

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 2025-26

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 Project		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	AI for Everyone I / Web design I / Digital Marketing I	2		2		15	35	50
AEC(2)	AEC-201-T/P	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			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 Project		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/P	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			550

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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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:		
<ol style="list-style-type: none"> 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 2 Hours / week	No. of Credit 02	Examination Scheme 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: <ol style="list-style-type: none"> 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 2 hours / week	No. of Credits 2	Examination Scheme CE: 15 Marks EE: 35 Marks
Prerequisites: <ul style="list-style-type: none"> • Knowledge of Python programming. • Basic knowledge of algorithms and problem solving 		
Course Objectives: <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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: <ul style="list-style-type: none"> • "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 (Pramana): 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. Shamasastri (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 : <ul style="list-style-type: none"> ● 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 : <ol style="list-style-type: none"> 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 sevice, Wrox publication 5. Mastering PHP , BPB Publication 6. PHP for Beginners, SPD publication 		

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
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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 inequality			

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:			
<ol style="list-style-type: none"> 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 			



सावित्रीबाई फुले पुणे विद्यापीठ, पुणे
[Savitribai Phule Pune University, Pune]

अभ्यासक्रम

पदविका / पदवी, वर्ष-२ (सत्र-३ व ४)

विषय – मराठी (AEC)

(शैक्षणिक वर्ष २०२५-२६ पासून)

[Level 5.0, UG Degree, Year-II]

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

मराठी विषयाचा पुनर्रचित अभ्यासक्रम - जून २०२५ पासून

Ability Enhancement Course: Marathi

AEC : Marathi

S. Y. BSc (Cyber & Digital Science)

U.G. मराठी – द्वितीय वर्ष (सत्र-३) अभ्यासक्रम [Level 5.0]			
Course Type	Ability Enhancement Course AEC - मराठी (Marathi)	Credits- 2 (Theory)	Weeks- 15 Hours- 30
AEC-201- MAR	भाषा आणि जीवनव्यवहार	Int. Marks 15	Ext. Marks 35

अभ्यासपत्रिकेविषयी :

सदर अभ्यासपत्रिकेतून भाषेचे स्वरूप, भाषानिर्मितीविषयक विविध सिद्धांत, भाषेची कार्ये आणि वैशिष्ट्ये, भाषाभ्यासाची अंगे व भाषाभ्यासाची आवश्यकता, भाषा आणि जीवनव्यवहार यांच्यातील परस्परसंबंध, व्यावहारिक भाषा, शास्त्रीय साहित्याची भाषा, ललित साहित्याची भाषा स्वरूप, कार्यालयीन भाषा, परिभाषा यांचे स्वरूप व आवश्यकता समजून घेण्यास मदत होईल.

अभ्यासपत्रिकेची उद्दिष्टे :

- भाषेचे स्वरूप व कार्ये यांचा परिचय करून घेणे.
- जीवनव्यवहारानुसार भाषेचा वापर व त्यानुसार निर्माण होणाऱ्या प्रकारांचे आकलन करून घेणे .
- मराठी भाषेचा परिभाषा सापेक्ष आणि शैली सापेक्ष विकास जाणून घेणे.
- मराठी भाषेच्या उपयोजनात्मक कौशल्यांचा विकास साधणे.

अभ्यासक्रम :

घटक	तपशील	श्रेयांक	घड्याळी तास
१	भाषेचे स्वरूप व कार्ये १.१ भाषा स्वरूपचर्चा १.२ भाषेची निर्मिती : विविध सिद्धांत १.३ भाषारूपे : मौखिक आणि लिखित (भाषा आणि लिपी) १.४ भाषेची कार्ये आणि वैशिष्ट्ये १.५ भाषाभ्यासाची अंगे व भाषाभ्यासाची आवश्यकता	१	१५
२	भाषा आणि जीवनव्यवहार : परस्परसंबंध २.१ व्यावहारिक भाषेचे स्वरूप २.२ शास्त्रीय साहित्याच्या भाषेचे स्वरूप २.३ ललित साहित्याच्या भाषेचे स्वरूप २.४ कार्यालयीन भाषेचे स्वरूप २.५ परिभाषा : स्वरूप व आवश्यकता	१	१५

अभ्यासपत्रिकेची अध्ययन निष्पत्ती (COs) :

