Practical Based on CDS412MJ		2		4	15	35	50
Minor(4)	CDS-441-MN	Research Methodology	4		4		30	70	100
TOTAL			16	06	16	12	165	385	550

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

Course Type	Course Code	Course Code	Credits		Teaching Scheme Hr Week		Evaluation /Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (10+4)	CDS-451-MJ	Mobile Application And Services	2		2		15	35	50
	CDS-452-MJ	Incident Handling	2		2		15	35	50
	CDS-453-MJ	Cyber Security Architecture	2		2		15	35	50
	CDS-454-MJP	Practical Based on CDS451MJ		2		4	15	35	50
	CDS-455-MJP	Practical Based on CDS452MJ		2		4	15	35	50
	CDS-456-MJ	Introduction to Hardware Security	2		2		15	35	50
	CDS-457-MJ	IT Security Strategy Planning and Leadership	2		2		15	35	50
Major Elective (2+2)	CDS-458-MJ	Dark web and Cyber warfare	2		2		15	35	50
	CDS-459-MJP	Practical Based on CDS458MJ		2		4	15	35	50
	OR								
	CDS-460-MJ	DecSecOps	2		2		15	35	50
	CDS-461-MJP	Practical Based on CDS460MJ		2		4	15	35	50
	OR								
	CDS-462-MJ	Tools and Technology for Cyber Security	2		2		15	35	50
	CDS-463-MJP	Practical Based on 462MJ		2		4	15	35	50
FP/OJT/CEP(4)	CDS-481-OJT	OJT		4		8	30	70	100
TOTAL			12	10	12	20	165	385	550

SEM I

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
LinuxSystem Administration(CDS104MJP)

Teaching Scheme 4 hours / week	No. of Credits 2	Examination Scheme 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.(Cyberand 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

SEM-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 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: -

- 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.

SEM III

Savitribai Phule Pune University
As per NEP
S.Y.B.Sc. (Cyber and Digital Science)
CDS201MJ
Title: Ethical Hacking - I

Teaching Scheme 3 Hours / week	No. of Credit 02	Examination Scheme CA :15 marks UA: 35 marks

Prerequisites:
1. Fundamentals of Cyber Security
2. Fundamentals of OSI Model and TCP/IP Suite
3. Fundamentals of GNU/Linux Operating System

Course Objectives
1. Understand the fundamentals of Ethical Hacking and cyber security.
2. Learn reconnaissance and OSINT techniques for information gathering.
3. Perform network scanning, enumeration, and exploitation effectively.
4. Conduct vulnerability assessments and system hacking.
5. Explore web application security and penetration testing.

Course Outcomes: On completion of the course, student will be able to
1. Explain ethical hacking concepts and hacker types.
2. Perform reconnaissance and OSINT techniques.
3. Conduct network scanning and exploitation.
4. Analyze system vulnerabilities and hacking methods.
5. Identify and exploit web application vulnerabilities.

Unit	Course Contents	Hours	CO
1	**Introduction to Ethical Hacking**	**4**	**CO 1**

1.1 What is Ethical Hacking?
1.2 Confidentiality Integrity Availability (C.I.A) Triad
1.3 Cyber security Threats & Attack Vectors
1.4 Types of Hackers
1.5 Ethical Hacking vs. Cyber crime
1.6 Ethical Hacking Process

2	**Foot printing, Reconnaissance & Open-Source Intelligence (OSINT)**	**4 Hours**	**CO 2**

2.1 Introduction to Reconnaissance
2.2 Passive vs. Active Reconnaissance
2.3 Introduction To Open Source Intelligence (OSINT)
2.4 Information Gathering/ Foot printing Techniques:
- 2.4.1 WHOIS Lookup, Reverse WHOIS
- 2.4.2 DNS Enumeration (Ns lookup, Dig)
- 2.4.3 Social Media Intelligence Gathering
- 2.4.4 Shodan & Censys for Internet-wide Scanning

3	**Network Scanning, Enumeration & Exploitation**	**6 Hours**	**CO 3**
3.1 Understanding Network Scanning (TCP, UDP, SYN, ACK) 3.2 Using Nmap & Advanced Nmap Scripting Engine 3.3 OS Fingerprinting & Service Detection 3.4 Enumerating Network Services (NetBIOS, SNMP, SMB) 3.5 Identifying Open Ports and Vulnerable Services 3.6 Evading Intrusion Detection Systems (IDS) & Firewalls 3.7 Network Traffic Analysis (Wireshark) 3.8 ARP Spoofing & MITM Attacks			
4	**Vulnerability Assessment & System Hacking**	**8 Hours**	**CO 4**
4.1 Introduction to Vulnerability Scanning 4.2 Automated vs. Manual Vulnerability Analysis 4.3 Vulnerability Scanning Tools: 4.3.1 Nessus 4.3.2 OpenVAS 4.3.3 Nikto (for Web Servers) 4.4 Password Cracking Techniques: 4.4.1 Hash Cracking (John the Ripper, Hashcat) 4.4.2 Windows Password Extraction/ reset 4.4.3 Brute Force & Dictionary Attacks 4.5 Privilege Escalation Techniques(Windows & Linux)			
5	**Web Application Hacking & Exploitation**	**8 Hours**	**CO 5**
5.1 Introduction to Web Vulnerabilities (OWASP Top 10) 5.2 SQL Injection (SQLi) - Manual & Automated Exploitation 5.3 Cross-Site Scripting (XSS) - Reflected, Stored & DOM-Based 5.4 Cross-Site Request Forgery (CSRF) 5.5 Remote File Inclusion (RFI) & Local File Inclusion (LFI) 5.6 Exploiting Content Management Systems (CMS) 5.7 Web Shell Injection & Command Execution 5.8 Bypassing Web Application Firewalls (WAF)			
Reference Book: 1. The Basics of Hacking and Penetration Testing – Patrick Engebretson 2. Hacking: The Art of Exploitation (2nd Edition) – Jon Erickson 3. CEH Certified Ethical Hacker All-in-One Exam Guide – Matt Walker 4. Penetration Testing: A Hands-On Introduction to Hacking – Georgia Weidman			

Savitribai Phule Pune University
As per NEP
S.Y.B.Sc. (Cyber and Digital Science)
CDS203MJP
Title: Practical Based CDS201MJ-Ethical Hacking - I

Teaching Scheme 3 Hours / week	No. of Credit 02	Examination Scheme CA :15 marks UA: 35 marks

Prerequisites:
1. Fundamentals of Cyber Security
2. Fundamentals of OSI Model and TCP/IP Suite
3. Fundamentals of GNU/Linux Operating System

Course Objectives
1. Understanding Ethical Hacking & Lab Setup
2. Footprinting, Reconnaissance & OSINT
3. Network Scanning, Enumeration & Exploitation
4. Vulnerability Assessment & System Hacking
5. Web Application Hacking & Exploitation

Course Outcomes: On completion of the course, student will be able to
1. Fundamentals of Ethical Hacking & Lab Configuration
2. Information Gathering & Open-Source Intelligence (OSINT)
3. Network Scanning, Attack Simulation & Exploitation
4. System Security Analysis & Vulnerability Exploitation
5. Web Security Testing & Web Application Exploitation

Unit	Course Contents	CO
Unit 1	**Introduction to Ethical Hacking & Lab Setup**	**CO 1**

1. Install & configure Kali Linux on VirtualBox/VMware
2. Set up a penetration testing lab (Metasploitable2, DVWA, Windows 10)
3. Learn basic Linux commands for hacking & security testing
4. Configure network settings for ethical hacking practice
5. Understand and use essential hacking tools (Nmap, Metasploit, Wireshark)

Unit 2	Footprinting, Reconnaissance & OSINT	CO 2

1. Perform WHOIS lookup on a target domain
2. Extract DNS records using `nslookup` and `dig`
3. Use Google Dorking to find sensitive information
4. Conduct passive reconnaissance using Shodan & Censys
5. Perform social media intelligence gathering using OSINT tools (theHarvester, Maltego)
6. Enumerate email addresses & phone numbers from a website
7. Use Recon-ng framework for automated reconnaissance

