Curriculum Framework

Bachelor of Computer Application
(BCA)
(Department of Computer Science)

As per NEP 2020 and Learning Outcomes-based National Curriculum Framework

(Aligned with NCrF and NHEQF)

Effective From Academic Year 2025-2026

GUJARAT VIDYAPITH: AHMEDABAD

Curriculum Framework of Bachelor of Computer Application (Department of Computer Science)

Published by:

Dr. Himanshu Patel

Registrar

Gujarat Vidyapith

Near Income Tax Office, Ashram Road, Ahmedabad - 380009.

From the Desk of Vice Chancellor…

Dear All,

Any curriculum, at any level, must be firmly grounded in the objectives and goals that an educator or an educational institution aspires to achieve for its students. A course that trains students to solve mathematical equations must be very different from one that teaches them how to play a musical instrument, practice yoga, or conduct social research. Each subject requires its own methods, activities, and learning goals, which is why curriculum design is so important.

Therefore, curriculum is of utmost importance, as it determines how teachers and students will spend their time—in laboratories, in clinical practice, in creative endeavors, or in interactive lectures. It also reflects what a class, a department, a school, or an institution values; what it defines as its mission; and what it expects its graduates to accomplish. In this sense, the curriculum is the map that guides the essentials of learning from the classroom level to the institutional level.

The true success of any curriculum must be judged by its ability to achieve its intended objectives. It is a test of how well an institution—or an individual teacher—understands and articulates those objectives, and how effectively a pathway is created for students to attain success as defined by them. Curriculum is, in fact, a continuous chain of activities designed to translate broad educational goals into concrete practices, learning materials, and observable changes in behavior. A lesson plan, for instance, is curriculum at the classroom level, answering the critical questions: *What do I want my students to know? How can I engage them meaningfully? How will I measure what they have learned?*

For a society to achieve its educational aspirations, the curriculum must be both functional and relevant to its needs. Through careful management of curriculum, effective use of resources, and policies that bring systemic improvements, education can move society toward a more promising future. Indeed, curriculum is the very foundation of any academic institution—without it, the institution would lose its purpose and direction.

At Gujarat Vidyapith, established by Mahatma Gandhi in 1920 with its rich cultural and educational heritage, we remain committed to these ideals and we work with well-defined objectives to prepare our students for a brighter academic and social future.

It gives me immense pride and joy to announce the unveiling of the latest curriculum of Gujarat Vidyapith. This curriculum has been carefully designed in alignment with the objectives and guiding principles of the National Education Policy (NEP) 2020. I take this opportunity to place on record my deep appreciation for the efforts of the teaching faculty of Gujarat Vidyapith, the Members of the Board of Studies, and the Members of the Academic Council. Their dedication and vision have given shape to this comprehensive neo-curriculum, which will guide our students and our institution toward continued excellence.

With best wishes,

Dr. Harshad Patel
Vice Chancellor
Gujarat Vidyapith

Curriculum Framework

Bachelor of Computer Application
(BCA)
(Department of Computer Science)

Effective From Academic Year 2025-2026

Department of Computer Science

Faculty of Information, Communication and Technology

Gujarat Vidyapith

Board of Studies

Chairperson:

Prof. Ajay Parikh
Professor & Dean, Faculty of Information, Communication and Technology, Gujarat Vidyapith, Ahmedabad.

External Experts:

1) **Prof. Rajiv Wankar**
   Professor, University of Hyderabad

2) **Prof. Nilesh Modi**
   Professor, Babasaheb Ambedkar Open University

Members from the Department:

1) **Prof. Dhiren Patel**
   Professor, Faculty of Information, Communication and Technology, Gujarat Vidyapith, Ahmedabad.

2) **Dr. Neepa Shah**
   Associate Professor, Faculty of Information, Communication and Technology, Gujarat Vidyapith, Ahmedabad.

3) **Mr. Kamaleshkumar Salunke**
   Assistant Professor, Faculty of Information, Communication and Technology, Gujarat Vidyapith, Ahmedabad.

4) **Dr. Ruchita Shah**
   Assistant Professor, Faculty of Information, Communication and Technology, Gujarat Vidyapith, Ahmedabad.

PROGRAMME STRUCTURE							
Course Code	Course Name	Hours			Credit	Evaluations	
		Theory	Practical	Total		CCE	TEE
SEMESTER-1							
254510345001	Problem Solving & Basic Programming Language (C)	45	0	45	3	40	60
254510345002	Fundamentals of Computer & Information Technology	45	0	45	3	40	60
254510245003	Web Design-I (Lab Base)	0	60	60	2	40	60
254510245004	Lab Based on C Programing Language	0	60	60	2	40	60
Total		**90**	**120**	**210**	**10**	**160**	**240**
SEMESTER-2							
254510345005	Web Design-II	45	0	45	3	40	60
254510345006	Computer Programming (C)	45	0	45	3	40	60
254510245007	Lab Based on Computer Programming	0	60	60	2	40	60
254510245008	Lab Based on Web Design-II	0	60	60	2	40	60
Total		**90**	**120**	**210**	**10**	**160**	**240**
SEMESTER-3							
255010245009	Fundamentals of Database Management System	30	0	30	2	40	60
255010445010	Object Oriented Programming using Java	60	0	60	4	40	60
255010345011	System Analysis and Design	45	0	45	3	40	60
255010145012	Lab Based on Fundamentals of Database Management System	0	30	30	1	40	60
255010245013	Lab Based on Object Oriented Programming using Java	0	60	60	2	40	60
Total		**135**	**90**	**225**	**12**	**200**	**300**
SEMESTER-4							
255010345014	Data Structures	45	0	45	3	40	60
255010345015	Web Application Development	45	0	45	3	40	60
255010345016	Computer Network	45	0	45	3	40	60
255010345017	Search Engine Optimization (Lab Based)	0	90	90	3	40	60
255010245018	Lab Based on Data Structures	0	60	60	2	40	60
255010245019	Lab Based on Web Application Development	0	60	60	2	40	60
Total		**135**	**210**	**345**	**16**	**240**	**360**
SEMESTER-5							
255510345020	Python Programming	45	0	45	3	40	60
255510445021	Mobile Application Development- Elective-I	60	0	60	4	40	60
255520445022	MOOC*- Elective-II						
255510445023	Internship / Capstone Project	0	120	120	4	40	60
255510345024	Operating System	45	0	45	3	40	60
255510245025	Lab Based on Python Programming	0	60	60	2	40	60
255510245026	Lab Based on Mobile Application Development- Elective	0	60	60	2	40	60
255510245027	Lab Based on **255520445022**						
255510245028	Lab Based on Operating System	0	60	60	2	40	60
255510445029	Major Project (Evaluation in Sixth Semester)	0	0	0	0	0	0
Total		**150**	**300**	**450**	**20**	**280**	**420**
SEMESTER-6							
255510245030	Advanced Data Structures-Elective-I	30	60	90	4	40	60
255510245031	Lab Based on Advanced Data Structures						
265520445036	MOOC*- Elective-II						
265511645035	Internship	0	0	0	16	40	60
Total		**30**	**60**	**90**	**20**	**80**	**120**
GRAND TOTAL		**630**	**900**	**1530**	**88**	**1120**	**1680**

***CCE- Continuous Comprehensive Evaluation; **TEE- Term End Evaluation**

***Student can select a MOOC Course from the list of MOOCs approved and declared by the department at the beginning of every semester**

Programme Summary								
Broad Category of Course	**Sem-1**	**Sem-2**	**Sem-3**	**Sem-4**	**Sem-5**	**Sem-6**	**Total**	**Required**
Major (Core)	3+2=**5**	3+2=**5**	2+1+4+2=**9**	3+2+3+2=**10**	3+2+4+2=**11**	4+16=**20**	**60**	**60**
Minor	3+2=**5**	3+2=**5**	**3**	3+3=**6**	3+2=**5**	**-**	**24**	**24**
Multidisciplinary	**3**	**3**	**3**	**-**	**-**	**-**	**9**	**9**
Ability Enhancement Course	**2**	**2**	**2**	**2**	**-**	**-**	**8**	**8**
Skill Enhancement Course	**3**	**3**	**3**	**-**	**-**	**-**	**9**	**9**
Value Added Courses	**2**	**2**	**-**	**2**	**-**	**-**	**6**	**6-8**
Internship	**-**	**-**	**-**	**-**	**4**	**-**	**4**	**4**
Total	**20**	**20**	**20**	**20**	**20**	**20**	**120**	**120**

Collaborating Organisations

- **Tiny ERP (Odoo)**
- **Tecblic India**
- **Complitech Solution Pvt. Ltd.**
- **CMExpertise Infotech Pvt.Ltd**
- **Yudiz Solutions Pvt Ltd**
- **Qurious Tech**
- **PLUSINFOSYS**
- **Addon Solutions**
- **PerceptionCare**
- **Raimptech Solutions Pvt. Ltd**
- **Xomic infotech**
- **Confidosoft**
- **Serpent Consulting Pvt. Ltd.**
- **Maxgen Technologies Ltd.**
- **Vowels digitech software Pvt. Ltd**
- **IncDesign Agency LLP**
- **Esfina Technology & Solution Pvt. Ltd.**
- **Infoware**
- **Mday Consultancy**
- **MV Clouds Private Limited**
- **NUWAVE COMMUNICATION Inc.**
- **Emerging Five**
- **Neela Spaces Limited**
- **TRENTIUM SOLUTION PRIVATE LIMITED**
- **Echobitz IT Solutions Pvt Ltd**
- **Macdroid Solutions PVT. LTD.**
- **Restrosoft Solutions Pvt. Ltd.**
- **Cilans System**
- **Wibit Solutions LLP**
- **Whitestork software solutions**

Programme Outcomes (POs)

After successful completion of the BCA program, students will be able to:

PO-1	**Discipline Specific Knowledge**	To provide a strong foundation in the principles and practices of computer applications, including programming, databases, networking, web development, operating systems, and advanced (current) topics in the vernacular language.
PO-2	**Problem Analysis**	To develop students' ability to identify, define, and analyze computational problems using logical and algorithmic thinking, relevant especially for solving local and rural challenges.
PO-3	**Experimental Skills**	Graduates will develop the ability to design, implement, and evaluate experiments and projects in the field of computer applications, applying theoretical knowledge to practical scenarios using modern tools and technologies.
PO-4	**Environment And Sustainability**	Develop sustainable IT solutions mindful of environmental impact, aligning with Gandhian principles of simplicity and ecological balance.
PO-5	**Ethics and Values**	Demonstrate ethical decision-making, and commitment to truth, non-violence, simplicity and service in the practice and application of computer science.
PO-6	**Communication**	Communicate technical information effectively in Gujarati and English, enabling outreach to local communities as well as participation in national/global digital initiatives.
PO-7	**Modern Tool Usage**	To train students in using current technologies, software tools, and computing platforms, along with emerging digital practices like Cloud Computing, AI, Data Science, Data Analytics and mobile development.
PO-8	**Teamwork and Leadership**	Communicate technical concepts effectively through written reports and oral presentations, and demonstrate leadership and teamwork skills in multidisciplinary and multicultural settings.
PO-9	**Lifelong Learning**	Encourages continuous learning and adaptability, ensuring graduates stay updated with scientific advancements and societal changes.
PO-10	**Project Management**	Develop organizational and economic skills to effectively plan, manage, and execute software projects, IT operations, and system development tasks in academic, industrial, or field-based environments.
PO-11	**Innovation and Entrepreneurship**	Demonstrate entrepreneurial mindset and innovative thinking by applying computing knowledge to identify real-world problems, design IT-based solutions, and explore startup opportunities in the tech industry.
PO-12	**Societal Contribution**	Apply computing skills and ethical practices to develop technology solutions that address societal needs, promote digital inclusion, and contribute to community development

Programme Specific Outcomes (PSOs)

After successful completion of the BCA program with a specialization in Computer Application, students will be able to:

PSO-1	Apply logic, core computing principles, and programming skills (C, Java, web development, data structures) to model, analyze, and solve complex problems in software development, data analysis, and computer-based applications.	Aligns with PO1 (**Discipline Specific Knowledge**), PO2 (**Problem Analysis**), and Gujarat Vidyapith's emphasis on rigorous academic foundations.
PSO-2	Integrate computational skills (Python, Excel, Google Sheets) and simulations to solve scientific problems, visualize data, and prepare structured reports for research and practice.	Supports PO7 (Modern Tools), Digital Skills, and NEP 2020's emphasis on digital integration
PSO-3	Demonstrate independent and team-based work using scientific methods, fieldwork, and interdisciplinary approaches that promote simplicity, sustainability, and societal relevance in line with Gandhian principles.	Fulfills PO4 (**Environment & Sustainability**) and Gujarat Vidyapith's mission of rural service and value-based education.
PSO-4	Communicate computing concepts effectively in oral and written forms using technical, ethical, and culturally sensitive language, upholding professional values and the spirit of community engagement.	Connects with PO5 (**Ethics and Value**), PO6 (**Communication**), PO12 (**Societal Contribution**), and Gandhian ideals.

CO Attainment Levels (OBE & NEP 2020 Aligned)

COs Attainment Levels	**Level**	**Description**	**Attainment Criteria**
	Level 3	High	≥ 80% of students score above a set performance benchmark
	Level 2	Moderate	60%–79% of students meet the performance benchmark
	Level 1	Low	40%–59% of students meet the performance benchmark
	Level 0	Not Attained	< 40% of students achieve the desired learning outcome

Target Attainment (Benchmark)	**Cos**	**CO-1**	**CO-2**	**CO-3**	**CO-4**
	Target Level (%)	**60**	**60**	**60**	**60**

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 1

Course Code 254510345001	Name of Course Problem Solving & Basic Programming Language (C)	Compulsory
Credit: 03	Teaching Scheme: Theory (45) - Practical (0)	Teaching Hours: 45

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Apply systematic problem-solving techniques by analyzing and modeling problems using appropriate strategies such as top-down, bottom-up, and divide-and-rule approaches.