या अभ्यासपत्रिकेच्या अध्ययनातून विद्यार्थ्यांमध्ये पुढील क्षमतांचा विकास होईल,

Cognitive Ability	Course Outcomes	Teaching Learning Method
Co-1 Remember	भाषेचे स्वरूप, वैशिष्ट्ये आणि कार्य याविषयी माहिती सांगता येईल.	व्याख्यान
Co-2 Understanding	भाषा आणि जीवनव्यवहार याचे आकलन होईल.	व्याख्यान, स्वयं-अध्ययन
Co-3 Applying	जीवनव्यवहारानुसार भाषेचा वापर करण्याची प्रेरणा मिळेल.	वाचन, लेखन
Co-4 Analyzing	भाषा आणि जीवनव्यवहाराच्या संदर्भात विश्लेषणक्षमता विकसित होईल.	आशय विश्लेषण
Co-5 Evaluating	भाषेच्या विविध स्तरावरील उपयोजन विषयक समज विकसित होईल.	रसग्रहण
Co-6 Creating	मराठी भाषेच्या उपयोजनात्मक कौशल्यांच्या अभ्यासातून अनुभवमांडणीची कला अवगत होईल.	स्व-अनुभवांचे सादरीकरण

U.G. मराठी – द्वितीय वर्ष (सत्र-४) अभ्यासक्रम [Level 5.0]			
Course Type	Ability Enhancement Course AEC - मराठी (Marathi)	Credits- 2 (Theory)	Weeks-15 Hours-30
AEC-251-MAR	भाषा आणि संवादकौशल्ये	Int. Marks 15	Ext. Marks 35

अभ्यासपत्रिकेविषयी :

सदर अभ्यासपत्रिकेतून भाषा आणि भाषिक कौशल्ये यांचे स्वरूप व सहसंबंध, प्रमाणभाषाविषयक लेखन नियम, भाषा आणि संवादकौशल्ये यांचे स्वरूप व सहसंबंध, प्राथमिक संवादकौशल्ये तसेच प्रगत संवादकौशल्ये समजून घेता येतील.

अभ्यासपत्रिकेची उद्दिष्टे :

- भाषेच्या स्वरूपाचा व भाषिककौशल्यांचा परिचय करून घेणे.
- जीवनव्यवहारानुसार भाषिककौशल्यांच्या वापराचे स्वरूप जाणून घेणे .
- जीवनव्यवहारानुसार संवादकौशल्यांचा परिचय करून घेणे.
- भाषिककौशल्ये व संवादकौशल्ये यांच्यातील परस्पर साहचर्याचे आकलन करून घेणे .
- भाषिक कौशल्ये व संवादकौशल्ये यांचे उपयोजनात्मक कौशल्यांचा विकास साधणे.

अभ्यासक्रम :

घटक	तपशील	श्रेयांक	घड्याळी तास
१	भाषा आणि भाषिक कौशल्ये : स्वरूप व सहसंबंध १.१ भाषा : उच्चारण आणि लेखन १.२ भाषा : श्रवण आणि संभाषण १.३ भाषा : लिपी आणि लेखन (प्रमाणभाषाविषयक लेखन नियम) १.४ लेखनविषयक नवीन शासकीय सूचना	१	१५
२	भाषा आणि संवादकौशल्ये : स्वरूप व सहसंबंध २.१ प्राथमिक संवादकौशल्ये : श्रवण, वाचन, संभाषण, भाषण, चिंतन, लेखन २.२ प्रगत संवादकौशल्ये : सारांश लेखन, भाषांतर, कल्पना विस्तार, निवेदनात्मक व संवादात्मक लेखन, मुलाखत लेखन	१	१५

अभ्यासपत्रिकेची अध्ययन निष्पत्ती (COs) :