Unit 3	Network Scanning, Enumeration & Exploitation	CO 3
1. Perform a network scan using Nmap (TCP, UDP, SYN, FIN scans) 2. Enumerate open ports and running services on a target system 3. Perform OS fingerprinting & service detection 4. Scan and exploit SMB services using enum4linux & Metasploit. 5. Enumerate SNMP information using Nmap 6. Capture network packets using Wireshark 7. Perform ARP spoofing & Man-in-the-Middle (MITM) attack using Bettercap		
Unit 4	**Vulnerability Assessment & System Hacking**	**CO 4**
1. Perform vulnerability scanning using Nessus/OpenVAS 2. Scan web applications for vulnerabilities using Nikto 3. Crack password hashes using John the Ripper & Hashcat 4. Extract Windows passwords using Mimikatz 5. Perform brute-force login attacks using Hydra 6. Exploit weak file permissions for privilege escalation (Linux & Windows) 7. Create a backdoor using Netcat		
Unit 5	**Web Application Hacking & Exploitation**	**CO 5**
1. Identify OWASP Top 10 vulnerabilities in a test web application 2. Perform SQL Injection to extract data from a database 3. Exploit XSS (Reflected, Stored & DOM-Based) to steal session cookies 4. Perform Cross-Site Request Forgery (CSRF) attack 5. Exploit Local File Inclusion (LFI) & Remote File Inclusion (RFI) vulnerabilities 6. Crack website login using Burp Suite Intruder 7. Bypass Web Application Firewall (WAF) using tampered requests		
Note: Perform All this topic on try hack me also for home practice		

Reference Book:

1. The Basics of Hacking and Penetration Testing – Patrick Engebretson
2. Hacking: The Art of Exploitation (2nd Edition) – Jon Erickson
3. CEH Certified Ethical Hacker All-in-One Exam Guide – Matt Walker
4. Penetration Testing: A Hands-On Introduction to Hacking – Georgia Weidman

Savitribai Phule Pune University
As per NEP
S.Y.B.Sc. (Cyber and Digital Science)
CDS202MJ
Title: Cyber Ethics , Cyber Law & Cyber Policies

Teaching Scheme	No. of Credit	Examination Scheme
2 Hours / week	02	CA :15 marks UA: 35 marks

Prerequisites:
1. Basic Knowledge of Cyber Security
2. Fundamental Understanding of Information Technology
3. Basic Knowledge of Cyber Laws & Regulations

Course Objectives
1. Understand the fundamentals of cyber ethics and their role in digital behavior.
2. Explore various types of cybercrimes and analyze their legal and ethical implications.
3. Examine intellectual property rights (IPR) in cyberspace and their impact on digital content.
4. Analyze data protection and privacy laws to understand their importance in safeguarding digital information.
5. Evaluate national and international cyber policies to understand governance mechanisms in cyberspace.
6. Investigate emerging cyber threats and assess their implications on legal, ethical, and policy frameworks

Course Outcomes: On completion of the course, student will be able to
1. Principles of cyber ethics and apply them to real-world digital scenario
2. Identify and categorize cybercrimes while understanding the legal actions
3. Assess the role of IPR in protecting digital assets and preventing online fraud.
4. Analyze cyber security policies and frameworks implemented by governments and organizations.
5. Implementation of Policies in governments and organizations .Evaluate emerging cyber threats and propose legal and ethical solutions to mitigate risks.

Course Contents

Chapter 1	**Introduction to Cyber Space and Cyber Ethics**	**4 hours**	**CO1**

1.1 Definition and characteristics of cyberspace
1.2 Introduction to Cybercrime
1.3 Need Cyber laws: The Indian Context
1.4 Cybercrime and Information Security
1.5 Understanding cyber ethics and its importance
1.6 Moral, ethical, and legal issues in cyberspace
1.7 Professional ethics in information technology

Chapter 2	**Cyber Crimes and Legal Framework**	**8 hours**	**CO2**

2.1 Cybercrimes, Classification and types of cybercrimes
Classifications of Cybercrimes:
(E-Mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup, Spam/Crimes, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Computer Sabotage, Email Bombing/Mail Bombs, Computer Network Intrusions, Password Sniffing, Credit Card Frauds, Identity Theft)

2.2 Legal perspectives: Indian and global scenarios
2.3 Overview of the Information Technology Act, 2000
2.4 Amendments and their implications
2.5 Role of law enforcement agencies in combating cybercrime
2.6 Introduction to IT governance framework: COBIT, ISO/IEC 27001/27002

Chapter 3	**Intellectual Property Rights in Cyberspace**	**4 hours**	**CO3**

3.1 Understanding intellectual property in the digital age
3.2 Copyrights, trademarks, and patents online
3.3 Legal challenges in protecting digital content
3.4 Digital rights management and fair use policies
3.5 Case studies on IP infringement and resolutions

Chapter 4	**Data Protection and Privacy Laws**	**6 hours**	**CO4**

4.1 Importance of data protection in the digital era
4.2 Global data protection regulations: GDPR, CCPA, etc.
4.3 Indian data protection laws and policies
4.4 Challenges in implementing privacy laws
4.5 Case studies on data breaches and legal actions
4.6 Cybercrime and Punishment
4.7 Social computing and the associated challenges for organizations, Protecting people's privacy in the organization
4.8 Organizational guidelines for Internet usage and safe computing guidelines and computer usage policy

Chapter 5	**Cyber Policies and Governance**	**8 hours**	**CO5**

5.1 National and international cyber policies
5.2 Role of government and private sectors in cyber governance
5.3 Cyber Security Policy and Domains of Cyber Security Policy
5.4 Cyber security strategies and frameworks
5.5 Public-private partnerships in cyber security
5.6 Analysis of existing cyber policies and their effectiveness
5.7 The future of cyber laws and policies
5.8 Preparing for future cyber challenges
5.9 Case studies on recent cyber incidents and lessons learned

Reference Book:

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives–Nina Godbole,Sunit Belapure,Wiley:April2011India Publications Released.
2. Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2nd Edition Prentice Hall, 2004.
3. Principles of Information Security, -Michael E Whitman, HerbertJMattord,3rdEdition, 2011.

Savitribai Phule Pune University
S.Y.B.Sc.(Cyber and Digital Science) Sem - III
Subject Code: CDS 221 VSC
Subject: Data Structure Using Python

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

Prerequisites:
- Knowledge of Python programming.
- Basic knowledge of algorithms and problem solving

Course Objectives:
1. Develop problem-solving skills using data structures and algorithms in Python.
2. Analyze and implement Linear and Non-linear Data Structures.
3. Develop the ability to design and implement efficient algorithms using appropriate data structures.
4. Understand the role of Python's built-in data structures like lists, tuples, sets, and dictionaries.

Course Outcomes:
On completion of the course, students will be able to:
1. Understand fundamental data structures and their importance in problem-solving.
2. Implement, manipulate, apply and analyze linear and non-linear data structures.
3. Develop efficient algorithms by utilizing appropriate searching and sorting techniques.
4. Solve real-world problems by selecting and implementing suitable data structures in Python.
5. Understand several ways of solving the same problem.

Course Contents

Chapter 1	Introduction to Data Structure, Sorting and Searching techniques	6 hours

1.1 Introduction to Data Structure, Concept, Need, Types
1.2 Algorithm Analysis: Definition, Characteristics, Space complexity, Time complexity, Best, Worst, Average Case Analysis
1.3 Asymptotic Notation: Big O, Omega Ω, Theta Θ
1.4 Sorting algorithms with efficiency: Bubble sort, Insertion sort, Merge sort, Quick Sort, Selection Sort.
1.5 Searching techniques: Linear Search, Binary search

Chapter 2	Stack and Queue	6 hours

Stack:
2.1 Introduction
2.2 Representation: Using Arrays
2.3 Operations: init(), push(), pop(), isEmpty(), isFull(), peek()
2.4 Application: String reversal, infix to postfix, infix to prefix, postfix evaluation
Queue:
2.5 Introduction
2.6 Representation: Using Arrays
2.7 Operations: init(), Insert(), Delete(), isEmpty(), isFull()
2.8 Types of Queues: Linear Queue, Circular Queue, Priority Queue

Chapter 3	**Linked List**	**6 hours**

3.1 Introduction
3.2 Dynamic implementation of Linked List
3.3 Types of Linked List: Singly, Doubly, Singly Circular, Doubly Circular
3.4 Operations on Linked List: create, display, insert, delete, reverse, search, sort, concatenate, merge
3.5 Representation of stack and queue using linked list

Chapter 4	**Tree**	**6 hours**

4.1 Concept and Terminologies
4.2 Types of Trees: Binary Tree, Binary Search Tree, Expression Tree
4.3 Representation Dynamic
4.4 Operations on BST: Create, Insert, Delete, Search
4.5 Tree traversals: preorder, inorder, postorder (recursive)
4.6 Counting leaf, non-leaf & total nodes

Chapter 5	**Graph**	**6 hours**

5.1 Concept and terminologies
5.2 Graph Representation: Adjacency matrix, Adjacency list
5.3 Graph traversal: Breadth First Search and Depth First Search

Reference Books:

- "Introduction to Computing and Problem-Solving Using Python" by E. Balagurusamy
- "Problem Solving in Data Structure & Algorithms using Python" by Hemant Jain
- "Problem Solving with Algorithms and Data Structures using Python" by Bradley N. Miller and David L. Ranum

Savitribai Phule Pune University

S.Y.B.Sc. (Cyber and Digital Science) Sem III

Sub Code: IKS-200-T

Title: Indian Knowledge System in Computing

Objective:

1. To introduce Vedic mathematical techniques and their relevance to modern computational methods.
2. To understand Nyaya's logical framework and its application in reasoning and AI.
3. To explore the algorithmic structure of Panini's grammar and Chandasastra's binary system in computational linguistics and mathematics.
4. To explore real-world applications of IKS concepts in computational sciences.