CO-2: Design logical solutions using pseudocode and flowcharts, and demonstrate an understanding of basic programming language concepts, including structure and compilation of C programs.

CO-3: Implement programming constructs such as operators, decision-making statements, and loops in C to develop structured and efficient programs.

CO-4: Declare, initialize, and manipulate one-dimensional arrays in C, including integer, float, and character arrays, for effective data handling in programming tasks.

Detailed Syllabus

Unit-1. Problem Solving Techniques

1.1. Problem Solving: Introduction of Problem Solving, Steps in Problem Solving, Understanding Problem, Analysis of Problem, Formulate Model, Development of Solution.

1.2. Example Design: Bottom Up Design, Top Down Design, Divide and Rule

1.3. Algorithm: Characteristic of Good Algorithm, Representation of Algorithm

Unit-2. Pseudocode writing and Flow-chart

2.1. Pseudocode writing and Flow-chart for Problem Solving using Flowchart: Pseudo code writing for a problem, Notations of flow-chart, Development of Flow Chart, Various Examples of Flow Control, Case Study based on Computer Problem Solving Strategic Planning- Meaning, Characteristics, Process.

2.2. Programming Language Fundamentals: Introduction to programming language and types of programming language, Concept of Editor, Compiler, Interpreter, Getting started with C, History, Structure of C program, Character Set, Keywords, Identifier, Data Type, Variable and Constant, Compilations & linking C program.

Unit-3. Programming Constructs

3.1. Operators: Formatted Input and output statements, Operators.

3.2. Program Controlling Statements: Decision making and Branching (If, if-else, switch etc) Looping construct (While loop, Do..While loop, For loop), Break, Continue, go to and exit.

Unit-4. Array

4.1. Array handling: Introduction of array, Declaration and initialization of 1-D, Programming using 1-D, Declaration and initialization of integer and float array, character array.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	3	2	1	1	1	2	2	2	2	2	1	**1.83**	3	2	2	2	**2.25**
CO-2	3	2	2	1	1	2	2	1	2	2	2	1	**1.75**	3	3	2	2	**2.50**
CO-3	3	3	3	1	1	1	3	1	2	2	2	1	**1.91**	3	3	3	2	**2.75**
CO-4	3	2	3	1	1	1	3	1	2	1	1	1	**1.66**	2	2	3	3	**2.50**
Avg	**3**	**2.5**	**2.5**	**1**	**1**	**1.25**	**2.5**	**1.25**	**2**	**1.75**	**1.75**	**1**	**1.79**	**2.75**	**2.50**	**2.50**	**2.25**	**2.50**

3 = Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1)	• Classroom Teaching, Tutorial
CO-2 (Unit: 2)	• Classroom Teaching, Tutorial, Presentation
CO-3 (Unit: 3)	• Classroom Teaching, Tutorial, Presentation, Seminar
CO-4 (Unit: 4)	• Classroom Teaching, Tutorial, Presentation, Seminar

Assessment Method

			Exam Component			
	COs	**Marks**	**Class Test**	**Assignment**	**Presentation/ Seminar**	**Involvement**
Continuous Comprehensive Evaluation 40 Marks	**CO-1**	10	5	7	7	6
	CO-2	10	5			
	CO-3	10	5			
	CO-4	10	5			
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

References

Books:

- Balaguruswamy, Programming in ANSI ‘C’, Tata McGowell Hill, 2004
- YasvantKanitkar, Let Us C, BPB publication, 2016
- Mulish Cooper: The Spirit of C, Jaico Pub. House, 19th Edition, 1999
- ReemaThareja, Programming in C, BPB publication, Oxford Higher Education, 2015
- Introduction to Problem Solving, NCERT, 2023
- Introduction to Problem Solving Techniques, IGNOU, 2022
- નીપાશાહ, “ફ્લોચાર્ટથીપ્રોગ્રામીંગસુધી” , યુનિ. ગ્રંથનિર્માણબોર્ડ, 2024

Web & Other Study Resources:

- Swayam& e-PG Pathshala
- Patrick Coxall, Computer Based Problem Solving , https://readthedocs.org/projects/computer-based-problem-solving/downloads/pdf/latest/
- https://ncert.nic.in/
- https://egyankosh.ac.in/

Program - BCA (Faculty of Information, Communication and Technology)
Semester- 1

Course Code 254510345002	Name of Course Fundamentals of Computer & Information Technology	Compulsory
Credit: 03	Teaching Scheme: Theory (45) - Practical (0)	Teaching Hours: 45

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Describe the basic structure and functioning of a computer system, classify different types of computers, and identify common input/output and storage devices used in computing.

CO-2: Perform number system conversions, apply binary arithmetic, and analyze logical operations using Boolean algebra and standard logic gates.

CO-3: Explain the architecture and key components of the motherboard, memory hierarchy, ports, and system buses involved in data processing and communication within a computer system.

CO-4: Identify various system and application software, describe networking concepts including IP addressing and domain names, and analyze hardware configurations through desktop/laptop case studies.

Detailed Syllabus

Unit-1. Basics of Computer

1.1 Introduction: Block diagram of a computer, characteristics of computers, Generation of computer: First, Second, Third, Fourth and Fifth.

1.2 Classification of Computers:

- On the basis of data handling: Analog, Digital, Hybrid
- On the basis of Size: Mini, Micro, Mainframe, Super-computer
- On the basis of functionality: Server, Workstation, Embedded computer

1.3 Computer peripherals devices:

- Input Devices: Keyboard, mouse, and touch panel.
- Display Devices: LCD and LED Monitors, Touch Screens
- Printer and Scanner: Dot matrix, Line, Drum, Ink Jet, Laser, scanner (optical and Barcode), web camera
- Magnetic storage & Hard Disk, Optical storage technology, CDs, DVDs. Flash memory, Memory stick (pen drive)
- RFID card and Reader

Unit-2. Data Representation and Number Systems

2.1 Representation: Representation of Numbers, Binary, Octal, Hexadecimal numbers, 1's, 2's complement representation, Characters codes (ASCII, EBCDIC, UNICODE)

2.2 Binary arithmetic: addition, subtraction, Multiplication, and Division

2.3 Shift Operations: Shift Left and Shift Right Operations

2.4 Boolean Algebra and Logical gate: Law of Boolean Algebra, DeMorgan's theorems (two variables), AND, OR, NOT, NAND and NOR Gate

2.5 Conversion of Numbers: Decimal, Binary, Octal, Hexadecimal

Unit-3. Motherboard, Processors, Memory, port, and Computer buses

3.1. **Introduction to Motherboard:** CPU organization, Registers, ALU, Control Unit, execution of instruction Primary Memory: RAM, ROM, Types of RAM and ROM, Introduction to GPU & TPU

3.2. Cache Memory: L1 cache and L2 cache, Introduction to Virtual MemoryShift Operations: Shift Left and Shift Right Operations

3.3. Port: Parallel Port, Serial Port, USB Port, SCSI Port

3.4. Introduction to buses: Read and write cycle, introduction to FSB, PCI Bus and USB

Unit-4. Computer Application &Information Technology

4.1. Introduction to System Software: Introduction to Operating System, Windows and Ubuntu OS, Utility Software, Introduction Application Software, Office automation tools, Business Applications

4.2. Introduction to Network and Internet: History of the Internet, Intranet, Introduction to cloud, IP

Addresses, Domain names, Web browse

4.3. Case Study of Desktops/Laptops : **Introduction to Computer Parts/Configuration:** Processors, Intel i-Family Processor, ARM, AMD, Memory (RAM/ROM), SRAM, DRAM, DDR, ECC, PROM, EEPROM, Flash, Cache, VRAM, External Storage, HDD, SATA SSD, M.2 SSD, Ports, USB, HDMI, Display Port, VGA, D-SUB, Network/Connectivity, Wi-Fi, Wire, Bluetooth, Graphics Card, Slots PCI, PSI-E, PCI-X, M.2 Connector, SATA

Mapping Matrix of POs, PSOs, and COs

	POs													PSOs				
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Avg**	**1**	**2**	**3**	**4**	**Avg**
CO-1	3	2	1	--	--	1	2	1	2	1	--	--	**1.62**	2	2	1	2	**1.75**
CO-2	3	3	2	--	--	1	3	1	2	2	--	--	**2.12**	3	2	2	2	**2.25**
CO-3	3	2	2	--	--	1	2	1	2	1	--	--	**1.75**	2	2	2	1	**1.75**
CO-4	3	2	1	--	--	2	2	2	2	1	--	--	**1.87**	2	3	2	2	**2.25**
Avg	**3**	**2.25**	**1.5**	**0**	**0**	**1.25**	**2.25**	**1.25**	**2**	**1.25**	**0**	**0**	**1.84**	**2.25**	**2.25**	**1.75**	**1.75**	**2**

3 = Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1)	• Classroom Teaching, Tutorial
CO-2 (Unit: 2)	• Classroom Teaching, Tutorial, Presentation
CO-3 (Unit: 3)	• Classroom Teaching, Tutorial, Presentation, Seminar
CO-4 (Unit: 4)	• Classroom Teaching, Tutorial, Presentation, Seminar

Assessment Method

			Exam Component			
	COs	**Marks**	**Class Test**	**Assignment**	**Presentation/ Seminar**	**Involvement**
Continuous Comprehensive Evaluation 40 Marks	**CO-1**	10	5	7	7	6
	CO-2	10	5			
	CO-3	10	5			
	CO-4	10	5			
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

References

Books:

- Pradeep K. Sinha &Priti Sinha ,Computer Fundamentals, BPB,2020
- V. Raja Raman, Fundamentals of Computers, PHI Learning Pvt. Ltd, 2014
- Alexis Leon, Mathews Leon, Information Technology, Vijay Nicole,2019
- Ron White, How computers work, Tech Media, 2015
- Peter Norton, Introduction to computers, McGrawHill, 2017
- Problems and Solutions in Digital Logic and Computer Design, G.K. Publisher,2013

Online Resources & Tools:

- SWAYAM Courses**:** **https://swayam.gov.in**
- e-PG Pathshala

Reference Persons:

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 1

Course Code 254510245003	Name of Course Web Design-I (Lab Based)	Compulsory
Credit: 02	Teaching Scheme: Theory (0) - Practical (60)	Lab Hours: 60

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Describe fundamental internet and web concepts, identify key protocols used in web communication, and develop structured HTML pages using basic tags and formatting elements.

CO-2: Create interactive web content using hyperlinks, tables, images, and forms, and apply foundational JavaScript concepts to enhance form usability.

CO-3: Utilize HTML5 semantic elements, multimedia tags, form enhancements, and Web APIs like local storage and geolocation to build modern, accessible web pages.

CO-4: Design and style web pages effectively using CSS and CSS3 features, including box model, layout techniques, responsive design with media queries, and basic animations and transitions.

Detailed Syllabus

Unit-1. Internet Concepts, Web concepts and HTML

1.1 Internet Concepts: Introduction to Computer Network, Introduction to TCP/IP Reference model, Introduction to Internet and WWW, Protocol: HTTP, HTTPS, IP, TCP, UDP, IMAP, DNS, FTP, SMTP, POP.

1.2 Introduction to HTML: User Interface: Importance and Benefits, Introduction to Markup language, Web page, Web Site, Web Browsers and its working principle, Web server, Web site architecture.

1.3 Structure of web page: <!DOCTYPE> Declaration, Understanding tags, elements, and attribute, HTML tags<html><head><body><p> etc.HTML Formatting Elements <b><i><mark><small><del><ins><sub><sup>, Text effects, Colours, Horizontal rules, Line break.

1.4 Lists: Ordered Lists, Unordered Lists, Glossary/ Description Lists.

Unit-2.

2.1 Link / Anchor: URL Anatomy, Protocol, Host name, folder & file name, Types of URL, Absolute & relative URLs, creating link and anchors: Link to other document, Link to part of same document, Linking Specific location in a document, Bookmark.

2.2 Table: Creating tables <table>, working with rows <tr>, working with data <td>, Table heading <th>, Captions, Spanning rows & columns, Formatting tables.

2.3 Images: Understanding Image basics, Adding images, Image height & width, Alignment, Border, Alternative text, Image as a link, Image links, thumbnails, Image map, Understanding image map types, Creating client-side image map.

2.4 Forms: Why Form? Determining Form content, Information, Usability and Design, Creating Forms, Form tags, child elements, attributes, onSubmit event, submit & reset buttons, Form controls <input/><select> etc. Introduction of JavaScript.

Unit-3. HTML5

3.1. Semantic Tags: <header><footer><nav><Aside><section><picture><figure> etc.

3.2. HTML5 Form: Form element and attributes, Form child elements, Input types, Input type attributes and restrictions (autocomplete, min, max, multiple, pattern and step)

3.3. Audio/Video Tags: Multimedia accessibility, <video><audio><source>

3.4. Web APIs: Web Storage (cookies, local storage and session storage), Geolocation etc.

Unit-4. Cascading Style Sheets

4.1 Introduction to CSS: Inline, Internal & External CSS Implementing CSS, Style sheets with HTML, Developing a Style sheet, Rules, Selector, Declaration, Property & Value, id and class attributes, CSS box property model (padding, margin, border).

4.2 Setting properties: Font, Text, Box, Color & background, Classification, Formatting web page using CSS, Advantage & Disadvantage of CSS.