या अभ्यासपत्रिकेच्या अध्ययनातून विद्यार्थ्यांमध्ये पुढील क्षमतांचा विकास होईल,

Cognitive Ability	Course Outcomes	Teaching Learning Method
Co-1 Remember	भाषा आणि भाषिक कौशल्ये यांचे स्वरूप व सहसंबंधा विषयी माहिती सांगता येईल.	व्याख्यान, स्वयं-अध्ययन
Co-2 Understanding	भाषा आणि संवादकौशल्ये यांचे स्वरूप व सहसंबंध यांचे आकलन होईल.	व्याख्यान, साहित्यप्रकारांचे वाचन
Co-3 Applying	प्राथमिक संवादकौशल्यांचा वापर करण्याची प्रेरणा मिळेल.	सादरीकरण
Co-4 Analyzing	प्रगत संवादकौशल्यांच्या संदर्भात विश्लेषणक्षमता विकसित होईल.	आशय विश्लेषण
Co-5 Evaluating	भाषा आणि संवादकौशल्ये विषयक समज विकसित होईल.	रसग्रहण
Co-6 Creating	भाषिक कौशल्ये व संवादकौशल्ये यांचे उपयोजन करण्याचे कौशल्य अवगत होईल.	स्व-अनुभवांचे सादरीकरण

संदर्भ ग्रंथ :

- शासनव्यवहारात मराठी (समस्या: स्वरूप: प्रक्रिया) भाषा संचालनालय, शासकीय फोटो झिंको मुद्रणालय, पुणे १९९७.
- वैखरी, डॉ. अशोक केळकर, स्नेहवर्धन प्रकाशन, पुणे, १ जानेवारी २०००.
- गीतयात्री, माधव मोहोळकर, मौज प्रकाशन, मुंबई, १ जानेवारी २००४.
- सृजनात्मक लेखन, आनंद पाटील, पद्मगंधा प्रकाशन, पुणे, २००५ .
- व्यावहारिक मराठी भाषा, शरदिनी मोहिते, स्नेहवर्धन प्रकाशन, पुणे, १ जानेवारी २००८.
- व्यासपीठ, महादेव वाळूज, अक्षरमानव प्रकाशन, पुणे, मे २०११.
- जाहिरात शास्त्र, डॉ. वंदना खेडीकर, स्नेहवर्धन प्रकाशन, पुणे, १ जानेवारी २०१३.
- सायबर- संस्कृती, डॉ. रमेश वरखेडे, साकेत प्रकाशन प्रा. लि. औरंगाबाद, १ जानेवारी २०१५.
- व्यावहारिक मराठी, पाठ्यपुस्तक, पुणे विद्यापीठ प्रकाशन, पुणे.
- बातमीची कार्यक्षेत्रे, यशवंतराव चव्हाण महाराष्ट्र मुक्त विद्यापीठ, नाशिक.
- मराठीचिचे मंदिरी, श्री.ना. चाफेकर, स्नेहवर्धन प्रकाशन, पुणे,
- मराठी लेखन मार्गदर्शिका, यास्मिन शेख, राज्य मराठी विकास संस्था, मुंबई.
- उपयोजित अभ्यासक्रम, मराठी भाषेची संवादकौशल्ये, यशवंतराव महाराष्ट्र मुक्त विद्यापीठ, नाशिक.
- व्यावहारिक मराठी- डॉ. कल्याण काळे व डॉ. द.दि.पुंडे, निराली प्रकाशन, पुणे.
- मराठी साहित्य : काही लेखनबंध, डॉ. सुधाकर शेलार, स्वरूप प्रकाशन, औरंगाबाद.
- व्यावहारिक मराठी, डॉ. लीला गोविलकर, डॉ. जयश्री पाटणकर, स्नेहवर्धन प्रकाशन, पुणे.
- व्यावहारिक उपयोजित मराठी आणि प्रसारमाध्यमांची कार्यशैली : संपादक - डॉ. संदीप सांगळे, डायमंड पब्लिकेशन्स, पुणे.
- भयंकर सुंदर मराठी भाषा, डॉ. द. दि. पुंडे, मॅजेस्टिक प्रकाशन, पुणे.
- पत्रकारितेचा स्वभाव, ल. न. गोखले, पुणे विद्यापीठ प्रकाशन, पुणे.
- पत्रकारिता : स्वरूप आणि चिकित्सा, महावीर जोधळे, सुविधा प्रकाशन, पुणे.
- भाषांतर मीमांसा, कल्याण काळे, अंजली सोमण, प्रतिमा प्रकाशन, पुणे.
- नवभारत, व्यावहारिक मराठी विशेषांक, ऑगस्ट-सप्टें, १९८२, प्राज्ञ पाठशाला, वाई.
- व्यावहारिक मराठी- ल.रा.नसिराबादकर, फडके प्रकाशन, कोल्हापूर.