Learning Outcomes:

By the end of the course, students will:

1. Understand the computational foundations of Indian Knowledge Systems by applying Vedic mathematical techniques in problem-solving.
2. Use Nyaya's logical reasoning in AI and decision-making.
3. Explore the connection between **Panini's** grammar and NLP technologies.
4. Recognize the applications of IKS in modern computing fields.

Unit 1: Vedic Mathematics & Computational Thinking (8 Hours)

1.1 Introduction to Vedic Mathematics: Origins and importance in ancient India, Sutras and their logical foundation

1.2 Basic Arithmetic using Vedic Methods: Addition, subtraction, multiplication, and division tricks

1.3 Algebraic Applications of Vedic Mathematics: Squaring, square roots, cube roots, and factorization

Unit 2: Introduction to Nyaya (Indian Logic) (8 Hours)

2.1 Introduction to Nyaya Philosophy: Introduction to Nyaya (Indian Logic), Overview of Indian philosophical schools, Importance of Nyaya in logical reasoning, Types of reasoning (Anumana, Pramana, etc.)

2.2 Nyaya's Four Sources of Knowledge (Pramaṇa): Perception, inference, comparison, verbal testimony

2.3 Types of Argumentations in Nyaya

Vada (truth-based), Jalpa (debate-focused), Vitanda (criticism)

2.4 Applications in AI & Machine Learning**:** Logical reasoning models, expert systems, and rule-based AI

Unit 3: Panini's Astadhyayi & Chandasāstra (8 Hours)

3.1 Introduction to Panini's Astadhyayi: Historical background and linguistic importance

3.2 Rule-Based System of Sanskrit Grammar: Sutras, meta-rules, recursion, and transformations

3.3 Chandasastra's Binary logic and combinatorial techniques

Unit 4: Applications of IKS in Computer Science (6 Hours)

4.1 Mind and cognition in Samkhya and Yoga: AI insights

4.2 Machine Learning and Indian philosophies: Understanding of human cognition in Indian philosophical schools (Advaita, Samkhya and Yoga)

4.3 Cryptography and Security: Ancient cryptographic methods in Kautilya's Arthashastra, protecting information: analogies from Indian traditions.

Recommended Books:

1. Vedic Mathematics, Jagadguru Swami Bharati Krishna Tirtha, Motilal Banarsidass Publishing House, New Delhi.
2. "The Power of Vedic Maths" – Atul Gupta, JAICO publishing
3. Nyaya Theory of Knowledge" – S.C. Vidyabhusana
4. "A Primer of Indian Logic" – Kuppuswami Sastri, Hassell Street Press.2021
5. "Indian Logic: A Reader" – Jonardon Ganeri
6. "Aṣṭādhyāyī of Pāṇini" (Volumes 1 & 2) – Rama Nath Sharma, Munshirm Manoharlal publication
7. "Panini: His Work and Its Traditions" – George Cardona, Motilal Banarsidass Publishing House
8. "The Mathematics of Metre" – Satyanarayana Das
9. "Samkhya and Science" – Debabrata Sen Sharma
10. Explores the cognitive science aspects of Samkhya and Yoga in AI research.
11. "AI and Indian Philosophy" – Sangeet Kedia
12. "Kautilya's Arthashastra" – R. Shamasastry (Translation)
13. "History of Indian Cryptography" – Subhash Kak
14. Discusses coded messages, steganography, and security concepts in ancient India.
15. Saubhagya Vardhan, AI in Land of Vedas, Notion Press, 2023

	Savitribai Phule Pune University **S.Y.B.Sc. (Cyber and Digital Science)** **Subject Code: CDS 241MN** **Subject: Web Technology**	
Teaching Scheme: 2 hours / week	**No. of Credits: 2**	**Examination Scheme :** **CE: 15 Marks** **UE: 35 Marks**
	Course Objectives : ● To Learn Core-PHP, Server Side Scripting Language ● To Learn PHP with File handling & Database handling ● To Design dynamic and interactive Web pages.	
	Course Outcomes: **CO1:** Explain the basic concepts of the World Wide Web, HTTP protocol, and client-server architecture. **CO2:** Design and structure web pages using HTML elements, forms, tables, and CSS for styling. **CO3:** Develop client-side interactivity using JavaScript including event handling and string operations. **CO4:** Develop server-side scripts using PHP including functions, control structures, and string manipulation techniques. **CO5:** Apply array handling techniques in PHP for storing, accessing, and manipulating data efficiently. **CO6:** Perform file handling operations in PHP such as reading, writing, renaming, and accessing file information.	
Course Contents		
Unit 1	**Introduction to Web, HTML and CSS**	**4 hours**
	1.1 WWW, Web server and Web browser, HTTP basics [HTTP Request, HTTP Response] 1.2 Client – Server Architecture 1.3 HTML - Tags and Attributes 1.4 Form & Table - Designing / Processing , Tables 1.5 Introduction to stylesheet 1.6 CSS- Concept, Types of CSS & ways to use CSS	
Unit 2	**Introduction to JavaScript**	**6 hours**
	2.1 Basic syntax of JavaScript 2.2 Data types and variables 2.3 Functions and events [onclick, onchange, onload] 2.4 Popup boxes 2.5 String methods	

Unit 3	**Introduction to PHP**	**10 hours**
	3.1 Introduction to PHP 3.2 How does PHP work? 3.3 Lexical structure –Basic program, Control structure 3.4 Function - Definition and function call 3.5 Types of parameters - Default parameters , Variable parameters, Missing parameters 3.6 Variable function 3.7 Anonymous function 3.8 Printing functions 3.9 Introduction to String 3.10 Types of strings 3.11 Comparing, manipulating and searching string 3.12 Regular expressions	
Unit 4	**Arrays**	**5 hours**
	4.1 Types of Array 4.2 Identifying elements of an array 4.3 Storing data in arrays 4.4 Extracting multiple values 4.5 Converting between arrays and variables 4.6 Traversing arrays 4.7 Sorting 4.8 Array Operations	
Unit 5	**File Handling**	**5 hours**
	5.1 Working with files and directories 5.2 Operations on Files - Opening and Closing, Getting information about file, Read/write to file, Splitting name and path from file, Rename and delete files 5.3 Reading and writing characters in file 5.4 Reading entire file 5.5 Random access to file data 5.6 Getting information on file	

Reference Books :

1. HTML & CSS: The Complete Reference, Fifth Edition Author: Thomas A. Powell First published: 01 Jan 2010.
2. Programming PHP By Rasmus Lerdorf and Kevin Tatroe, O'Reilly publication
3. Beginning PHP 5 , Wrox publication
4. PHP web sevices, Wrox publication
5. Mastering PHP , BPB Publication
6. PHP for Beginners, SPD publication

OPEN ELECTIVE

Savitribai Phule Pune University
S.Y.B.Sc. (Cyber and Digital Science)
Subject Code: OE-201-CDS-T
Subject Name: AI for Everyone - I

Teaching Scheme: 2 hours / week	No. of Credits: **2**	Examination Scheme: CA:15 Marks UA: 35 Marks

Course Objectives: -

1. Understand the basics of artificial intelligence and its subfields.
2. Explore real-world applications of AI across different industries.
3. Gain insights into the ethical, social, and economic implications of AI.
4. Develop an appreciation for the potential of AI to drive innovation and transformation.

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

CO1: Define and explain the fundamental concepts and subfields of AI.
CO2: Identify real-world applications of AI across various industries.
CO3: Analyze the ethical, social, and economic implications of AI.
CO4: Recognize the potential of AI to drive innovation and transformation in different domains.