4.3 CSS3: New in CSS3, Position property, Flex property, Gradient, shadow, rounded corner, animation and transform, Media query.

Mapping Matrix of POs, PSOs, and COs

	POs													PSOs				
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Avg**	**1**	**2**	**3**	**4**	**Avg**
CO-1	3	2	2	--	--	2	2	1	2	1	1	--	**1.77**	2	2	2	1	**1.75**
CO-2	3	3	2	--	--	2	3	1	2	2	2	--	**2.22**	3	3	2	2	**2.5**
CO-3	3	2	2	--	--	2	3	1	2	2	2	--	**2.11**	3	3	3	2	**2.75**
CO-4	3	2	2	--	--	2	3	1	2	2	2	--	**2.11**	2	3	3	2	**2.5**
Avg	**3**	**2.25**	**2**	**0**	**0**	**2**	**2.75**	**1**	**2**	**1.75**	**1.75**	**0**	**2.05**	**2.5**	**2.75**	**2.5**	**1.75**	**2.38**

3 = Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1)	• Classroom Teaching, Tutorial
CO-2 (Unit: 2)	• Classroom Teaching, Tutorial, Presentation
CO-3 (Unit: 3)	• Classroom Teaching, Tutorial, Presentation, Seminar
CO-4 (Unit: 4)	• Classroom Teaching, Tutorial, Presentation, Seminar

Assessment Method

			Exam Component			
Continuous Comprehensive Evaluation 40 Marks	**COs**	**Marks**	**Class Test**	**Assignment**	**Participation**	**Performance**
	CO-1	10	5	13	4	3
	CO-2	10	5			
	CO-3	10	5			
	CO-4	10	5			
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

References

Text & Reference Books:

1 Ivan Bayross , Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP, BPB, 2010

2 Bruce Lawson, Remy Sharp, Introducing HTML5, New Riders, 2012

3 Introducing HTML5 (Voices That Matter) by Bruce Lawson, Remy Sharp

4 Ivan Bayross, HTML5 and CSS3 Made Simple, BPB, 2012

5 Laura Lemay, Rafe Colburn, Jennifer Kyrnin, Mastering Html, CSS & JavaScript Web Publishing, BPB Publication, 2016

Web & Other Study Resources:

1 Swayam& e-PG Pathshala, 2 https://www.w3schools.com/, 3 https://www.tutorialspoint.com/index.htm

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 1

Course Code	Name of Course	Compulsory
254510245004	Lab Based on C Programming Language	
Credit: 02	Teaching Scheme: Theory (0) - Practical (60)	Lab Hours: 60

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Demonstrate a systematic approach to solving problems using algorithmic design and modeling techniques.

CO-2: Apply pseudo code and flowcharting techniques for basic problem-solving and understand fundamental programming concepts.

CO-3: Write and execute C programs using operators, decision-making, and control structures to implement logic.

CO-4: Develop C programs to manipulate arrays for numeric and character data handling and processing.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	3	2	--	--	--	2	1	2	1	2	2	**2**	3	2	2	2	**2.25**
CO-2	3	2	2	--	--	--	2	--	2	1	1	1	**1.75**	2	2	2	1	**1.75**
CO-3	3	3	3	--	--	1	3	1	2	2	2	2	**2.2**	3	3	3	2	**2.75**
CO-4	3	2	3	--	--	--	3	1	2	2	2	2	**2.22**	3	3	2	2	**2.5**
Avg	**3**	**2.5**	**2.5**	**0**	**0**	**1**	**2.5**	**1**	**2**	**1.5**	**1.75**	**1.75**	**2.04**	**2.75**	**2.5**	**2.25**	**1.75**	**2.31**

3 = Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1)	• Experimental Learning, Demonstration and Guided Practice
CO-2 (Unit: 2)	• Experimental Learning, Demonstration and Guided Practice
CO-3 (Unit: 3)	• Experimental Learning, Demonstration and Guided Practice Project-Based Learning, Reflective Practice
CO-4 (Unit: 4)	• Experimental Learning, Demonstration and Guided Practice Project-Based Learning, Reflective Practice

Assessment Method

			Exam Component			
	COs	**Marks**	**Class Test**	**Assignment**	**Participation**	**Performance**
Continuous Comprehensive Evaluation 40 Marks	**CO-1**	10	5	13	4	3
	CO-2	10	5			
	CO-3	10	5			
	CO-4	10	5			
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 2

Course Code 254510345005	Name of Course Web Design-II	Compulsory
Credit: 03	Teaching Scheme: Theory (45) - Practical (0)	Teaching Hours: 45

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Use JavaScript to manipulate the Document Object Model (DOM), implement control structures, handle events, and utilize built-in objects and functions to create interactive client-side web pages.

CO-2: Create dynamic web content by controlling element positioning, visibility, and behavior, as well as implement form validation and sanitization using JavaScript.

CO-3: Utilize the jQuery library for simplified DOM manipulation, event handling, and effects, and apply Bootstrap framework concepts to design responsive web page layouts and content.

CO-4: Integrate Bootstrap components and utilities to enhance UI/UX and implement asynchronous web communication using AJAX to develop faster and more interactive web applications.

Detailed Syllabus

Unit-1. DHTML and Client-side scripting language

1.1 JavaScript: Static and Dynamic webpage, Introduction to JavaScript and DHTML, Object-Orientation and JavaScript, Client-Side Dynamic Mechanism/Behavior, DOM, Variables and Datatypes, Statements and Operators, Control Structures: Conditional, Branching and Loop Statements.

1.2 Array: Introduction to Array and Array Creation, Built-in Objects, and its properties: Document, Math, Date, History, Windows, Form, Location etc., Built-in Functions, User Define Functions/Methods, Message Boxes: Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes.

1.3 Events and Event Handling: Handling events from the Body elements, Button elements, Text box and Password elements; The DOM 2 event model.

Unit-2.

2.1 JavaScript: Dynamic Documents with JavaScript: Introduction to dynamic documents; Positioning elements; Moving elements; Element visibility; Changing colors and fonts; Dynamic content; Stacking elements; Locating the mouse cursor; Reacting to a mouse click; Slow movement of elements; Dragging and dropping elements.

2.2 Form Handling: Form Attributes, onSubmit Event, Validation, Sanitization

Unit-3. HTML5

3.1 jQuery: JavaScript Library

3.2 jQuery: Introduction, Installation and Configuration, jQuery Syntax, jQuery Selectors: Element Selector, Id Selector, Class Selector, jQuery Events, jQuery Effects, jQuery Methods/API

3.3 Bootstrap Framework

3.3.1 Introduction to Bootstrap: Introduction, Bootstrap Layout (Container, Row, Columns, Responsive, classes, Offset Column, Reordering Columns),Bootstrap Content (Typography, Tables, Images, Forms)

Unit-4. Bootstrap Framework

4.1 Introduction to Bootstrap: Bootstrap Components (Navbar, Navs and tabs, Dropdowns, Buttons, Button Groups, Breadcrumb, Pagination, Labels, Alerts, Progress Bars, Accordion, Card, Modal), Bootstrap Utilities (Colors, Background, Borders, Display, Overflow, Position, Spacing, Text, Vertical align)

4.2 Creating better, faster, and more interactive web pages

4.3 AJAX: Introduction, Introduction to XML, How AJAX Works- An event occurs in a web page (the page is loaded; a button is clicked), An XMLHttpRequest object is created by JavaScript, The

XMLHttpResponse object sends a request to a web server, The server processes the request and Processing and Response status, The server sends a response back to the web page, The response is read by JavaScript, AJAX with jQuery.

Mapping Matrix of POs, PSOs, and COs

	POs													PSOs				
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Avg**	**1**	**2**	**3**	**4**	**Avg**
CO-1	3	2	2	--	--	1	3	1	2	1	2	--	**1.88**	3	2	2	2	**2.25**
CO-2	3	2	2	--	--	1	3	1	2	1	2	--	**1.88**	3	2	2	2	**2.25**
CO-3	3	2	2	--	--	1	3	1	2	1	2	--	**1.88**	3	2	2	2	**2.25**
CO-4	3	2	2	--	--	1	3	1	2	2	3	--	**2.11**	3	3	3	2	**2.75**
Avg	**3**	**2**	**2**	**0**	**0**	**1**	**3**	**1**	**2**	**1.25**	**0**	**0**	**1.94**	**3**	**2.25**	**2.25**	**2.25**	**2.38**

3 = Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1)	• Classroom Teaching, Tutorial
CO-2 (Unit: 2)	• Classroom Teaching, Tutorial, Presentation
CO-3 (Unit: 3)	• Classroom Teaching, Tutorial, Presentation, Seminar
CO-4 (Unit: 4)	• Classroom Teaching, Tutorial, Presentation, Seminar

Assessment Method

			Exam Component			
	COs	**Marks**	**Class Test**	**Assignment**	**Presentation**	**Involvement**
Continuous Comprehensive Evaluation 40 Marks	**CO-1**	10	5	7	7	6
	CO-2	10	5			
	CO-3	10	5			
	CO-4	10	5			
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

References

Books:

- DT Editorial Service, HTML5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, DreamTech Press, 2016
- Ivan Bayross , Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP, BPB, 2010
- Ivan Bayross, HTML5 and CSS3 Made Simple, BPB, 2012
- Richard Y, JavaScript and CSS Development using jQuery, Wrox, 2009
- Laura Lemay, Rafe Colburn, Jennifer Kyrnin, Mastering Html, CSS & JavaScript Web Publishing, BPB Publication, 2016
- Ethan Brown, Learning JavaScript Essentials for Modern Application Development 3e, O'Reilly Media, 2016

Online Resources & Tools:

- SWAYAM Courses**: https://swayam.gov.in**
- e-PG Pathshala
- https://www.w3schools.com/
- https://www.tutorialspoint.com/index.htm

Reference Persons:

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 2

Course Code 254510345006	Name of Course Computer Programming (C)	Compulsory
Credit: 03	Teaching Scheme: Theory (45) - Practical (0)	Teaching Hours: 45

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Manipulate character arrays and strings using built-in functions, and implement structured data types like structures, unions, and enumerated data types for efficient data representation.

CO-2: Design modular programs by creating and utilizing user-defined functions, including passing arrays and strings as arguments, and apply recursion and macro definitions effectively.

CO-3: To implement pointer operations including pointer to arrays, functions, and structures, and manage memory efficiently using dynamic memory allocation techniques.

CO-4: To perform file handling operations using text and binary files in C, including reading, writing, insertion, and deletion of data.

Detailed Syllabus

Unit-1.

1.1 Character Array and String handling: Introduction of character array, Declaration and initialization of 1-D and 2-D, Programming of character array using 1-D, Declaration and initialization of character array, String management and functions of string.h

1.2 Enumerated Data Type: using typedef, structure and union, Dot operator and access of member of structure,

Unit-2.

2.1 Functions: Concept of modular programming, Elements of function, Type of Function, Declaration, Calling, and Defining a function, Passing Array and string as function argument, Built-in library for I/O, String, Maths, standard library, Recursion.

2.2 Simple macro implementation

Unit-3.

3.1 Pointer and Dynamic Memory Allocation: Introduction to pointers and different types of pointers, Pointer to array and Array of pointers, pointer to function, Dynamic memory Allocation, malloc, calloc, realloc ,free, Arrow operator and access of members of structure

Unit-4.

4.1 File and Data Handling: Simple File and its Concepts, Input – Output operation using File, Binary File, Operations for Binary files-Insert and Delete.

Mapping Matrix of POs, PSOs, and COs

	POs													PSOs				
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Avg**	**1**	**2**	**3**	**4**	**Avg**
CO-1	3	2	3	--	--	1	3	1	2	2	1	--	**2**	3	2	2	2	**2.25**
CO-2	3	3	3	--	--	2	2	2	2	2	2	--	**2.33**	3	3	2	2	**2.5**
CO-3	3	2	3	--	--	1	3	1	2	2	2	--	**2.22**	3	2	3	2	**2.5**
CO-4	3	3	3	--	--	1	2	1	2	2	1	--	**1.88**	3	2	2	2	**2.25**
Avg	**3**	**2.5**	**3**	**0**	**0**	**1.25**	**2.5**	**1.25**	**2**	**2**	**1.5**	**0**	**2.11**	**3**	**2.25**	**2.25**	**2.25**	**2.38**

3 = Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy	
CO-1 (Unit: 1)	• Classroom Teaching, Tutorial
CO-2 (Unit: 2)	• Classroom Teaching, Tutorial, Presentation
CO-3 (Unit: 3)	• Classroom Teaching, Tutorial, Presentation, Seminar
CO-4 (Unit: 4)	• Classroom Teaching, Tutorial, Presentation, Seminar

Assessment Method

			Exam Component			
	COs	**Marks**	**Class Test**	**Assignment**	**Presentation**	**Involvement**
Continuous Comprehensive Evaluation 40 Marks	**CO-1**	10	5	7	7	6
	CO-2	10	5			
	CO-3	10	5			
	CO-4	10	5			
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

References

Books:

- Programming in ANSI ‘C’ – Balaguruswamy: TMH
- Let Us C By YasvantKanitkar
- Computer Based Problem Solving by Patrick Coxall
- Mulish Cooper: The Spirit of C, Jaico Pub. House, 19th Edition-1999
- Programming in C by ReemaThareja
- Introduction to Problem Solving by NCERT
- Introduction to Problem Solving Techniques by IGNOU
- નીપાશાહ, “ફ્લોચાર્ટથીપ્રોગ્રામીંગસુધી” , યુનિ. ગ્રંથનિર્માણબોર્ડ, 2024

Online Resources & Tools:

- UGC Swayam Portal (Swayam Central), e-PGPathsala (e-PGPathshala (inflibnet.ac.in))

Reference Persons:

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 2

Course Code 254510245007	Name of Course Lab Based on Computer Programming	Compulsory
Credit: 02	Teaching Scheme: Theory (0) - Practical (60)	Lab Hours: 60

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Demonstrate the use of character arrays, strings, and user-defined data types (structures, unions, enums) for structured programming.