२४. भाषाचिंतन, डॉ. केशव देशमुख, सकाळ प्रकाशन, पुणे
२५. भाषिक सर्जन आणि उपयोजन, गवस राजन, शिंदे अरुण, पाटील गोमटेश्वर, दर्या प्रकाशन, पुणे
२६. मराठी भाषा : आज आणि उद्या, अनिल गवळी, दर्या प्रकाशन, पुणे.
२७. फीचर रायटिंग, प्रसन्नकुमार अकलूजकर, श्रीविद्या प्रकाशन, पुणे.
२८. जाहिरातीचे युग, केशव केळकर.
२९. दूरदर्शनसाठी लेखन, केशव केळकर.

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
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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: <ul style="list-style-type: none"> 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			
<p>Reference Book:</p> <ol style="list-style-type: none"> 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 Egebreton
4. Penetration Testing: A Hands-on Introduction to Hacking by Georgia Weidman

<p style="text-align: center;">Savitribai Phule Pune University As per NEP S.Y.B.Sc. (Cyber and Digital Science) CDS252 MJ Title: Advance Network Security</p>			
Teaching Scheme 2 Hours / week	No. of Credit 02	Examination Scheme CA :15 marks UA: 35 marks	
<p>Prerequisites:</p> <ol style="list-style-type: none"> 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 			
<p>Course Objectives</p> <ol style="list-style-type: none"> 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. 			
<p>Course Outcomes: On completion of the course, student will be able to</p> <ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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 <p style="padding-left: 20px;">OSI Security Architecture</p>			
Chapter 2	Cryptographic Techniques	8 hours	CO2
<ol style="list-style-type: none"> 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) <p>2.4 Symmetric key cryptography</p> <ol style="list-style-type: none"> 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 <p>2.6 Asymmetric key cryptography-RSA Security Services</p> <ol style="list-style-type: none"> 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 3.3 Virtual Private Networks (VPNs) 3.4 Wireless 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
4 hours / week

No. of Credits: 2

Examination Scheme
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 2 hours / week	No. of Credits 2	Examination Scheme CA:15 marks UA: 35 marks	
Prerequisites			
<ol style="list-style-type: none"> 1. HTML5, CSS3 2. Core PHP 			
Course Objectives: -			
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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
<ol style="list-style-type: none"> 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 			

<p>Performing SQL operations using <code>mysqli_query ()</code> or <code>PDO::query()</code>, handling query results.</p> <p>3.4 Fetching and Displaying Data Retrieving data using <code>mysqli_fetch_assoc()</code>, <code>mysqli_fetch_array()</code> or <code>PDO fetch</code> methods.</p> <p>3.5 Error Handling and Security Measures Using prepared statements (<code>mysqli_prepare()</code> or <code>PDO::prepare()</code>) to prevent SQL injection and handle database errors securely.</p> <p>3.6 PEAR DB basics</p>			
Chapter 4	Introduction of AJAX	6 hours	CO4
<p>4.1 AJAX web application model</p> <p>4.2 AJAX –PHP framework Performing</p> <p>4.3 AJAX validation Handling XML data using php and AJAX</p> <p>4.4 Connecting database using php and AJAX</p>			
Chapter 5	NodeJS	8 hours	CO5
<p>5.1 Introduction to Node JS</p> <p>5.2 What is Node JS?</p> <p>5.3 Advantages of Node JS</p> <p>5.4 Traditional Web Server Model</p> <p>5.5 Node.js Process Model</p> <p>5.6 Install Node.js</p> <p>5.7 Working in REPL</p> <p>5.8 Module and Module types</p> <p>5.9 What is NPM?</p> <p>5.10 Adding dependency in package .json</p>			
Reference Books:			
<ol style="list-style-type: none"> 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			
<ol style="list-style-type: none"> 1. https://www.w3schools.com 2. https://www.tutorialspoint.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
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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 of 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 2hours / week	No. of Credits 2	Examination Scheme CA:15 marks UA: 35 marks
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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 1.3Types of Operating Systems - Time-Sharing Systems, Personal Computer Systems, Parallel Systems, Distributed Systems, Real Time Systems, 1.4System 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			