Course Contents

Unit 1	**Introduction to Artificial Intelligence**	**6 hours**	**CO1**

1.1 Definition and scope of AI
1.2 Historical overview and key milestones
1.3 Differentiating AI from human intelligence
1.4 Types of AI tools: Text, image, audio, video, coding, and automation.
1.5 Where to find free AI tools? (Google AI, OpenAI, Hugging Face, etc.)

Unit 2	**AI Subfields and Technologies**	**6 hours**	**CO2**

2.1 Machine learning: Supervised, unsupervised, and reinforcement learning
2.2 Deep learning and neural networks
2.3 Natural language processing (NLP) and computer vision

Unit 3	**Applications of AI**	**6 hours**	**CO3**

3.1 AI in healthcare: Diagnosis, treatment, and medical imaging
3.2 AI in finance: Fraud detection, algorithmic trading, and risk assessment
3.3 AI in transportation: Autonomous vehicles and traffic optimization
3.4 AI in customer service and chatbots
3.5 AI in education: Personalized learning and intelligent tutoring systems

Unit 4	**Ethical and Social Implications of AI**	**6 hours**	**CO4**

4.1 Bias and fairness in AI systems.
4.2 Privacy and data protection concerns
4.3 Impact of AI on employment and the workforce
4.4 AI and social **ineq**uality

Unit 5	AI Writing Assistants Tools	6 hours	CO5
5.1 ChatGPT (OpenAI) 5.2 Google Gemini (Bard AI) 5.3 Claude AI (Anthropic) 5.4 Perplexity AI 5.5 Rytr			
Reference Books:			

1. **Artificial Intelligence: A Guide for Thinking Humans"** – Melanie Mitchell
2. **The AI Revolution in Medicine: GPT-4 and Beyond"** – Peter Lee, Carey Goldberg, Isaac Kohane
3. **AI 2041: Ten Visions for Our Future"** – Kai-Fu Lee, Chen Qiufan
4. **The Business of AI: AI Technologies and How to Leverage Them for Business Success"** – Anirudh Koul
5. **AI-Powered Marketing: Harness the Future of Marketing with AI"** – Peter Gentsch
6. **The AI Marketing Handbook"** – Ryan McKenzie

Semester III					
Semester No.	**Course Code**	**Type of Course**	**Course Title**	**Credits**	**Hours/Week**
III	OE-204-CDS-T	OE (Open Elective)	Introduction to Cyber Security	2	2

Course Objectives	
1	Understand basic concepts and terms in cyber security.
2	Learn about privacy and related legal protections.
3	Grasp fundamental encryption principles.
4	Understand basics of Cyber laws and Indian IT Act.

Course Outcome	
CO1	Define and explain essential cybersecurity concepts, threats, and preventive strategies.
CO2	Interpret privacy principles and identify relevant laws and regulations protecting digital data.
CO3	Apply basic encryption methods to secure data and understand their role in cybersecurity.
CO4	Good understanding of cyberlaws, cybercrime and punishments in Indian Scenario.

Unit	**Title and Contents**	**No. of Lecture Hours**
1	**Chapter 1: Introduction to Cyber Crime and Cyber Security** 1.1 Introduction 1.2 Cybercrime:Definition and significance of cybersecurity, Evolution and historical context of cybersecurity 1.3 Cybercrime and Information Security 1.4 Who are Cybercriminals? 1.5 Hackers and Types of Hackers 1.6 Types of Cybercrimes: E-Mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup, Spam/Crimes Emanating from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Computer Sabotage, Email Bombing/Mail Bombs, Computer Network Intrusions, Password Sniffing, Credit Card Frauds, Identity Theft 1.7 Vulnerability, Threats, and Harmful Acts 1.8 CIA Triad	**15**

2	**Chapter 2:- Cybercrime Tools, Techniques and Cyber Laws** 2.1 Introduction 2.2 Proxy Servers and Anonymizers 2.3 Phishing 2.4 Password Cracking 2.5 Keyloggers and Spyware 2.6 Virus and Worms 2.7 Trojan Horses and Backdoors 2.8 Steganography 2.9 DoS and DDoS Attacks 2.10 SQL Injection 2.11 Introduction: Cyber Laws 2.12 Cybercrime and the Legal Landscape around the World 2.13 Why Do We Need Cyberlaws: The Indian Context 2.14 The Indian IT Act 2.14.1 Challenges to Indian Law and Cybercrime Scenario in India 2.14.2 Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act 2.15 Cybercrime and Punishment 2.16 Cyberlaw, Technology and Students: Indian Scenario	**15**

Reference Material

Reference Books

Sr. No.	Title of the Book	Author/s	Publication	Place
1	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives	Nina Godbole, Sunit Belapure	Wiley	April 2011 India Publications Released.
2	Principles of Information Security. 3rd Edition, 2011.	Michael E Whitman, Herbert J Mattord	Cengage Learning	20 Channel Center Street, Boston, MA 02210 USA
3	Computer Security: Principles and Practice, 3rd edition	William Stallings and Lawrie Brown	Pearson	Boston, Massachusetts, USA
4	Cyber Security Essentials	James Graham Richard Howard Ryan Olson	Auerbach Publications	United States of America

Other Learning Material

E- Resource:

1) Swayam – Cyber Security Course (by NPTEL/IIT Madras) https://nptel.ac.in/courses/106106248
2) Swayam – Cyber laws https://onlinecourses.swayam2.ac.in/cec25_cs04/preview

सावित्राब फुले पुणे विदाप्प, पुणे

[Savitribai Phule Pune University, Pune]

अभ्ासक्रम

पदविका / पद्वि, िर-२ (सत-३ ि ४)

विर् – कराप् (AEC)

(शैकवणक िर २०२५-२६ पासून)

[Level 5.0, UG Degree, Year-II]

(w.e.f. academic year 2025-26)

कराप् विर्ाचा पुनरवचि अभ्ासक्रम - जून २०२५ पासून

Ability Enhancement Course: Marathi

AEC : Marathi

S. Y. BSc (Cyber & Digital Science)

U.G. कराप् – व्ि्् ि्र (सत-३) अभ्ाससक [Level 5.0]			
Course Type	Ability Enhancement Course AEC - कराप् (Marathi)	Credits- 2 (Theory)	Weeks- 15 Hours- 30
AEC-201-MAR	भारा आवण ज्िनव्िवार	Int. Marks 15	Ext. Marks 35

अभ्ासपवतकेविर्् :

सदर अभ्यससपत्र िक भयषच स्वस, भयषयपेप्ितष्् प्ध पसदयि, भयषरचत ्य्् आपि ्ैपिष््र, भयषयभ्यसयचत अगर भयषयभ्यसयचत आ्श््यि, भयषय आपि जत्ेव््वयर ्यच्यिती सरससरसंध, व्वयार् भयषय, ियसत् सयपवत्यचत भयषय, ीपीि सयपवत्यचत भयषय स्वस, ्य्यीते भयषय, सारभयषय ्यचर स्वस आ्श््यि स्जेकरण्यस ्दि वोईl.

अभ्ासपवतकेच् उव्दे :

१. भयषचर स्वस ्य् ्यचय सारच् ्वे घरि
२. जत्ेव््वयरयेनसयर भयषरचय ्यसर त्येनसयर पेयि वोियन्य प्परयचर आ्ीि ्वे घरि.
३. ्रयठत भयषरचय सारभयषय सयसरक आपि िीित सयसरक प््यस जयीक घरि
४. ्रयठत भयषरच्य उस्ोजेयत्् ्ोील्यचय प््यस सयधिर.