CO-2: Apply modular programming concepts using functions, recursion, and macros to design structured and reusable code.

CO-3: Implement pointer operations and dynamic memory allocation techniques for efficient memory management.

CO-4: Use file handling operations to perform data storage, retrieval, and manipulation using text and binary files in C.

Mapping Matrix of POs, PSOs, and COs

	POs													PSOs				
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Avg**	**1**	**2**	**3**	**4**	**Avg**
CO-1	3	2	2	--	--	1	2	1	2	2	1	1	**1.6**	3	2	2	1	**2**
CO-2	3	3	3	--	--	1	3	2	2	2	2	1	**2.2**	3	3	2	2	**2.5**
CO-3	3	3	3	--	--	1	3	1	2	2	2	1	**2.1**	3	2	3	2	**2.5**
CO-4	3	2	2	--	--	1	3	1	2	2	2	1	**2**	3	2	2	2	**2.25**
Avg	**3**	**2.5**	**2.5**	**0**	**0**	**1**	**2.75**	**1.25**	**2**	**2**	**1.75**	**1**	**1.98**	**3**	**2.25**	**2.25**	**1.75**	**2.31**

3 = Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1)	• Experimental Learning
CO-2 (Unit: 2)	• Demonstration and Guided Practice
CO-3 (Unit: 3)	• Project-Based Learning
CO-4 (Unit: 4)	• Reflective Practice

Assessment Method

			Exam Component		
Continuous Comprehensive Evaluation 40 Marks	**COs**	**Marks**	**Class Test**	**Assignment**	**Participation/ Performance**
	CO-1	10	5	13	7
	CO-2	10	5		
	CO-3	10	5		
	CO-4	10	5		
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**		
	CO-1	15	Term End Examination		
	CO-2	15			
	CO-3	15			
	CO-4	15			

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 2

Course Code 254510245008	Name of Course Lab Based on Web Design-II	Compulsory
Credit: 02	Teaching Scheme: Theory (0) - Practical (60)	Lab Hours: 60

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Apply client-side scripting using JavaScript and DHTML to create dynamic and interactive web pages.

CO-2: Design and manage dynamic web documents with JavaScript for enhanced user interaction and data validation.

CO-3: Develop responsive and interactive web interfaces using jQuery and Bootstrap frameworks.

CO-4: Implement AJAX for asynchronous web communication and integrate it with Bootstrap to enhance web performance and user experience.

Mapping Matrix of POs, PSOs, and COs

	POs													PSOs				
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Avg**	**1**	**2**	**3**	**4**	**Avg**
CO-1	3	2	2	--	--	2	3	1	2	1	2	2	**2**	3	2	2	2	**2.25**
CO-2	3	2	2	--	--	2	3	1	2	2	2	2	**2.1**	3	2	2	2	**2.25**
CO-3	3	2	2	--	--	2	3	1	2	2	3	2	**2.2**	3	3	2	2	**2.5**
CO-4	3	2	3	--	--	2	3	1	2	2	3	2	**2.3**	3	3	2	2	**2.5**
Avg	**3**	**2**	**2.25**	**0**	**0**	**2**	**3**	**1**	**2**	**1.75**	**2.5**	**2**	**2.15**	**3**	**2.5**	**2**	**2**	**2.38**

3 = Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1) **CO-2 (Unit: 2)** **CO-3 (Unit: 3)** **CO-4 (Unit: 4)**	• Experimental Learning • Demonstration and Guided Practice • Project-Based Learning • Reflective Practice

Assessment Method

			Exam Component		
	COs	**Marks**	**Class Test**	**Assignment**	**Participation/ Performance**
Continuous Comprehensive Evaluation 40 Marks	**CO-1**	10	5	13	7
	CO-2	10	5		
	CO-3	10	5		
	CO-4	10	5		
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**		
	CO-1	15	Term End Examination		
	CO-2	15			
	CO-3	15			
	CO-4	15			

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 3

Course Code 255010245009	Name of Course Fundamentals of Database Management System	Compulsory
Credit: 02	Teaching Scheme: Theory (30) - Practical (0)	Teaching Hours: 30

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Describe fundamental concepts of database systems, including the architecture, structure, and roles involved, as well as differentiate between various data models such as ER, relational, hierarchical, network, and document models.

CO-2: Construct Entity-Relationship (ER) models and convert them into relational schemas, demonstrating an understanding of keys, attributes, relationships, and constraints within database modeling.

CO-3: Apply database design principles using functional dependencies and normalize relational schemas up to BCNF to ensure minimal redundancy and improve data integrity.

CO-4: Write and execute SQL queries for data definition and manipulation, apply constraints, and use built-in functions for data retrieval and transformation in relational databases.

Detailed Syllabus

Unit-1. Introduction to Database System

1.1 Fundamental Concepts: What is Data, What is database and database systems, What is database management system, Purpose and advantages of Database management system (over file systems), Various data models – ER Model, Relational Model, Network Model, Hierarchical Model and Document Model, Three Level Architecture, Structure of DBMS, Database Actors and Workers.

Unit-2. Data Modelling using Entity Relationship Model

2.1 Basics of ER Modelling: Entity Types, Entity Sets, Attributes, Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, ER Diagram – Notations and fundamentals, Concept of Generalization and Specialization, Associative Entity, Conversion from ER Model to Relational Model.

2.2 Relational Data Modelling: Relational Model Concepts, Relational Model Constraints, Relational Model Schemas.

Unit-3. Database Design Methodology

3.1 Basics of Database Design: Basics of database design and Informal Design Guidelines for Relational Schemas, Functional Dependencies, Normal Forms (1NF, 2NF, 3NF, BCNF), Codd Rules.

Unit-4. Introduction to SQL (Schema Definition, Constraints, Basic Queries)

4.1 SQL Basics: Table Fundamentals: Basic Data types, Create Table Command, Viewing Data in the tables, Insert, Update and Delete in SQL, Modifying the structure of tables, Renaming table, Truncating Table, Deleting Table, Data Constraints and Functions: - Pseudo columns, Null values and DUAL table Operators, Data constraints, Type of data constraints, Altering constraints, Concept of metadata and working with data dictionary.

4.2 SQL Functions: Introduction, merits and demerits, Types of functions, Numeric functions, Character functions, Date functions, Conversion functions, Aggregate functions.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	1	--	--	1	2	1	2	1	1	--	1.55	3	2	2	1	2
CO-2	3	3	2	--	--	1	2	1	2	2	2	--	2	3	3	2	2	2.5
CO-3	3	2	2	--	--	1	2	1	2	2	2	--	2	3	2	3	2	2.5
CO-4	3	3	3	--	--	1	3	1	2	2	2	--	2.11	3	3	2	2	2.5
Avg	3	2.5	2	0	0	1	2.25	1	2	1.75	1.75	0	1.92	3	2.5	2.25	1.75	2.38

3 = Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1)	• Classroom Teaching, Tutorial
CO-2 (Unit: 2)	• Classroom Teaching, Tutorial, Presentation
CO-3 (Unit: 3)	• Classroom Teaching, Tutorial, Presentation, Seminar
CO-4 (Unit: 4)	• Classroom Teaching, Tutorial, Presentation, Seminar

Assessment Method

			Exam Component			
Continuous Comprehensive Evaluation 40 Marks	**COs**	**Marks**	**Class Test**	**Assignment**	**Presentation**	**Involvement**
	CO-1	10	5	7	7	6
	CO-2	10	5			
	CO-3	10	5			
	CO-4	10	5			
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

References

Books:

- Mynani MadhuBala, Introduction to DBMS, Theory and Practicals, AICTE, 2022
- RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems , 5th Edition, , Pearson Publication, 2018
- Ramkrishnan, Gehrke : Database Management Systems, 3rd Edition, McGrawHill Publication, 2002
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- S. K. Singh, Database Systems: Concepts, Design and Applications, Pearson Education, 2009
- C.J.Date, a Kannan, S Swaminathan : An Introduction to Database Systems, 8th Edition, Pearson Education, 2003
- Peter Rob, Carlos Coronel, Database Systems: Design, Implementation and Management, 7th Edition, Cengage Learning, 2007.

Online Resources & Tools:

- http://docs.oracle.com/cd/A97335_02/apps.102/a81358/05_dev1.htm [For ER Diagram]
- http://plsql-tutorial.com/ [For PL/SQL]
- http://www.microsoftvirtualacademy.com/trainingcourses/databasefundamentals#?fbid=tbZ92pOp_Tt [For overall subject]
- http://www.ntu.edu.sg/home/ehchua/programming/sql/Relational_Database_Design.html [for relational database design]

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 3

Course Code 255010445010	Name of Course Object Oriented Programming using Java	Compulsory
Credit: 04	Teaching Scheme: Theory (60) - Practical (0)	Teaching Hours: 60

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Explain the core principles of Object-Oriented Programming and apply Java programming constructs such as variables, data types, Arrays, control statements, and loops to build basic programs.

CO-2: Design and implement Java classes using objects, methods, constructors, and inheritance to create modular and reusable code.

CO-3: Demonstrate the use of polymorphism through abstract classes and interfaces, apply exception handling mechanisms, and effectively use Java packages for code organization.

CO-4: Develop multithreaded Java applications and perform file input/output operations using Java streams and serialization techniques.

Detailed Syllabus

Unit-1. Introduction Object Oriented Programming and Java

- **1.1 Object Oriented Overview and Concepts:** Need of object-oriented programming, Object Oriented Programming vs other Paradigms, Principles of Object-Oriented Programming: Class and, Objects, Encapsulation, Abstraction, Inheritance, and Polymorphism
- **1.2 Introduction to Java:** History, Features, Program Structure, Java Virtual Machine, JRE, and J2SE/ JDK
- **1.3 Java Programming Constructs:** Variable, Data Types: Primitive, Object Reference, String, Array etc., Identifiers, Literals, Operators, Expressions, Precedence Rules and Associativity, Type Conversion: Casting, Boxing, Unboxing
- **1.4 Flow of Control & Decision-Making Statements:** if, if else, else if, switch, Loop statements: do while, while, for, for-each loop, break and continue

Unit-2. Java Programming Building Blocks

- **2.1 Class: Declaration, class body.**
- **2.2 Object:** Creating Objects, Declaring, Instantiating and Initializing an Object.
- **2.3 Methods:** Declaration, Invocation & Overloading.
- **2.4 Constructors:** Declaration, Constructor Overloading, "this" Keyword, Class Variable and Methods, Access Specifiers, Access Modifiers, ComUmand Line Arguments, Garbage Collection and Finalization.
- **2.5 Inheritance Basics:** Types of Inheritance, Access Control, Method Overriding, super keyword, final keyword.

Unit-3.

- **3.1 Polymorphism:** Types of polymorphism, Abstract Method, Abstract Class.
- **3.2 Interface:** Declaration, need, Variables and methods in Interface, Extending Interface, Interface Vs Abstract Class, Polymorphism with Interface
- **3.3 Package**: Introduction, Advantages of package, Creating, Using and Access Protection, Importing Package, Java.lang package: Object, Wrapper Classes, String, StringBuffer and StringBuilder Classes.
- **3.4 Exception and Error:** Exception and Error in Java, Exception Types
- **3.5 Exception-Handling Techniques:** try, catch, finally, throw, User-Defined Exception and throws, Exception Encapsulation and Enrichment

Unit-4.

- **4.1 Input/Output & Serialization**

4.2 Java Streams: What is Stream, advantages, Types of Streams: Character and Byte Stream, File Class, Byte and Character Stream classes' hierarchy

4.3 Reading and Writing Data: Using Byte and Character Stream, User Input/Output, Serialization: need and serialize class

4.4 Multithreading and Muti-Thread Programming

4.5 Threads: Introduction, Use of Multithread programming, Java Thread Model, The Main Thread, Thread class and Runnable interface, Thread priority.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	3	--	--	2	1	3	1	2	--	--	2.13	3	2	2	2	2.25
CO-2	3	2	3	--	--	2	1	3	2	2	--	--	2.25	3	2	2	2	2.25
CO-3	3	2	3	1	--	3	1	3	2	2	--	--	2.22	3	3	3	2	2.75
CO-4	3	2	3	--	--	3	2	3	2	2	--	--	2.5	3	3	3	2	2.75
Avg	3	2	3	1	0	2.5	1.25	3	1.75	2	0	0	2.28	3	2.5	2.5	2.25	2.5

3 = Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1) CO-2 (Unit: 2) CO-3 (Unit: 3) CO-4 (Unit: 4)	• Problem Solving, Examples, Questioning, Experiment, Demonstration, Seminar

Assessment Method

			Exam Component			
Continuous Comprehensive Evaluation 40 Marks	COs	Marks	Class Test	Assignment	Presentation/ Seminar	Involvement
	CO-1	10	5	7	7	6
	CO-2	10	5			
	CO-3	10	5			
	CO-4	10	5			
Term-End Evaluation 60 Marks	COs	Marks	Exam Component			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

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Books:

- Herbert Schild, Java: The Complete Reference, - McGraw Hill Education, Eleventh Edition 2018.
- E. Balagurusamy, Programming with Java: A Primer, The McGraw Hill, 2006.
- Herbert Schildt, Dale Skrien, Java Fundamentals A comprehensive introduction By McGraw Hill Education, 2017.
- James Rumbaugh, Michael Blaha, Object-Oriented Modelling and Design, Pearson Education India, 2007.