अभ्ासक :

घटक	ि्पश्ल	शा्क	घ्ड््ाळ िासं
१	**भारेचे सिवप ि का््** १.१ भयषय स्वसचचय १.२ भयषरचत पेप्ित : प्ध पसदयि १.३ भयषयवसर : ्ोपि् आपि पीपिि (भयषय आपि पीसत) १.४ भयषरचत ्य्् आपि ्ैपिष््र १.५ भयषयभ्यसयचत अगर भयषयभ्यसयचत आ्श््यि	१	१५
२	**भारा आवण ज्िनव्िवार : परसपरसरं** २.१ व्वयार् भयषचर स्वस २.२ ियसत् सयपवत्यच्य भयषचर स्वस २.३ ीपीि सयपवत्यच्य भयषचर स्वस २.४ ्य्यीते भयषचर स्वस २.५ सारभयषय : स्वस आ्श््यि	१	१५

अभ्ासपवतकेच् अध्ून वनषपप् (COs) :
ा अभ्ासपवतकेा अध्नाून विदाय्ा्कध्े पुढ्ल ककिाचा विकास वोबल,

Cognitive Ability	Course Outcomes	Teaching Learning Method
Co-1 Remember	भाषेच स्वस, ापिष्र आपि ्य् ्यष्प्त ्यपावेत सयागेय ्रड़ी.	व्याय्
Co-2 Understanding	भयषय आपि जत्व्वयर ्यचर आ् वाड़ी.	व्याय्, स-अध्े
Co-3 Applying	जत्व्वयरयेनसयर भयषरचय ्यसर ्रण्यचत पररेय प्ळरी.	्यच, ोार
Co-4 Analyzing	भयषय आपि जत्व्वयरयच्य संदभाय प्शराषक्ाय प्पास वोड़ी.	ाआ् प्शराष
Co-5 Evaluating	भयषरच्य प्ध्व सिरप्रता उस्ाज ष्प् स्ज प्पास वोड़ी.	रसगाव
Co-6 Creating	्रयठत भयषरच्य उस्ाजयत् ाल्यच्य अभ्यसायक अेनभ््यडितचत ाीय अ्गि वोड़ी.	स्-अनभ्वर सयदरात्रे

U.G. कराप् – व्ि्ि ि्र (सत-४) अभ्ासस्क [Level 5.0]			
Course Type	**Ability Enhancement Course AEC - कराप् (Marathi)**	**Credits- 2 (Theory)**	**Weeks-15 Hours-30**
AEC-251-MAR	**भारा आवण सिादकौशल्े**	**Int. Marks 15**	**Ext. Marks 35**

अभ्ासपवतकेविर्ु :

सदर अभ्यससपत्र ि्क भयषय आपि भयपष् ्ोौि्ल् ्यचर स्वस सवसंध, प्यिभयषयष्ष् ्ीरि पे्ु, भयषय आपि स्यद्ौि्ल् ्यचर स्वस सवसंध, पयरप्ु स्यद्ौि्ल् ि्सरच पगि स्यद्ौि्ल् स्जेक घरिय ्रिती.

अभ्ासपवतकेच् उद्दे :

१. भयषरच्य स्वसयचय भयपष्ु्ोौि्ल्यचय सारच् ्वे घ्रीर
२ .जत्ेव्ु्वयरयेनसयर भयपष्ु्ोौि्ल्यच्य ्यसरयचर स्वस जीवक घरि.
३ .जत्ेव्ु्वयरयेनसयर स्यद्ौि्ल्यचय सारच् ्वे घ्रीर
४. भयपष्ु्ोौि्ल् स्यद्ौि्ल् ्यच्यिती सरससर सयवच्यचर आ्ीे ्वे घ्रीर.
५ .भयपष् ्ोौि्ल् स्यद्ौि्ल् ्यचर उस्ोजेयत्ु ्ोौि्ल्यचय प्ुयस सयधिर.

अभ्ासस्क :

घटक	ि्ेपश्ल	शी्क	घड्ु्ाळ् ि्ेास
१	**भारा आवण भावरक कौशल्े : सिवप ि् सवसरं** १.१ भयषय : उचचयरि आपि ्ीरि १.२ भयषय : शि् आपि सभयषि १.३ भयषय : पीसत आपि ्ीरि (प्यिभयषयष्ष् ्ीरि पे्ु) १.४ ्ीरिष्ष् ्े्ते ि्यस्ी् स्क्े्य	१	१५
२	**भारा आवण सिादकौशल्े : सिवप ि् सवसरं** २.१ पयरप्ु स्यद्ौि्ल् : शि्, ्यचे, सभयषि, भयषि, पचिे, ्ीरि २.२ पगि स्यद्ौि्ल् : सयरयि ्ीरि, भयषयिर, ्लसेय स्सियर, पे्रदेयत्ु स्यदयत्ु ्ीरि, ्नीयि्ि ्ीरि	१	१५

अभ्ासपवतकेच् अध्ृन वनषपप् (COs) :

ृा अभ्ासपवतकेर्ृा अध्ृनार्ूिन विदाय्ा्कध्े पुढ्ल ककािचा विकास वोबल,

Cognitive Ability	Course Outcomes	Teaching Learning Method
Co-1 Remember	भयषय आपि भयपष् ृााल् ृयचर स्वस सवसधय ष्त ृयपावत सयगिय ृरड़ी.	व्याय्, स्ृ-अध्ृे
Co-2 Understanding	भयषय आपि स्यद्ााल् ृयचर स्वस सवसध ृयचर आ्ा वोड़ी.	व्याय्, सयपवत्यरयचर ृयचे
Co-3 Applying	पयरपृ स्यद्ाल्यचय ृयसर ृरण्यचत परायय प्ळरा.	सयदरात्र
Co-4 Analyzing	पाग स्यद्ाल्यच्य सदभाये प्शराषका्य प्ृपास वाड़ा.	ाआ् प्शराष
Co-5 Evaluating	भयषय आपि स्यद्ाल् ष्ृ स्ज प्ृपास वाड़ा.	रसगाव
Co-6 Creating	भयपष् ृााल् स्यद्ाल् ृयचर उस्ाज ृरण्यचर ृााल् अ्गि वोड़ी.	स्-अनभ्यर सयदरत्रि

सदभ गर :

१. ियसेव्ृवयरयि ृरयठत (स्य: स्वस: पपर्य) भयषय सचयीाी, ियस्ाृ फोटो पि्ा ृनदियी, सनि१९९७.
२. ्ैिरत, डॉ. अि्ाृ ृस्ळ्, सेरव्धे प्यिै, सनि१ जयेर्यरत २०००.
३. गतियतत, ृयध् ृावोळ, ृाज प्यिै, ृनंई१ जयेर्यरत २००४.
४. सृजेयत्ृ ारि, आ्द सयटती, सद्रधय प्यिै, सनि२००५ .
५. व्वयार् ृरयठत भयषय, िरपदेत ृापविर, सेरव्धे प्यिै, सनि१ जयेर्यरत २००८.
६. व्यससतठ, ृवयदर् ृ्फ्ळज अकर्ये प्यिै, सनि ृर२०११.
७. जयपवरयि ियस, डॉ.ृदेय िरडत्र, सेरव्धे प्यिै, सनि१ जयेर्यरत २०१३.
८. सयंर- सस्ृित, डॉ. रि ृस्डि स्प्ाि प्यिै पय. पी. औरगयंयद, १ जयेर्यरत २०१५.
९. व्वयार् ृरयठत, सयठ्ृसनसि, सनिप्दयसतठ प्यिै, सनि
१०. ंयितचत ृव्कत्र ृ्ृिरय् चववयि ृवयरयष ृकप्दयसतठ, ेयपि्.
११. ृरयठतपच्र ृपदरत, शत्ेय. चयफर ृर, सेरव्धे प्यिै, सनि
१२. ृरयठत ारि ृयगदप्यि, ृयपस्े िरि, रयज् ृरयठत प्ृयस ससरय, ृनंई
१३. उस्ापजि अभ्यसर, ृरयठत भयषरचत स्यद्ाल्, ृ्ृिरय् ृवयरयष ृकप्दयसतठ, ेयपि्.
१४. व्वयार् ृरयठत- डॉ. ृल्यि ृव्ळ डॉ. द.पद.सनडर, पेरयीत प्यिै, सनि
१५. ृरयठत सयपवत् : ृयवत ारिंध, डॉ. सनधप्र िरीयर, स्वस प्यिै,औरगयंयद.
१६. व्वयार् ृरयठत, डॉ. ातीय गोप्ाृर, डॉ. ज्शत सयदिर, सेरव्धे प्यिै, सनि
१७. व्वयार् उस्ापजि ृरयठत आपि पसयर्यध्ृयचत ृयर्ाात : ससयद् - डॉ. सदतस सयगळर, डय्ृड सप्ाृर िशस, सनि
१८. भ्ृर सनदर ृरयठत भयषय, डॉ. द. पद. स्हृ्जरपसट प्यिै, सनि
१९. सत्यारिरचय स्भय्, ा. े. गो्ार, सनिप्दयसतठ प्यिै, सनि
२०. सत्यारिय : स्वस आपि पचप्तसय, ृव्तर जोधळर, सनध्य प्यिै, सनि
२१. भयषयिर ृत्यसय, ृल्यि ृयळर, अजीत सो्ि, पपि्य प्यिै, सनि
२२. ेृभयरि, व्वयार् ृरयठत प्ृिरषय, ऑगसट-सपटट, १९८२, पयर सयठियीय, ृयई.
२३. व्वयार् ृरयठत- ा.रय.ेपसरयंयद्र, फड़ प्यिै, ृाल्हपक .