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 3

Course Code 255010345011	Name of Course System Analysis and Design	Compulsory
Credit: 03	Teaching Scheme: Theory (45) - Practical (0)	Teaching Hours: 45

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Explain the fundamental concepts of systems, identify various types of information systems, and understand the roles and responsibilities of system analysts and users.

CO-2: Describe system development life cycle (SDLC) phases, apply structured systems analysis and design methodologies (SSADM), and evaluate prototyping as an alternative development approach.

CO-3: Create and interpret data flow diagrams (DFDs), context diagrams, and entity-relationship (E-R) diagrams for effective data modeling during system design.

CO-4: Design system inputs, outputs, and reports, perform system testing using test data, and understand the processes involved in system implementation and maintenance.

Detailed Syllabus

Unit-1. System Concept

1.1 Introduction to Information System: Introduction to system, Characteristics and elements of system, Types of system, System analysis, System analyst & its role, Computer based information system, Types of information systems, System users, Fact finding techniques.

Unit-2. System Development Strategies

2.1 System Development Life Cycle: Introduction to SDLC Approach, Phases of SDLC, Application of SDLC Method, Limitation of SDLC Method.

2.2 Structured Systems Analysis and Design Method: Introduction, Approach and need of SSADM, System survey, structured analysis and design, Advantages of SSADM, Prototype Approach.

Unit-3. System Design and Implementation

3.1 Data Modelling: Data Flow Diagram, Context Diagram, DFD Level, DFD Examples, Data Dictionary and design of data dictionary, E-R Diagram.

Unit-4.

4.1 Design and Implementation: Input Design, Output Design, Report Design, Sample Reports, System Testing, Test Data, Implementation and Maintenance.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	--	--	--	2	1	1	2	1	--	--	1.71	3	2	1	2	2
CO-2	3	3	--	--	--	2	2	1	2	2	--	--	2.14	3	3	2	2	2.5
CO-3	3	3	2	--	--	2	2	1	2	2	--	--	2.12	3	3	2	2	2.5
CO-4	3	3	2	--	--	2	2	1	2	2	--	--	2.12	3	3	2	2	2.5
Avg	3	2.75	2	0	0	2	1.75	1	2	1.75	0	0	2.02	3	2.75	1.75	2	2.38

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1)	• Classroom Teaching, Tutorial
CO-2 (Unit: 2)	• Classroom Teaching, Tutorial, Presentation
CO-3 (Unit: 3)	• Classroom Teaching, Tutorial, Presentation, Seminar
CO-4 (Unit: 4)	• Classroom Teaching, Tutorial, Presentation, Seminar

<table>
<tr><th colspan="6">Assessment Method</th></tr>
<tr><td rowspan="5">Continuous Comprehensive Evaluation 40 Marks</td><td rowspan="2">COs</td><td rowspan="2">Marks</td><td colspan="3">Exam Component</td></tr>
<tr><td>Class Test</td><td>Assignment</td><td>Presentation</td><td>Involvement</td></tr>
<tr><td>CO-1</td><td>10</td><td>5</td><td rowspan="4">7</td><td rowspan="4">7</td><td rowspan="4">6</td></tr>
<tr><td>CO-2</td><td>10</td><td>5</td></tr>
<tr><td>CO-3</td><td>10</td><td>5</td></tr>
<tr><td>CO-4</td><td>10</td><td>5</td></tr>
<tr><td rowspan="5">Term-End Evaluation 60 Marks</td><td>COs</td><td>Marks</td><td colspan="4">Exam Component</td></tr>
<tr><td>CO-1</td><td>15</td><td colspan="4" rowspan="4">Term End Examination</td></tr>
<tr><td>CO-2</td><td>15</td></tr>
<tr><td>CO-3</td><td>15</td></tr>
<tr><td>CO-4</td><td>15</td></tr>
</table>

References

Books:

- James Senn, Analysis and Design of Information System, McGraw-Hill, 1989
- Priti Srinivas Sajja, Essence of Systems Analysis and Design, Springer, 2017
- Kenneth Kendall and Julie Kendall, Systems Analysis and Design, Prentice Hall, 2011

Online Resources & Tools:

- Swayam

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 3

Course Code 255010145012	Name of Course Lab Based on Fundamentals of Database Management System	Compulsory
Credit: 01	Teaching Scheme: Theory (0) - Practical (30)	Lab Hours: 30

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Understand the fundamental concepts, architecture, and models of database systems.

CO-2: Design data models using ER diagrams and convert them into relational schemas.

CO-3: Apply normalization techniques and functional dependencies for designing efficient relational schemas.

CO-4: Implement relational database schemas and perform queries using SQL for data definition, manipulation, and retrieval.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	2	--	--	1	2	--	2	1	1	1	1.66	3	2	1	2	2
CO-2	3	3	3	--	--	1	2	1	2	2	2	1	2	3	3	2	2	2.5
CO-3	3	3	2	--	--	1	2	--	2	2	2	1	2	3	3	2	2	2.5
CO-4	3	2	3	--	--	1	3	--	2	2	2	1	2.11	3	3	2	2	2.5
Avg	3	2.5	2.5	0	0	1	2.25	1	2	1.75	1.75	1	1.94	3	2.75	1.75	2	2.38

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1) CO-2 (Unit: 2) CO-3 (Unit: 3) CO-4 (Unit: 4)	• Experimental Learning • Demonstration and Guided Practice • Project-Based Learning • Reflective Practice

Assessment Method

			Exam Component		
	COs	Marks	Class Test	Assignment	Participation/ Performance
Continuous Comprehensive Evaluation 40 Marks	CO-1	10	5	13	7
	CO-2	10	5		
	CO-3	10	5		
	CO-4	10	5		
Term-End Evaluation 60 Marks	COs	Marks	Exam Component		
	CO-1	15	Term End Examination		
	CO-2	15			
	CO-3	15			
	CO-4	15			

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 3

Course Code 255010245013	Name of Course Lab Based on Object Oriented Programming using Java	Compulsory
Credit: 02	Teaching Scheme: Theory (0) - Practical (60)	Lab Hours: 60

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Understand and apply basic object-oriented programming concepts and Java fundamentals including variables, control statements, and operators.

CO-2: Demonstrate the ability to create and manipulate classes, objects, constructors, and apply inheritance effectively in Java programs.

CO-3: Implement polymorphism using abstract classes and interfaces, manage packages and handle exceptions efficiently in Java applications.

CO-4: Develop Java programs using file handling, serialization, and multithreading for concurrent and persistent data processing.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	2	--	--	1	3	--	2	1	2	1	1.88	3	2	2	2	2.25
CO-2	3	2	3	--	--	1	3	1	2	2	2	1	2	3	3	2	2	2.5
CO-3	3	3	3	--	1	1	3	1	2	2	3	2	2.18	3	3	3	2	2.75
CO-4	3	2	3	--	--	1	3	1	2	3	3	2	2.3	3	3	3	2	2.75
Avg	3	2.25	2.75	0	1	1	3	1	2	2	2.5	1.5	2.09	3	2.75	2.5	2	2.56

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1) CO-2 (Unit: 2) CO-3 (Unit: 3) CO-4 (Unit: 4)	• Experimental Learning • Demonstration and Guided Practice • Project-Based Learning • Reflective Practice

Assessment Method

			Exam Component		
	COs	Marks	Class Test	Assignment	Participation/ Performance
Continuous Comprehensive Evaluation 40 Marks	CO-1	10	5	13	7
	CO-2	10	5		
	CO-3	10	5		
	CO-4	10	5		
Term-End Evaluation 60 Marks	COs	Marks	Exam Component		
	CO-1	15	Term End Examination		
	CO-2	15			
	CO-3	15			
	CO-4	15			

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 4

Course Code 255010345014	Name of Course Data Structures	Compulsory
Credit: 03	Teaching Scheme: Theory (45) - Practical (0)	Teaching Hours: 45

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Classify data structures as linear and non-linear, and demonstrate memory allocation techniques along with recursive programming concepts.

CO-2: Apply linear data structures like arrays, structures, and stacks to solve problems, including expression conversion and factorial computation.

CO-3: Implement and compare various sorting and searching algorithms, and apply queue structures to real-life applications such as process scheduling.

CO-4: Implement linked lists and perform operations on singly and doubly linked lists, and evaluate the performance of sorting and searching techniques.

Detailed Syllabus

Unit-1.

1.1 Introduction to Data Structure: Introduction and Definition of Data Structure, Classification of Data Types – Primitive and Non-primitive, Types of Data Structures- Linear & Non Linear Data Structures, Static and Dynamic Memory Allocation, Function, Recursion.

1.2 Array: Single dimensional & its addressing function, Multidimensional arrays: two- & three-dimensional arrays, Row major & column major representation & addressing functions.

Unit-2. Linear Data Structure

2.1 Structure: Definition & Concept, Operations on structure, Array of Structure, Structure of array.

2.2 Strings: Definition & Concept, Library Functions of Strings.

2.3 Stack: Definition & Concept, Operations on stack, Multiple stacks, Applications of stacks, Conversion from infix to postfix without parentheses, Implementing factorial with stack.

Unit-3.

3.1 Queue: Definition & Concepts, Operations on queue, D-queue, Circular queue, Applications of queue, Priority queue, Process queue.

3.2 Sorting: Introduction, Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Two-Way Merge Sort.

3.3 Searching Methods: Introduction, Linear (Sequential) Search, Binary Search, Comparison of linear & binary searching.

Unit-4.

4.1 Linked list representation: Introduction to link list, Insertion in linked list, deletion in linked list, Traverse in linked List, Doubly Linked list – Insert, Delete operations

4.2 Stack using Linked list: implementation using linked list

4.3 Performance analysis: Performance analysis and comparison of different sorting and searching methods.

Mapping Matrix of POs, PSOs, and COs																		
COs	**POs**													**PSOs**				
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Avg**	**1**	**2**	**3**	**4**	**Avg**
CO-1	3	2	3	--	--	--	2	1	1	--	--	--	**1.71**	3	2	2	1	**2**
CO-2	3	3	2	--	--	1	2	1	1	--	--	--	**1.67**	3	2	2	1	**2**
CO-3	3	3	3	--	--	--	3	1	1	1	1	--	**2**	3	3	3	2	**2.75**
CO-4	3	2	3	--	--	--	3	1	1	1	1	--	**1.83**	3	2	3	2	**2.5**
Avg	**3**	**2.5**	**2.75**	**0**	**0**	**0.25**	**2.5**	**1**	**1**	**0.5**	**0.5**	**0**	**1.80**	**3**	**2.25**	**2.5**	**1.5**	**2.31**

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy	
CO-1 (Unit: 1)	• Classroom Teaching, Group Discussion, Assignment, Examples, Questioning
CO-2 (Unit: 2)	
CO-3 (Unit: 3)	
CO-4 (Unit: 4)	

Assessment Method						
Continuous Comprehensive Evaluation 40 Marks	**COs**	**Marks**	**Exam Component**			
			Class Test	**Assignment**	**Presentation**	**Involvement**
	CO-1	10	5	7	7	6
	CO-2	10	5			
	CO-3	10	5			
	CO-4	10	5			
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

References

Books:

- Paul Gordon Sorenson, Jean-Paul Tremblay, An introduction to Data Structures with Applications, Tata McGrawHill, 1984
- A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, Data Structures using C, PHI-Pearson Education, 2008
- YashwantKanetkar, Data Structures Through C, 4th Edition, BPB Publications, 2022
- N.B. Venkateswarlu, Data Structures, Theory & Practical, AICTE e-Kumbh, 2022
- Samanta Debasis, Classical Data Structures, 2nd Edition, PHI, 2009
- IGlenn W. Rowe, Introduction to Data Structure and algorithm with C, Printice Hall, 1997
- Horowitz, Sahni, and Anderson-Freed, Fundamentals of Data Structures in C, 2ndEdition,OrientBlackswan, 2008
- નીપા શાહ, “ફ્લોચાર્ટથીપ્રોગ્રામીંગસુધી” , યુનિ. ગ્રંથનિર્માણબોર્ડ, 2024

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 4

Course Code 255010345015	Name of Course Web Application Development	Compulsory
Credit: 03	Teaching Scheme: Theory (45) - Practical (0)	Teaching Hours: 45

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Explain the fundamentals of web development, differentiate between static and dynamic pages, and write basic PHP scripts using correct syntax, data types, and embedded HTML.

CO-2: Apply conditional structures, loops, and arrays in PHP and effectively use built-in and user-defined functions to structure and modularize code.

CO-3: Design interactive web forms and implement data handling mechanisms using GET and POST methods, handling HTTP requests and responses for dynamic web applications. as well as managing user data across multiple pages using sessions and cookies.

CO-4: Integrate PHP with MySQL to perform basic CRUD operations and utilize PHP utilities such as file uploading etc. Reading and Writing data from file and handling files.

Detailed Syllabus

Unit-1. Basics of Web Development

1.1 Introduction of Web development: Introduction, open source vs. closed source software, Introduction to Webpage and Website, Static and Dynamic Webpage, Client & Server-Side Scripting, Introduction to other server-side languages.

1.2 PHP Configurations and Basics

1.2.1 Introduction to PHP: Introduction, Installation and configuration of Apache, MySQL and PHP, How PHP code is parsed, Embedding PHP and HTML, Executing PHP and viewing in Browser, Data types, Operators, PHP variables: static and global variables, Comments in PHP

Unit-2. Control Structures

2.1 Conditional Statements: If…Else, Switch, Ternary operator.

2.2 Looping Statements: While, Do. While, for, foreach.

2.3 Branching Statements: break and continue, die, exit, return.

2.4 Array: Introduction, Types of arrays, array functions.

2.5 Functions

2.5.1 Built in Functions: Overview of built in functions of PHP, string, date, calendar, maths functions, file system and file handling functions, CSV function, include files- Include Vs Required.