२४. भयषयपचिे, डॉ. ्र्ि्ि दरि्नि् स्यळ प्यिे, सनिि

२५. भयपष् सजे आपि उस््िजे, ग्स रयजे, पिदर अरि, सयटती गो्टरशर, द्य प्यिे, सनिि

२६. ्रयठत भयषय : आज आपि उदय, अपी ग्ळत, द्य प्यिे, सनिि

२७. फीचर रय्पटग, पसश्ेन ्यर अ्ि्क ्र, शतप्दय प्यिे, सनिि

२८. जयपवरयितचर ्ना ्र्ि् ्स्ळ्.

२९. ब्लिदिसयठत ीरि, ्र्ि् ्स्ळ्.

SEM IV

Savitribai Phule Pune
University As per NEP
S.Y.B.Sc. (Cyber and Digital Science)
CDS251MJ
Title: Ethical Hacking - II

Teaching Scheme 2 Hours / week	No. of Credit 02	Examination Scheme CA :15 marks UA: 35 marks

Prerequisites:
1. Fundamentals of Cyber Security
2. Basics of Ethical hacking
3. understanding of network

Course Objectives
1. Understand wireless and IoT security vulnerabilities.
2. Use Metasploit for system exploitation.
3. Learn social engineering and phishing techniques.
4. Analyze malware and perform reverse engineering.
5. To Basic understanding of penetration Testing

Course Outcomes: On completion of the course, student will be able to:
1. Demonstrate wireless and IoT hacking skills.
2. Exploit systems using Metasploit.
3. Perform ethical social engineering attacks.
4. Analyze and reverse-engineer malware.
5. Understanding of how penetration works

Unit	Course Contents	Hours	CO
1	**Wireless & IoT Hacking**	4 Hours	CO 1

1.1 Understanding Wireless Encryption (WEP, WPA, WPA2, WPA3)
1.2 Wireless Network Sniffing(Wireshark, Airodump-ng)
1.3 Cracking Wi-Fi Networks with Aircrack-ng & Wifite
1.4 Rogue Access Points & Evil Twin Attacks
1.5 Bluetooth Hacking & Exploitation
1.6 IoT Device Security & Exploitation
1.7 IoT Network Protocols

2	**Exploiting Systems Using Metasploit**	8 Hours	CO 2

2.1 Introduction to Metasploit Framework
2.2 Creating Exploits & Payloads with Msfvenom
2.3 Exploiting Windows & Linux Systems
2.4 Post-Exploitation Techniques:
  2.4.1 Privilege Escalation
  2.4.2 Data Exfiltration
  2.4.3 Persistence & Covering Tracks
2.5 Writing Custom Exploits

3	**Social Engineering & Phishing Attacks**	**6 Hours**	**CO 3**
3.1 Social Engineering Techniques 3.2 Crafting Malicious Attachments 3.3 Phishing Attacks: 3.3.1 Spear Phishing vs. Mass Phishing 3.3.2 Creating Fake Websites for Credential Harvesting 3.3.3 Advanced Phishing Tools (Evilginx2, Gophish) 3.4 SMS & Voice Phishing (Vishing) 3.5 USB-based Attacks (Rubber Ducky, BadUSB)			
4	**Malware Analysis & Reverse Engineering**	**5 Hours**	**CO 4**
1.1 Types of Malware (Viruses, Worms, Trojans, Ransomware) 1.2 Static vs. Dynamic Analysis of Malware 1.3 Using Sandboxes for Malware Analysis 1.4 Reverse Engineering Basics			
5	**Penetration Testing**	**5 Hours**	**CO 5**
5.1 Phases of Penetration Testing (Planning, reconnaissance,Scanning, Exploitation, Reporting) 5.2 Black Box vs. White Box Testing 5.3 Simulating Advanced Persistent Threats (APT) 5.4 Red Team vs. Blue Team vs. Purple Team Exercises 5.5 Writing a Professional Penetration Testing Report 5.6 Legal & Ethical Considerations in Ethical Hacking			

Reference Book:

1. Hacking: The Art of Exploitation by Jon Erickson

2. The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws by Dafydd Stuttard and Marcus Pinto

3. The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy by Patrick Engebretson

4. Penetration Testing: A Hands-on Introduction to Hacking by Georgia Weidman

Savitribai Phule Pune University
As per NEP
S.Y.B.Sc. (Cyber and Digital Science)
CDS253MJP
Title:Practical based on CDS251MJ
Ethical Hacking - II

Teaching Scheme 3 Hours / week	No. of Credit 02	Examination Scheme CA :15 marks UA: 35 marks

Prerequisites:

1. Basic knowledge of Linux and Windows operating systems.
2. Understanding of networking concepts (TCP/IP, ports, protocols).
3. Familiarity with cybersecurity fundamentals and ethical hacking principles.
4. Experience with command-line tools and scripting (Bash, Python preferred).

Course Objectives

1. Understand and exploit vulnerabilities in wireless and IoT networks.
2. Utilize Metasploit for system exploitation and post-exploitation techniques.
3. Execute social engineering attacks, phishing campaigns, and bypass security controls.
4. Analyze malware behavior, perform reverse engineering, and debug malicious code.
5. Conduct advanced penetration testing and red team operations to assess security defenses.

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

1. Capture, analyze, and crack Wi-Fi traffic using advanced tools.
2. Exploit vulnerabilities in IoT devices and misconfigured systems.
3. Use Metasploit for penetration testing, payload execution, and credential dumping.
4. Execute social engineering attacks and bypass multi-factor authentication.
5. Perform malware analysis, reverse engineering, and sandbox-based investigations.
6. Simulate real-world attacks, bypass security measures, and generate professional reports.

Unit	Course Contents	CO
Unit 1	**Wireless & IoT Hacking**	**CO 1**

1. Capture Wi-Fi traffic using Airodump-ng
2. Crack WEP/WPA2 Wi-Fi passwords using Aircrack-ng
3. De-authenticate clients from a Wi-Fi network using Aireplay-ng
4. Perform Evil Twin attack to steal Wi-Fi credentials
5. Exploit Bluetooth vulnerabilities using Hciconfig & Bluesniff
6. Extract firmware from an IoT device for vulnerability analysis
7. Exploit a misconfigured IoT device (Smart Camera, Router, or Smart Plug)

Unit 2	**Exploiting Systems Using Metasploit**	**CO 2**

1. Perform a Metasploit scan for vulnerable services
2. Exploit a Windows system using Metasploit & Meterpreter
3. Generate & execute a payload using Msfvenom
4. Maintain persistence using Metasploit post-exploitation modules
5. Extract system credentials using Hashdump & Credential Dumping
6. Exploit an unpatched Linux service using Metasploit

7. Perform remote code execution on a vulnerable machine

Unit 3	Social Engineering & Phishing Attacks	CO 3

1. Create a phishing email using GoPhish
2. Clone a login page to capture credentials using Social Engineering Toolkit (SET)
3. Bypass 2FA using Evilginx2
4. Execute a Rubber Ducky USB attack
5. Perform a voice phishing (vishing) attack simulation

Unit 4	Malware Analysis & Reverse Engineering	CO 4

1. Perform static analysis on a malware sample using PE Studio
2. Use Wireshark to analyze malware network activity
3. Introduction to IDA Pro
4. Intro to OllyDbg
5. Extract strings from malware using `strings` command

Unit 5	Penetration Testing	CO 5

1. Conduct a full penetration test on a network (reconnaissance to exploitation)
2. Perform a red team exercise against a secure environment
3. Use Scapy to create fragmented packets and observe how a firewall handles `them`
4. Write a professional penetration testing report with remediation steps

Note: Perform All this topic on try hack me also for home practice

Reference Book:

1. Hacking: The Art of Exploitation by Jon Erickson
2. The Web Application Hacker's Handbook: Discovering and Exploiting Security Flaws by Dafydd Stuttard and Marcus Pinto
3. The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy by Patrick Engebretson
4. Penetration Testing: A Hands-on Introduction to Hacking by Georgia Weidman

Savitribai Phule Pune University
As per NEP
S.Y.B.Sc. (Cyber and Digital Science)
CDS252 MJ
Title: Advance Network Security

Teaching Scheme 2 Hours / week	No. of Credit 02	Examination Scheme CA :15 marks UA: 35 marks

Prerequisites:
1. Basic knowledge of Networking and ISO/OSI model.
2. Basic knowledge of security concepts, authentication, and access control.
3. Knowledge of Linux and Windows security concepts

Course Objectives
1. Understand the fundamental concepts of network security and its importance in modern communication.
2. Explore various cryptographic techniques and their role in securing data transmission.
3. Analyze different network security protocols and their implementation.
4. Study intrusion detection and prevention mechanisms for securing networks.
5. Examine security challenges in web applications and API security.

Course Outcomes: On completion of the course, student will be able to
1. Understand Advanced Network Security Concepts
2. Understand Cryptographic Techniques
3. Secure Network Architectures and Protocols also Identify and Mitigate Cyber Threats
4. Implement Network Security Devices
5. Implement Security Policies and Risk Management and Investigate and Respond to Security Incidents

Course Contents

Chapter 1	**Introduction to Network Security**	**4 hours**	**CO1**

1.1 Basics of Network Security
1.2 Security Goals: Confidentiality, Integrity, Availability (CIA)
1.3 Security Threats and Attacks: Malware, Phishing, DoS/DDoS
1.4 Security Policies and Risk Management
OSI Security Architecture

Chapter 2	**Cryptographic Techniques**	**8 hours**	**CO2**

2.1 Cryptography, plain text and cipher text, cipher key,
2.2 Categories of cryptography-Symmetric key, asymmetric key
2.3 Key Exchange Mechanisms (Diffie-Hellman)
2.4 Symmetric key cryptography
2.5.1 Traditional ciphers – substitution cipher, shift cipher, Transposition cipher
2.5.2 Simple Modern ciphers-XOR, Rotation cipher, s-box,p-box
2.5.3 Modern round ciphers-DES
2.5.4 Mode of operation-ECB,CBC,CFB,OFB
2.6 Asymmetric key cryptography-RSA Security Services
2.6.1 Message confidentiality-With Symmetric key cryptography, with asymmetric key cryptography
2.6.2 Message integrity-Document and fingerprint, message and message digest
2.6.3 Message authentication-MAC,HMAC

2.6.4 Digital signature
2.6.5 Entity Authentication-Passwords, Fixed passwords challenge-response

Chapter 3	Network Security Protocols	8 hours	CO3

3.1 Secure Socket Layer (SSL) & Transport Layer Security (TLS)
3.1.1 SSL services
3.1.2 Security parameters
3.1.3 Sessions and connections
3.1.4 Transport layer security
3.2 Internet Protocol Security (IPSec)
3.2.1 Two modes
3.2.2 Two security protocols
3.3.3 Services provided by IPSec
3.3.4 Security association
3.3Virtual Private Networks (VPNs)
3.4Wireless Security Protocols (WEP, WPA, WPA2, WPA3)

Chapter 4	Intrusion Detection and Prevention	4 hours	CO4

4.1 Firewalls: Types and Configurations
4.2 Intrusion Detection Systems (IDS) & Intrusion Prevention Systems (IPS)
4.3 Honeypots and Honeynets
4.1 Security Information and Event Management (SIEM)

Chapter 5	Web & API Security	6 hours	CO5

5.1 OWASP Top 10 Security Risks
5.2 Secure Authentication and Authorization (OAuth, JWT)
5.3 Secure API Design and Implementation
5.4 Web Application Firewalls (WAF)
5.5 Emerging Threats and Security Trends
5.5.1 Cloud Security and Zero Trust Architecture
5.5.2 AI and Machine Learning in Cyber security

Reference Book:

1. Behourz A Forouzan, Cryptography And Network Security, McGraw Hill Education, 2015. 2.William Stallings,Cryptography And Network Security,Prentice Hall, 2018.
3. Atul Kahate,Cryptography And Network Security, TMH, 2019.
4. Cryptography and Network Security: Principles and Practice, William Stallings, 7th edition, Pearson Education
5. Network Security Essentials: Applications and Standards (For VTU), William Stallings, 3rd edition, Pearson Education

Savitribai Phule Pune University
S.Y.B.Sc. (Cyber and Digital Science)
CDS-221-VSC-P
Title: Database Management System

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

Course Objectives: -The course should enable the student:

- Learn how to design databases using ER models to represent real-world scenarios.
- Gain hands-on experience in creating and modifying databases, tables, and constraints (Linux platform).
- Develop skills to insert, update, delete, and retrieve data using SQL.
- Learn how to use joins, sub queries, and set operations for complex data retrieval.
- Implement views and indexing techniques to improve query performance.

Course Outcome: The students should be able to

- Construct ER diagrams for real-world applications.
- Create and manage databases using DDL commands effectively.
- Perform DML operations and write optimized queries using SELECT statements.
- Execute joins, sub queries, and set operations for efficient data analysis.
- Apply indexing and views to optimize database operations.

Practical Assignment:

Module 1: Database Design and ER Model

1. **Database Concepts and Normalization**
2. **Understanding ER Models**
    - Create an ER diagram for a case study (e.g., Hospital Management, Online Shopping, and Library System).
    - Identify entities, attributes, relationships, and cardinality.

Module 2: SQL Basics – Data Definition and Constraints

2. **Creating and Modifying Databases (DDL Commands)**
    - Create a database and define multiple tables with appropriate data types.
    - Implement primary key, foreign key, unique, not null, check, and default constraints.
    - Alter tables (add/drop/rename columns, modify constraints).
    - Drop tables and databases.
    - Truncate

Module 3: Data Manipulation and Retrieval

3. **Data Insertion, Modification, and Deletion (DML Commands)**
    - Insert single and multiple records into tables.
    - Update specific and multiple records.
    - Delete specific and all records.

4. **Querying Data using SELECT Statements**
    - Use various SQL operators (AND, OR, BETWEEN, NOT, IN, IS NULL, LIKE).
    - Apply aggregate functions (AVG, COUNT, MAX, MIN, and SUM).
    - Use DISTINCT, ORDER BY, GROUP BY, HAVING.

Module 4: Advanced SQL – Joins and Sub queries

5. **Working with Joins**
    - Perform different types of joins:
        - Inner Join
        - Left, Right, and Full Outer Joins
        - Self-Join
6. **Sub queries and Set Operations**
    - Write nested queries using SELECT, INSERT, UPDATE, and DELETE.
    - Use set operations: UNION, UNION ALL, INTERSECT, EXCEPT.

Module 5: Views and Indexing

7. **Views and Indexing for Performance Optimization**
    - Create and manage views (CREATE VIEW, UPDATE VIEW, and DROP VIEW).
    - Implement indexing (Single-level, Multi-level).
    - Compare query performance with and without indexing.

Reference Books :

- Beginning Databases with PostgreSQL: From Novice to Professional, Richard Stones, Neil Matthew, ISBN:9781590594780
- Henry F. Korth, Abraham Silberschatz, S. Sudarshan, “Database System Concepts”, Tata McGraw-Hill Education
- Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw Hill Education (India) Private Limited, 3rd Edition.
- MySQL: The Complete Reference, Vikram Vaswani, McGraw Hill Professional, 2004

Websites for Reference:

1. **NPTEL Online Course:** https://nptel.ac.in/courses/106/105/106105175/
2. **MIT Open Courseware (Databases):** https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-830-database-systems-fall-2010/
3. **Stanford Online - Databases Course:** https://online.stanford.edu/courses/cs145-introduction-databases
4. **Khan Academy - SQL Tutorial:** https://www.khanacademy.org/computing/computer-programming/s
5. https://www.w3schools.com/sql/
6. https://www.geeksforgeeks.org/dbms/
7. https://www.tutorialspoint.com/dbms/index.htm
8. https://mode.com/sql-tutorial/

Savitribai Phule Pune University
S.Y.B.Sc. (Cyber and Digital Science)
CDS-291-MN: Advanced Web Technologies Syllabus

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

Prerequisites

1. HTML5, CSS3
2. Core PHP

Course Objectives: -

1. To Learn different technologies used at client Side Scripting Language
2. To Learn XML and XML parsers.
3. To Learn Database connectivity using PHP
4. To Learn AJAX to make our application more dynamic.
5. To Learn basic concepts of NodeJS.

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

CO1: Understand concepts like setting response headers, PHP error handling etc.
CO2: Interpret and formulate XML queries.
CO3: To learn database handling with PHP.
CO4: Learn to build website AJAX framework
CO5: Understand technical concepts behind Node JS.