2.5.2 User Defined Functions: Create and use functions

Unit-3. Working With Data

3.1 Form Handling: FORM attributes, INPUT elements and its attributes, validating the user input, Submitting and getting form parameter: Passing variables through GET and POST, GET vs POST, Query string.

3.2 Session Management: Cookies and Sessions: Cookies Handling, Concept of Session, Session handling methods, starting session, modifying session variables, Unregistering and deleting session variables.

Unit-4.

4.1 PHP and Database connectivity (MySQL): CRUD operations.

4.2 PHP Utilities

4.3 File Uploading: Upload Single and Multiple files using PHP script, Understanding HTTP requests, Exploring and modifying HTTP responses, Getting information from web server.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	2	--	--	1	3	1	1	1	--	1	1.67	3	2	2	1	2
CO-2	3	3	2	--	--	--	3	2	1	2	--	--	2.28	3	3	2	2	2.5
CO-3	3	3	3	--	--	2	3	2	1	2	--	2	2.33	3	3	3	2	2.75
CO-4	3	2	3	1	1	--	3	2	1	2	2	2	2	3	2	3	2	2.5
Avg	3	2.5	2.5	1	1	1.5	3	1.75	1	1.75	2	1.67	2.07	3	2.5	2.5	1.75	2.44

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1)	• Classroom Teaching, Tutorial
CO-2 (Unit: 2)	• Classroom Teaching, Tutorial, Presentation
CO-3 (Unit: 3)	• Classroom Teaching, Tutorial, Presentation, Seminar
CO-4 (Unit: 4)	• Classroom Teaching, Tutorial, Presentation, Seminar

Assessment Method

			Exam Component			
Continuous Comprehensive Evaluation 40 Marks	**COs**	**Marks**	**Class Test**	**Assignment**	**Presentation**	**Involvement**
	CO-1	10	5	7	7	6
	CO-2	10	5			
	CO-3	10	5			
	CO-4	10	5			
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

References

Books:

- DT Editorial Service, HTML5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, DreamTech Press, 2016
- Ivan Bayross , Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP, BPB, 2010
- Steven Holzner, The Complete Reference PHP, McGraw Hill, 2017
- Kelvin Tetroe, Peter Moulding, Programming PHP, 4th Edition, O'Reilly, 2016
- Sharanam Shah, Vaishali Shah LAMP Programming for Professionals, Shroff Publishers, 2009
- Jason Garner, Morgan Owens, Elizabeth Naramore, Matt Warden, Jeremy Stolz , Professional LAMP: Linux, Apache, MySQL and PHP Web Development, Wrox, 2005.

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 4

Course Code 255010345016	Name of Course Computer Network	Compulsory
Credit: 03	Teaching Scheme: Theory (45) - Practical (0)	Teaching Hours: 45

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Describe the fundamental concepts of computer networks, including network types, topologies, and reference models, and explain physical and data link layer functionalities such as error detection and data framing.

CO-2: Analyze medium access control protocols, understand Ethernet technologies, and explain network layer design issues along with routing algorithms and internetworking concepts.

CO-3: Explain transport layer services and protocols, including connection management, flow control, and the characteristics of UDP and TCP protocols.

CO-4: Describe application layer protocols such as DNS, email systems, HTTP, FTP, and DHCP, and understand their roles in network communication.

Detailed Syllabus

Unit-1. Introduction to Computer Network

1.1 Computer Network: Definition, Essential, Uses, Objectives, Advantages, Network Utility, Network Hardware and Software, Types of networks, Network Topologies, Reference Models: OSI, TCP/IP.

1.2 Physical Layer: Bandwidth, Signal Data Rate, And Transmission Media: Guided and Unguided.

1.3 Data Link Layer

1.3.1 Design issues: Services provided to network layer, Framing, Error control, Flow control.

1.3.2 Error detection and correction: Error correcting codes, Error detecting codes, Elementary.

1.3.3 Data Link protocols: Simplex, stop and wait, Sliding window protocol, Overview of HDLC.

Unit-2. Medium Access Control Sublayer

2.1 Channel allocation and Protocols: Channel allocation problem, Multiple access protocols- ALOHA, CSMA, Collision free protocols, Limited contention protocols.

2.2 Ethernet: Traditional Ethernet, Switched Ethernet.

2.3 Network Layer

2.3.1 Introduction: Design issues, Role and Responsibility, Comparison of virtual circuit and datagram subnets.

2.3.2 Algorithms: Routing algorithms, Optimality principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing,

2.3.3 Internetworking: Tunneling, Network Layer in the Internet, IP protocol-IPV4 and IPV6, IP addresses, Internet Control Protocol, OSPF, and BGP.

Unit-3. Transport Layer

3.1 Transport Service and Primitives: Upper Layer Service Base, Transport, Service Primitives, Socket

3.2 Protocols: Elements of Transport protocols, Addressing, Connection Establishment, and Connection release, Flow control, Multiplexing, Transport protocol - UDP, TCP

Unit-4. Application Layer

4.1 DNS: The DNS namespace, Resource records, Name servers

4.2 Electronic Mailing System: Architecture and services, User agent, Message formats, Message transfer, Final delivery.

4.3 Protocols: World Wide Web - Architecture overview, HTTP, FTP and DHCP.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	2	--	--	1	2	1	2	1	--	--	1.75	3	2	2	1	2
CO-2	3	3	2	--	--	1	2	1	2	2	--	--	2	3	3	2	2	2.5
CO-3	3	2	2	--	--	1	2	1	2	2	--	--	1.87	3	2	2	1	2
CO-4	3	2	1	--	--	1	2	1	2	1	--	--	1.62	3	2	1	1	1.75
Avg	3	2.25	1.75	0	0	1	2	1	2	1.5	0	0	1.81	3	2.25	1.75	1.25	2.06

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1)	• Classroom Teaching, Tutorial
CO-2 (Unit: 2)	• Classroom Teaching, Tutorial, Presentation
CO-3 (Unit: 3)	• Classroom Teaching, Tutorial, Presentation, Seminar
CO-4 (Unit: 4)	• Classroom Teaching, Tutorial, Presentation, Seminar

Assessment Method

			Exam Component			
Continuous Comprehensive Evaluation 40 Marks	**COs**	**Marks**	**Class Test**	**Assignment**	**Presentation**	**Involvement**
	CO-1	10	5	7	7	6
	CO-2	10	5			
	CO-3	10	5			
	CO-4	10	5			
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

References

Books:

- Andrew S. Tanenbaum, Computer Network, Prentice Hall, 2011
- Behrouz Forouzan, Introduction to Data Communication and Networking, Mc-Graw Hill, 2007
- Natalia Olifer and Victor Olifer, Computer Network, John Wiley and Sons, 2005
- William Stallings, Data and Computer Communication, Pearson Education, 2007

Online Resources & Tools:

- NPTEL, Swayam

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 4

Course Code 255010345017	Name of Course Search Engine Optimization (Lab Based)	Compulsory
Credit: 03	Teaching Scheme: Theory (90) - Practical (0)	Teaching Hours: 90

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Explain the fundamentals of Search Engine Optimization, including its types, query classifications, and search engine result structures, and apply basic search operators for information retrieval.

CO-2: Analyze the web search process, evaluate web content using SEO metrics, and implement keyword research and URL rewriting strategies to improve search rankings.

CO-3: Differentiate between white hat and black hat SEO techniques and apply technical and organic SEO strategies—including link building and page rank optimization etc.—to enhance website visibility.

CO-4: Develop search engine–friendly content using canonicalization, content optimization, and scripting methods, and demonstrate techniques to optimize for voice search.

Detailed Syllabus

Unit-1. Search Engine Optimization Basics

- **1.1 Introduction To SEO:** Introduction, Need, Site Architecture, advantages and disadvantages, SEO Myths.
- **1.2 Optimization Types:** On-page, Off-page and Technical SEO.
- **1.3 Search Query Types:** Navigational, Informational, and Transactional.
- **1.4 Search Types:** Narrow, Broad, Local, And Global.
- **1.5 Search Operators:** Basic and Advanced.
- **1.6 Search Engine Result Page Layout:** Introduction, Result Types.

Unit-2. Web Search Process

- **2.1 Web Page Content Evaluation: Need, SEO Metrics**
- **2.2 Search Engine Types:** Crawler-based, Human Powered Directories, Meta Search Engine and Hybrid Search Engine, Search Engine.
- **2.3 Architecture: Components and Functions.**
- **2.4 Ranking Factors:** Visible On-Page Factors, Invisible Off-Page Factors, Time-Based Factors, and External Factors
- **2.5 URL Rewriting**
  - **2.5.1 URL:** Introduction, Importance, Types, URL Rewriting-Need and Implementation, Redirection Approaches, Process.
  - **2.5.2 Keyword Research:** Introduction and Importance, Keyword value determination: High-value keyword and Low-value keyword, Keyword Demand and Long Tail Approach.

Unit-3.

- **3.1 Technical SEO:** Introduction, Definition, Overview and Importance
- **3.2 Organic SEO:** Internal and External links, Website content, Link Equity
- **3.3 Page Ranks:** Overview, Algorithm
- **3.4 Search Engine Optimization Techniques**
  - **3.4.1 SEO Techniques:** Introduction and Importance of Search Engine Optimization Techniques
  - **3.4.2 White Hat:** Web Feed, Social Bookmarking, Traditional and Search Engine Sitemaps, Link Bait
  - **3.4.3 Black Hat:** Introduction and Overview
  - **3.4.4 Overview:** Foreign language optimization for foreign applications

Unit-4. Search Engine-Friendly Content Management

- **4.1 Duplicate Content:** Causes, Effects, and Approaches, URL Canonicalization: Overview, Usage and Implementation, Content Optimization: Text, Image, and Hyperlink, Search Engine Scripting.
- **4.2 Voice Search:** Introduction, Optimization techniques.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	2	--	1	2	3	1	--	--	--	2	2	3	2	2	1	2
CO-2	3	3	2	1	1	2	3	1	1	2	2	2	1.91	3	3	2	2	2.5
CO-3	3	3	2	1	2	2	3	1	1	2	2	2	2	3	3	3	2	2.75
CO-4	3	2	3	2	2	2	3	2	1	2	2	3	2.25	3	3	3	2	2.75
Avg	3	2.5	2.25	1.33	1.5	2	3	1.25	1	2	2	2.25	2.04	3	2.75	2.5	1.75	2.5

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1) CO-2 (Unit: 2) CO-3 (Unit: 3) CO-4 (Unit: 4)	• Problem Solving, Examples, Questioning, Experiment, Demonstration, Seminar

Assessment Method

			Exam Component			
	COs	Marks	Quiz	Practical Test	Assignment	Participation/ Performance
Continuous Comprehensive Evaluation 40 Marks	CO-1	10	2.5	2.5	13	7
	CO-2	10	2.5	2.5		
	CO-3	10	2.5	2.5		
	CO-4	10	2.5	2.5		
Term-End Evaluation 60 Marks	COs	Marks	Exam Component			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

References

Books:

- CristianDarie, JaimieSirovich,Wrox-Wiley, Professional Search Engine Optimization with ASP.NET Developer's Guide to SEO, Wrox, 2007
- Eric Enge, Stephan Spencer, Rand Fishkin and Jessie Stricchiol, The Art of SEO: Mastering Search Engine Optimization,O'Reilly, 2015
- Jerri L. Ledford, SEO: Search Engine Optimization Bible,Wiley India, 2007
- JaimieSirovich and CristianDarie, Professional Search Engine Optimization with PHP, WroxWiley, 2007
- Jennifer Grappon and GradivaCouzin, Search Engine Optimization An Hour a Day, Sybex, 2006

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 4

Course Code 255010245018	Name of Course Lab Based on Data Structures	Compulsory
Credit: 02	Teaching Scheme: Theory (0) - Practical (60)	Lab Hours: 60

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Understand the fundamentals of data structures and memory management including arrays, functions, pointers and recursion.

CO-2: Apply concepts of structures, strings, and stacks in solving real-time problems like expression conversion.

CO-3: Apply graph theory and multi-linked structures to solve Implement various types of queues and apply appropriate sorting and searching algorithms effectively.

CO-4: Develop and analyze linked list implementations and compare performance of different searching and sorting techniques.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	3	--	1	2	2	--	--	--	--	--	1.58	3	2	2	1	2
CO-2	3	3	3	--	1	1	2	--	1	--	--	--	1.67	3	3	2	2	2.5
CO-3	3	3	3	--	1	--	2	2	2	1	1	1	1.83	3	3	3	2	2.75
CO-4	3	2	3	--	1	1	1	2	2	1	1	--	1.58	3	2	3	2	2.5
Avg	3	2.5	3	0	1	1	1.75	1.5	1.25	0.75	0.75	0.25	1.67	3	2.5	2.5	1.75	2.44

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1) CO-2 (Unit: 2) CO-3 (Unit: 3) CO-4 (Unit: 4)	• Experimental Learning • Demonstration and Guided Practice • Project-Based Learning • Reflective Practice

Assessment Method

			Exam Component		
	COs	Marks	Class Test	Assignment	Participation/ Performance
Continuous Comprehensive Evaluation 40 Marks	CO-1	10	5	13	7
	CO-2	10	5		
	CO-3	10	5		
	CO-4	10	5		
Term-End Evaluation 60 Marks	COs	Marks	Exam Component		
	CO-1	15	Term End Examination		
	CO-2	15			
	CO-3	15			
	CO-4	15			

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 4

Course Code 255010245019	Name of Course Lab Based on Web Application Development	Compulsory
Credit: 02	Teaching Scheme: Theory (0) - Practical (60)	Lab Hours: 60

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Install and configure PHP environment and apply basic PHP scripting to create dynamic web pages.

CO-2: Develop logic using PHP control structures, arrays, and functions, both built-in and user-defined.

CO-3: Handle user data using forms, GET/POST methods, and manage session and cookies securely.

CO-4: Integrate PHP with MySQL for data-driven applications and manage file uploads and HTTP responses effectively.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	2	--	--	1	3	--	2	1	2	1	1.88	3	2	2	1	2
CO-2	3	2	2	--	--	1	3	--	2	2	2	1	2	3	3	2	2	2.5
CO-3	3	3	2	--	1	1	3	1	2	2	2	2	2	3	3	3	2	2.75
CO-4	3	3	3	--	--	1	3	1	2	3	3	2	2.4	3	3	3	2	2.75
Avg	3	2.5	2.25	0	--	1	3	1	2	2	2.25	1.5	2.07	3	2.75	2.5	1.75	2.5

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1)	• Classroom Teaching, Tutorial
CO-2 (Unit: 2)	• Classroom Teaching, Tutorial, Presentation
CO-3 (Unit: 3)	• Classroom Teaching, Tutorial, Presentation, Seminar
CO-4 (Unit: 4)	• Classroom Teaching, Tutorial, Presentation, Seminar

Assessment Method

			Exam Component		
Continuous Comprehensive Evaluation 40 Marks	COs	Marks	Class Test	Assignment	Presentation
	CO-1	10	5	5	-
	CO-2	10	5	5	-
	CO-3	10	5	2.5	2.5
	CO-4	10	5	2.5	2.5
Term-End Evaluation 60 Marks	COs	Marks	Exam Component		
	CO-1	15	Term End Examination		
	CO-2	15			
	CO-3	15			
	CO-4	15			

Semester- 5

Course Code 255510345020	Name of Course Python Programming	Compulsory
Credit: 03	Teaching Scheme: Theory (45) - Practical (0)	Teaching Hours: 45

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Write and execute basic Python programs using variables, data types, operators, and compound data structures to solve simple computational problems.

CO-2: Apply control structures, functions, modules, file handling, and regular expressions in Python to design modular and reusable code for text and data processing tasks.

CO-3: Design and implement object-oriented programs in Python by applying concepts such as classes, objects, inheritance, encapsulation, and polymorphism.

CO-4: Develop basic web applications using Django framework by integrating models, views, templates, forms, and admin interface.

Detailed Syllabus

Unit-1. Introduction to Python

1.1 Introduction, Variables, and Data Types: ntroduction, Features, Installation, and Execution Writing Our First Python Program, Python Interpreter and Interactive Mode, Basic Data Types and Variables, expression, statements, Operators (Arithmetic Operators, Comparison Operators, Logical Operators, Assignment and Membership Operators, Identity Operators), Input and Output, Strings, Compound Data Types (list, tuples, set, dictionary, and list comprehension)

Unit-2. Control Structures and Arrays in Python

2.1 Control Structures: Conditional processing uses if, if-else, elif statements, and looping constructs, while control-flow alteration uses break, continue, pass, and else list comprehension. String: String Slices, Immutability, String Functions and Methods, String Module.

2.2 Basics of Functions, Modules, and Packages: Introduction to Function, built-in and User defined functions, function arguments (default, positional, keyword arguments) Scoping (global and local variable), Recursive Functions, lambda function, grouping functions using modules, Grouping modules using packages

2.3 Basics of Files and Regular Expressions: File Input/Output, Text Processing, Pattern Matching, Regular Expressions.

Unit-3. OOP in python

3.1 ntroduction to OOP, Core Concepts of OOP: Classes and Objects, Encapsulation, Abstraction, Inheritance, Polymorphism

3.2 Basic Class Structure in Python: class, __init__, self, Creating objects, Constructors, Methods, and self,The __init__() constructor, Instance variables and methods, The importance of self-Default values in constructors, Updating and accessing object data.

Unit-4.

4.1 Python Web Application Framework- Django: Overview of Django and Web Frameworks, Setting Up Django, Installing Python, pip, and Django, URL Routing and Views, Templates in Django, Creating and using templates, Django Models and Database Operations, Django Admin Interface, Creating a superuser, Forms and User Input,Mini Project / Integration

4.2 Build a small web app (e.g., a blog, to-do app, or contact form)

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	1	3	--	--	--	2	2	--	2	--	--	**2.16**	3	2	2	1	**2**
CO-2	3	2	3	1	--	--	2	2	2	2	1	--	**2**	3	2	2	2	**2.25**
CO-3	3	2	3	1	1	2	2	2	2	2	2	1	**1.91**	3	3	3	2	**2.75**
CO-4	3	3	3	2	2	2	2	3	2	2	3	3	**2.5**	3	3	3	3	**3**
Avg	**3**	**2**	**3**	**1.33**	**1.5**	**2**	**2**	**2.25**	**2**	**2**	**2**	**2**	**2.14**	**3**	**2.5**	**2.5**	**2**	**2.5**

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1)	• Classroom Teaching, Tutorial
CO-2 (Unit: 2)	• Classroom Teaching, Tutorial, Presentation
CO-3 (Unit: 3)	• Classroom Teaching, Tutorial, Presentation, Seminar
CO-4 (Unit: 4)	• Classroom Teaching, Tutorial, Presentation, Seminar

Assessment Method

			Exam Component		
Continuous Comprehensive Evaluation 40 Marks	**COs**	**Marks**	**Class Test**	**Assignment**	**Presentation**
	CO-1	10	5	5	-
	CO-2	10	5	5	-
	CO-3	10	5	2.5	2.5
	CO-4	10	5	2.5	2.5
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**		
	CO-1	15	Term End Examination		
	CO-2	15			
	CO-3	15			
	CO-4	15			

References

Books:

- Rupesh Nasre, Python Programming, Publisher -AICTE ,2022
- Mark Lutz, Learning Python, O′Reilly, 2013
- Kenneth A. Lambert , Fundamentals of Python, South-Western College Publishing, 2011
- Tony Gaddis,Starting out with Python, Pearson, 2019

Online Resources & Tools:

- Swayam & e-PG Pathshala

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 5

Course Code 255510445021	Name of Course Mobile Application Development	Elective
Credit: 04	Teaching Scheme: Theory (60) - Practical (0)	Teaching Hours: 60

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Demonstrate understanding of the fundamental components of Android applications and apply Kotlin programming concepts to build basic Android functionalities.

CO-2: Configure the Android Manifest file, manage application resources, and set appropriate permissions to ensure proper app functionality and deployment readiness.

CO-3: Design effective and responsive user interfaces using Android layout components and apply basic animation techniques to enhance user experience.

CO-4: Utilize Android APIs for data storage, implement SQLite for local data management, and explore the basics of Flutter and mobile application testing methodologies.

Detailed Syllabus

Unit-1. Android Application Design Essentials

1.1 Introduction to Android Application: Anatomy of an Android applications, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Kotlin Overview, Basic, Control Flow, Array & String, Functions, Collections, OOPs Concept, Exception Handling, Null Safety, Regex & Ranges.

Unit-2. Android Application Prerequisite

2.1 Prerequisite: Android Manifest File and its common settings, Using Intent Filter, Permissions, Managing Application resources in a hierarchy, Working with different types of resources, Introduction of Google Play store.

Unit-3. Android User Interface Design Essentials

3.1 UI Design: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

Unit-4. Android APIs

4.1 APIs: Android Data and Storage APIs, Managing data using SQLite.

4.2 Notification: Type of notifications.

4.3 Android Framework and Testing

4.3.1 Introduction to Flutter

4.3.2 Introduction to Mobile Application Testing

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	1	2	--	1	1	3	2	2	2	2	2	2	3	2	2	2	2.25
CO-2	3	2	2	1	1	--	3	1	2	2	2	2	1.91	3	2	2	1	2
CO-3	3	2	3	1	--	2	3	2	2	2	2	2	2.18	3	3	2	2	2.5
CO-4	3	3	3	2	--	--	3	2	2	2	2	2	2.3	3	3	3	2	2.75
Avg	3	2	2.5	1.33	1	1.5	3	1.75	2	2	2	2	2.10	3	2.5	2.25	1.75	2.37

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy	
CO-1 (Unit: 1)	• Classroom Teaching, Tutorial
CO-2 (Unit: 2)	• Classroom Teaching, Tutorial, Presentation
CO-3 (Unit: 3)	• Classroom Teaching, Tutorial, Presentation, Seminar
CO-4 (Unit: 4)	• Classroom Teaching, Tutorial, Presentation, Seminar

Assessment Method

			Exam Component		
	COs	**Marks**	**Class Test**	**Assignment**	**Presentation**
Continuous Comprehensive Evaluation 40 Marks	**CO-1**	10	5	5	-
	CO-2	10	5	-	5
	CO-3	10	5	2.5	2.5
	CO-4	10	5	2.5	2.5
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**		
	CO-1	15	Term End Examination		
	CO-2	15			
	CO-3	15			
	CO-4	15			

References

Books:

- Joseph Annuzzi, Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson, Education, 4th ed., 2014
- Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd, 2014
- Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd, 2009
- Sujit Kumar Mishra, "Fundamentals of Android App Development", BPB Publication, 2020
- Michael Burton, "Android App Development for Dummies", 3ed, a Wiley Brand, 2015

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 5

Course Code 255520445022	Name of Course MOOC*- Cross-Platform Application Development Using Flutter	Elective
Credit: 04	Teaching Scheme: Theory (60) - Practical (0)	Teaching Hours: 60

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Students will be able to explain the fundamental concepts, benefits, and limitations of cross-platform application development, and identify scenarios where it is preferable over native development.

CO-2: Students will be able to design and construct responsive and user-friendly interfaces using Flutter's layout system, widget tree, and visual components.

CO-3: Students will be able to integrate RESTful APIs, handle JSON data, and implement local data persistence using shared preferences and local databases in Flutter.

CO-4: Students will be able to develop and execute unit, widget, and integration tests to ensure the quality and reliability of Flutter applications.

Detailed Syllabus

Week-1	**Introduction to Cross-Platform Application Development**
Week-2	**Introduction to the Dart Language, Getting Started with Flutter**
Week-3	**Understanding Flutter Widgets,**
Week-4	**Building User Interfaces with Flutter**
Week-5	**State Management in Flutter**
Week-6	**Working with Flutter Navigation**
Week-7	**Integrating APIs and Working with Data, Storing Data Locally**
Week-8	**Working with Firebase in Flutter**
Week-9	**Building and Deploying Multi-Platform Applications, Performance Optimization in Flutter**
Week-10	**Custom Widgets and Plugins**
Week-11	**Testing in Flutter**
Week-12	**Flutter for the Web and Desktop**

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	--	1	1	2	2	--	1	2	2	2	1.67	3	2	2	1	2
CO-2	3	2	2	1	--	2	3	2	2	2	2	2	2	3	2	2	2	2.25
CO-3	3	3	3	1	--	2	3	2	2	2	3	3	2.42	3	3	3	2	2.75
CO-4	2	2	3	--	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Avg	2.75	2.25	2.67	0.75	1	2	2.50	1.50	1.75	2	2.25	2.25	2.02	2.75	2.25	2.25	1.75	2.25

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1)	• Classroom Teaching, Tutorial
CO-2 (Unit: 2)	• Classroom Teaching, Tutorial, Presentation
CO-3 (Unit: 3)	• Classroom Teaching, Tutorial, Presentation, Seminar
CO-4 (Unit: 4)	• Classroom Teaching, Tutorial, Presentation, Seminar

Assessment Method (as per the MOOC Guideline)					
			Exam Component		
Continuous Comprehensive Evaluation 40 Marks	COs	Marks	Class Test	Assignment	Presentation
	CO-1				
	CO-2				
	CO-3				
	CO-4				
Term-End Evaluation 60 Marks	COs	Marks	Exam Component		
	CO-1 CO-2 CO-3		Term End Examination		
	CO-4				

References

Books:

- MCA-303: Cross-Platform Application Development, June 2024 by Dr. Babasaheb Ambedkar Open University, Ahmedabad
- Beginning Flutter: A Hands-On Guide to App Development, Marco L. Napoli, ISBN: 978-1119550822 by Wrox
- Flutter for Beginners" (Second Edition), Alessandro Biessek, ISBN: 978-1800566008 by Packet Publishing
- Flutter Cookbook, Simone Alessandria & Brian Kayfitz, ISBN: 978-1838823382 by Packt Publishing
- Flutter Projects: A practical, project-based guide to building realworld cross-platform mobile applications and games, Simone Alessandria, ISBN: 978-1800565995 by Packt Publishing

Online Resources & Tools:

- https://dart.dev/overview
- https://dartpad.dev/
- https://docs.flutter.dev/
- https://firebase.google.com/docs/flutter/setup?platform=android
- https://flutter.dev/multi-platform
- https://docs.flutterflow.io/concepts/custom-code/custom-widgets/

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 5

Course Code 255510345024	Name of Course Operating System	Compulsory
Credit: 03	Teaching Scheme: Theory (45) - Practical (0)	Teaching Hours: 45

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Explain fundamental operating system concepts, including different types of systems, memory management techniques, and virtual memory with page replacement policies.

CO-2: Understand File system structures, access methods, and device management techniques for efficient storage and input/output operations.