Course Contents

Chapter 1	**Introduction to Web Techniques**	**4 hours**	**CO1**

1.1 Variables
1.2 Server information Processing forms
1.3 Setting response headers
1.4 Maintaining state
1.5 PHP error handling

Chapter 2	**XML**	**6 hours**	**CO2**

2.1 What is XML?
2.2 XML document Structure
2.3 PHP and XML
2.4 XML parser
2.5 The document object model (DOM)
2.6 DOM Events(onmouseup, onmousedown, onclick, onload, onmouseover, onmouseout).
2.7 The simple XML extension
2.8 Changing a value with simple XML

Chapter 3	**Database Connectivity**	**6 hours**	**CO3**

3.1 **Introduction to MySQL and Database Concepts**
Overview of relational databases, tables, fields, and SQL basics (SELECT, INSERT, UPDATE, DELETE).
3.2 **Connecting PHP with MySQL Database**
Using mysqli_connect () or PDO to establish a connection to the database.
3.3 **Executing SQL Queries from PHP**

Performing SQL operations using mysqli_query () or PDO::query(), handling query results.

3.4 **Fetching and Displaying Data**
Retrieving data using mysqli_fetch_assoc(), mysqli_fetch_array() or PDO fetch methods.

3.5 **Error Handling and Security Measures**
Using prepared statements (mysqli_prepare() or PDO::prepare()) to prevent SQL injection and handle database errors securely.

3.6 PEAR DB basics

Chapter 4	**Introduction of AJAX**	**6 hours**	**CO4**

4.1 AJAX web application model
4.2 AJAX –PHP framework Performing
4.3 AJAX validation Handling XML data using php and AJAX
4.4 Connecting database using php and AJAX

Chapter 5	**NodeJS**	**8 hours**	**CO5**

5.1 Introduction to Node JS
5.2 What is Node JS?
5.3 Advantages of Node JS
5.4 Traditional Web Server Model
5.5 Node.js Process Model
5.6 Install Node.js
5.7 Working in REPL
5.8 Module and Module types
5.9 What is NPM?
5.10 Adding dependency in package .json

Reference Books:

1. Web Technologies, Black Book, Dreamtech Press
2. Web Applications : Concepts and Real World Design, Knuckles, Wiley-India
3. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson Education
4. Programming PHP By Rasmus Lerdorf and Kevin Tatroe, O'Reilly publication

E-Books and Online Learning Material

1. https://www.w3schools.com
2. https://wwwtutorialspoint.com
3. https://www.php.net

Savitribai Phule Pune University
S.Y.B.Sc. (Cyber and Digital Science)
Subject Code: OE-251-CDS-T
Subject Name: AI for Everyone - II

Teaching Scheme: 2 hours / week	No. of Credits: **2**	Examination Scheme: CA:15 Marks UA: 35 Marks

Course Objectives: -

1. Understand the basics of artificial intelligence and its subfields.
2. Explore real-world applications of AI across different industries.
3. Gain insights into the ethical, social, and economic implications of AI.
4. Develop an appreciation for the potential of AI to drive innovation and transformation.

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

CO1: To understand different types if AI Models
CO2: To understand content optimization using AI.
CO3: To understand Animations and motions in AI
CO4: To understand Transcription of text using AI
CO5: To Understand uses of AI in Data Science.

Course Contents

Unit 1	**Advanced AI Fundamentals & Trends**	**6 hours**	**CO1**

1.1 Deep Dive into AI, Machine Learning & Deep Learning
1.2 Types of AI Models: Generative AI, NLP, Computer Vision, Reinforcement Learning
1.3 Latest AI Trends: AGI, Large Language Models (LLMs), and multimodal AI
1.4 Exploring AI Frameworks & APIs: OpenAI, Hugging Face, Google AI

Unit 2	**AI for Advanced Text & Content Creation**	**6 hours**	**CO2**

2.1 AI for Long-form Writing & Reports
2.2 Automating Research & Citation Management
2.3 AI for SEO & Content Optimization
2.4 Using AI for Professional Emails & Business Writing

Unit 3	**Advanced AI for Image & Video Processing**	**6 hours**	**CO3**

3.1 AI Image Generation Beyond Basics
3.2 Deepfake Technology & Ethical Concerns
3.3 AI Video Editing & Creation
3.4 AI Animation & Motion Capture

Unit 4	**AI in Audio, Speech, and Music**	**6 hours**	**CO4**

4.1 Advanced AI Voice Cloning & Speech Synthesis
4.2 AI for Podcasting & Audiobooks
4.3 Music Composition with AI
4.4 Speech-to-Text & AI Transcription

Unit 5	**AI for Coding, Development & Automation**	**6 hours**	**CO5**

5.1 AI-Powered Code Generation & Debugging
5.2 AI for No-Code & Low-Code Development
5.3 Automating Workflows & AI Agents

5.4 AI in Data Science & Analytics
Reference Books:
1. **Artificial Intelligence: A Modern Approach** – Stuart Russell & Peter Norvig. 2. **Practical AI for Business Leaders** – Anand S. Rao 3. **AI-Powered Automation Handbook** – Will Kelly 4. **AI for Content Creators: How to Use AI Tools for Writing and Marketing** – Rob Lennon 5. **Human Compatible: Artificial Intelligence and the Problem of Control** – Stuart Russell

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

SEC251CDSP-241: Principles of Operating Systems

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

Prerequisites
1. Basics of mathematics

Course Objectives: -

1. To understand the concept of operation system and its principle
2. To study the various functions and services provided by operating system
3. To understand the concept of process, memory, deadlock handling
4. To study the different methods of CPU Scheduling, Disk Scheduling and Page replacements algorithms

Course Outcomes: - On completion of the course, student will be able to–
CO1. Basic concepts of operating System.
CO2. Processes and CPU Scheduling by operating system, Threads
CO3. Synchronization in process and threads by operating system
CO4. Deadlock
CO5. Disk scheduling Mechanism
CO6. Memory management by operating system using with the help of various schemes like demand paging

Course Contents

Chapter 1	**Introduction to Operating System and Structure**	**3 hours**	**CO1**

1.1 Operating Systems Overview- system Overview and Functions of operating systems
1.2 Operating system Services, Operating system structure
1.3 Types of Operating Systems - Time-Sharing Systems, Personal Computer Systems, Parallel Systems, Distributed Systems, Real Time Systems,
1.4 System calls Types of System calls and their working.

Chapter 2	**Processes and CPU Scheduling**	**8 hours**	**CO2**

2.1 Process & Thread Concept – The processes, Process states, Process control block, Thread
2.2 Process Scheduling – Scheduling queues, Schedulers, context switch
2.3 Scheduling Concepts- CPU-I/O burst cycle, Scheduling Criteria, CPU scheduler
2.4 Scheduling Algorithms – Types of Scheduling-preemptive and non-preemptive , FCFS, SJF, SRTF,Priority scheduling, Round-robin scheduling,

Chapter 3	**Process Synchronization**	**4 hours**	**CO3**

3.1 Principles Of Concurrency, Cooperating Process,
3.2 Critical Section Problem
3.2 Mutual Exclusion, Progress, Bounded Wait
3.4 Semaphores
3.3 Message Passing

3.4 Classic Problems of Synchronization – The bounded buffer problem, The reader writer problem, The dining philosopher problem			
Chapter 4	**Deadlock**	**8 hours**	**CO4**
4.1 Deadlock Characterization – Necessary conditions 4.2 Deadlock Handling Methods- 4.2.1 Prevention 4.2.2 Deadlock Avoidance - Safe state, Resource Allocation graph algorithm, Banker's Algorithm 4.2.3 Deadlock Detection and Recovery from Deadlock – Process termination, Resource preemption 4.2.4 Ignorance			
Chapter 5	**Memory Management**	**7 hours**	
5.1 Background – Basic hardware, Address binding, Logical versus physical address space, Swapping 5.2 Contiguous Memory Allocation –First Fit, Best Fit, Worst Fit, Fragmentation, types of fragmentation, Compaction 5.3 Paging and Segmentation – Basic Concepts 5.4 Demand paging 5.6 Page replacement – FIFO, Optimal, LRU, MRU,LFU,MFU			
Reference Books:			
1. Operating System Concepts by Silberschatz, Galvin, Wiley publication 2. Operating Systems: Internals and Design Principles, Seventh Edition, William Stallings,PEARSON 3. Modern Operating Systems by Andrew Tanenbaum, Prentice-Hall 4. Operating Systems by Deitel, Deitel and Choffnes, Pearson Education			