CO-3: Understand process concepts, implement CPU scheduling algorithms, and apply synchronization techniques to manage concurrent processes.

CO-4: Write UNIX shell scripts, use essential shell commands, and manage processes including creation, execution, and inter-process communication.

Detailed Syllabus

Unit-1.

- **1.1 Operating System Concepts:** Introduction, what is an operating system, Multiprogram /processing systems, Multiuser System, Time- Sharing Systems, Personal - Computer Systems, Parallel systems, Distributed systems & Real- Time system
- **1.2 Memory Management:** Background of Memory Management, Logical versus physical Address space, swapping, Contiguous allocation, Paging, Segmentation
- **1.3 Virtual Memory:** Demand Paging, Page Replacement

Unit-2.

- **2.1 Introduction to File System and File Management:** Information Management, Introduction to a Simple File system, General Model of a File System, Symbolic File System, Basic File System, Access Control Verification, Logical File System.
- **2.2 Physical File system File:** System Interface, File Concept, Access, Methods, Directory Structure, Protection
- **2.3 Device access and management:** Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices, Input or Output Devices, Storage Devices, Buffering

Unit-3.

- **3.1 Introduction to Process:** Process Concept, Process Scheduling, Operations on Processes
- **3.2 CPU Scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling
- **3.3 Process synchronization**

Unit-4.

- **4.1 Unix Shell script and Process Programming:** Introduction to shell programming, different types of shell and kernel, 'vi' Editor, Environment variables and user defined variables
- **4.2 shell commands:** pwd, ls, cd, mv, cat, rm, mkdir, rmdir, head, tail, grep, cut, who, ps, wc, find, sort, uniq, merge, let, expr, & (background process).
- **4.3 The process:** process creation, parent and child process, process related commands

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	2	--	--	--	2	1	1	--	--	--	1.5	3	2	1	1	1.75
CO-2	3	3	2	--	--	--	2	1	1	1	--	--	1.75	3	2	2	1	2
CO-3	3	3	3	--	--	--	2	2	1	1	1	--	2	3	3	2	2	2.5
CO-4	3	2	3	--	--	--	2	2	2	1	1	--	2	3	2	2	2	2.25
Avg	3	2.5	2.5	--	--	--	2	1.5	1.25	0.75	0.5	--	1.81	3	2.25	1.75	1.5	2.13

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1) CO-2 (Unit: 2) CO-3 (Unit: 3) CO-4 (Unit: 4)	• Classroom Teaching, Group Discussion, Assignment, Examples, Questioning

Assessment Method

			Exam Component			
	COs	Marks	Class Test	Assignment	Presentation	Involvement
Continuous Comprehensive Evaluation 40 Marks	CO-1	10	5	7	7	6
	CO-2	10	5			
	CO-3	10	5			
	CO-4	10	5			
Term-End Evaluation 60 Marks	COs	Marks	Exam Component			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

References

Books:

- Operating system concept by Silbersachatz and Galvin –Pearson.
- Operating Systems by Madnick E. and Donovan J. –Tata McGraw Hill.
- UNIX and Shell programming by B.M. Harwani – OXFORD
- The Unix Programming Environment, Kernigham & Pike –PHI.
- The Design of the UNIX OS, M. J. Bach – Prentice Hall.
- Working with UNIX, Vijay Mukhi –BPB Publications.
- UNIX Shells, Vijay Mukhi –BPB Publications.

Online Resources & Tools:

- Swayam & e-PG Pathshala

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 5

Course Code 255510245025	Name of Course Lab Based on Python Programming	Compulsory
Credit: 02	Teaching Scheme: Theory (0) - Practical (60)	Lab Hours: 60

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Understand Python syntax, data types, and apply basic programming constructs to develop simple Python applications.

CO-2: Apply control structures, string manipulations, functions, modules, file handling, and regular expressions for structured program development.

CO-3: Implement object-oriented programming concepts such as classes, objects, inheritance, and encapsulation using Python.

CO-4: Design and develop web applications using the Django framework including routing, templates, models, forms, and admin interface.

Mapping Matrix of POs, PSOs, and COs

COs	Pos													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	2	--	1	2	3	--	2	--	1	1	1.88	3	2	2	1	2
CO-2	3	3	3	--	1	2	3	--	2	1	1	1	2	3	3	2	2	2.5
CO-3	3	3	3	1	2	2	3	1	2	1	2	1	2	3	3	3	2	2.75
CO-4	3	2	3	1	1	2	3	2	3	2	1	1	2	3	2	3	2	2.5
Avg	3	2.5	2.75	1	1.25	2	3	1.5	2.25	1.33	1.25	1	1.97	3	2.5	2.5	1.75	2.44

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1) CO-2 (Unit: 2) CO-3 (Unit: 3) CO-4 (Unit: 4)	• Experimental Learning • Demonstration and Guided Practice • Project-Based Learning • Reflective Practice

Assessment Method

			Exam Component		
	COs	Marks	Class Test	Assignment	Participation/ Performance
Continuous Comprehensive Evaluation 40 Marks	CO-1	10	5	13	7
	CO-2	10	5		
	CO-3	10	5		
	CO-4	10	5		
Term-End Evaluation 60 Marks	COs	Marks	Exam Component		
	CO-1	15	Term End Examination		
	CO-2	15			
	CO-3	15			
	CO-4	15			

Program - BCA (Faculty of Information, Communication and Technology) Semester- 5		
Course Code 255510245026	**Name of Course** Lab Based on Mobile Application Development	**Elective**
Credit: 02	**Teaching Scheme: Theory (0) - Practical (60)**	**Lab Hours: 60**

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Understand the structure and lifecycle of Android applications and apply Kotlin programming concepts in app development.

CO-2: Configure essential components like manifest file, intent filters, permissions, and resources in Android apps.

CO-3: Design responsive and user-friendly Android interfaces using layouts, widgets, and animations.

CO-4: Implement data handling using Android APIs, utilize SQLite, notifications, and explore emerging tools like Flutter and testing frameworks.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	2	--	2	2	3	--	--	1	2	2	2.11	3	2	2	2	2.25
CO-2	3	2	2	--	2	2	3	--	--	1	2	2	2.11	3	2	2	2	2.25
CO-3	3	2	2	1	--	2	3	2	--	--	1	2	2	3	2	3	2	2.5
CO-4	3	2	3	--	--	2	3	2	1	1	2	2	2.1	3	3	3	2	2.75
Avg	3	2	2.25	1	2	2	3	2	1	1	1.75	2	2.08	3	2.25	2.5	2	2.44

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1) CO-2 (Unit: 2) CO-3 (Unit: 3) CO-4 (Unit: 4)	• Experimental Learning • Demonstration and Guided Practice • Project-Based Learning • Reflective Practice

Assessment Method

			Exam Component		
	COs	Marks	Class Test	Assignment	Participation/ Performance
Continuous Comprehensive Evaluation 40 Marks	CO-1	10	5	13	7
	CO-2	10	5		
	CO-3	10	5		
	CO-4	10	5		
Term-End Evaluation 60 Marks	COs	Marks	Exam Component		
	CO-1	15	Term End Examination		
	CO-2	15			
	CO-3	15			
	CO-4	15			

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 5

Course Code 255510245028	Name of Course Lab Based on Operating System	Compulsory
Credit: 02	Teaching Scheme: Theory (0) - Practical (60)	Lab Hours: 60

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Understand the basic structure of modern operating systems and simulate key memory management techniques like paging and segmentation.

CO-2: Explain and simulate file system organization, directory structures, file access methods, and device management strategies.

CO-3: Implement and analyze process management concepts using process sub system calls.

CO-4: Develop and execute shell scripts for automation, file management, and demonstrate process-related commands and system programming in UNIX/Linux.

Mapping Matrix of POs, PSOs, and COs

COs	POs													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	3	1	1	1	2	--	--	--	--	--	1.58	3	2	2	1	2
CO-2	3	2	3	--	1	1	2	--	--	--	--	--	1.58	3	2	2	1	2
CO-3	3	3	3	--	1	--	2	1	1	1	--	--	1.67	3	3	2	2	2.5
CO-4	3	2	3	--	1	1	3	1	1	1	1	--	1.83	3	2	3	2	2.5
Avg	3	2.25	3	0.25	1	0.75	2.25	0.75	0.75	0.75	0.25	--	1.67	3	2.25	2.25	1.5	2.25

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1) CO-2 (Unit: 2) CO-3 (Unit: 3) CO-4 (Unit: 4)	• Experimental Learning • Demonstration and Guided Practice • Project-Based Learning • Reflective Practice

Assessment Method

			Exam Component		
	COs	Marks	Class Test	Assignment	Participation/ Performance
Continuous Comprehensive Evaluation 40 Marks	CO-1	10	5	13	7
	CO-2	10	5		
	CO-3	10	5		
	CO-4	10	5		
Term-End Evaluation 60 Marks	COs	Marks	Exam Component		
	CO-1	15	Term End Examination		
	CO-2	15			
	CO-3	15			
	CO-4	15			

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 6

Course Code 255510245030	Name of Course Advance Data Structures	Elective
Credit: 02	Teaching Scheme: Theory (30) - Practical (0)	Teaching Hours: 30

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Implement binary trees and binary search trees, perform various tree traversals, and apply tree data structures to solve real-world problems.

CO-2: Represent graphs using different methods, and apply graph traversal algorithms such as Breadth First Search and Depth First Search effectively.

CO-3: Implement multilinked structures like sparse matrices and understand dynamic storage management techniques including fixed block and first-fit storage allocation.

CO-4: Advanced sorting algorithms such as radix and quick sort, and apply hashing techniques including collision resolution for efficient data retrieval.

Detailed Syllabus

Unit-1.

1.1 Trees: Definitions, Binary tree, Binary search tree, Tree traversals, Sequential representation of tree, Linked representation of tree, Recursive tree traversal, deleting a node, Applications of tree

Unit-2.

2.1 Graphs: Definitions, Sequential representation of graphs, Warshall's and Matrix minima algorithms, Node directory structure representation of graphs, Breadth First Search, Depth First Search

Unit-3.

3.1 Multilinked Structures: Sparse Matrices, Application of Sparse Matrices

3.2 Sparse Matrices, Application of Sparse Matrices: Fixed block storage allocation, First-fit storage allocation, Storage release

Unit-4.

4.1 Advanced Sorting and Hashing Methods: Radix sort, Quick sort, Introduction to hash table, Hashing Functions, Collision resolution techniques

Mapping Matrix of POs, PSOs, and Cos

Cos	Pos													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	3	3	--	--	1	2	2	1	1	2	1	1.67	3	2	2	1	2
CO-2	3	3	3	--	--	1	2	2	1	--	2	1	1.58	3	2	2	1	2
CO-3	3	2	3	1	--	1	2	1	1	--	1	1	1.42	3	2	2	1	2
CO-4	3	3	3	--	--	1	2	2	1	1	2	1	1.67	3	2	2	1	2
Avg	3	2.75	3	0.25	--	1	2	1.75	1	0.75	1.75	1	1.59	3	2	2	1	2

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1) CO-2 (Unit: 2) CO-3 (Unit: 3) CO-4 (Unit: 4)	• Classroom Teaching, Group Discussion, Assignment, Examples, Questioning

Assessment Method						
			Exam Component			
Continuous Comprehensive Evaluation 40 Marks	COs	Marks	Class Test	Assignment	Presentation	Involvement
	CO-1	10	5	7	7	6
	CO-2	10	5			
	CO-3	10	5			
	CO-4	10	5			
Term-End Evaluation 60 Marks	COs	Marks	Exam Component			
	CO-1	15	Term End Examination			
	CO-2	15				
	CO-3	15				
	CO-4	15				

References

Books:

- Paul Gordon Sorenson, Jean-Paul Tremblay, An introduction to Data Structures with Applications, Tata McGrawHill, 1984
- A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, Data Structures using C, PHI-Pearson Education, 2008
- Yashwant Kanetkar, Data Structures Through C, 4th Edition, BPB Publications, 2022
- N.B. Venkateswarlu, Data Structures, Theory & Practical, AICTE e-Kumbh, 2022
- SamantaDebasis, Classical Data Structures, 2nd Edition, PHI, 2009
- IGlenn W. Rowe, Introduction to Data Structure and algorithm with C, Printice Hall, 1997
- Horowitz, Sahni, and Anderson-Freed, Fundamentals of Data Structures in C, 2nd Edition,Orient Blackswan, 2008

Online Resources & Tools:

- Swayam, NPTEL & e-PG PATHSHALA

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 6

Course Code 265520445036	Name of Course MOOC-Generative AI for Everyday Life	Elective
Credit:04	Teaching Scheme: Theory (90) - Practical (0)	12 Weeks

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Explain the fundamental concepts, evolution, applications, and societal implications of Artificial Intelligence and Generative AI across diverse domains.

CO-2: Demonstrate effective use of commonly used Generative AI platforms (such as ChatGPT, Gemini, Copilot, and other AI tools) to support professional, educational, and creative tasks.

CO-3: Apply prompt engineering techniques—from basic to advanced—to generate accurate, relevant, and context-specific outputs for office work, education, digital marketing, and programming.

CO-4: Analyze and utilize Generative AI solutions in specialized sectors including education, healthcare, agriculture, digital marketing, creative arts, gaming, customer service, and software development while considering ethical and practical considerations.

Detailed Syllabus

Unit-1. Foundations of Artificial Intelligence & Generative AI

1.1 Introduction to Artificial Intelligence
1.2 Foundations, applications, and implications of AI
1.3 Fundamentals of Generative AI
1.4 Evolution and real-world applications of Generative AI
1.5 Video 1: Foundations of Artificial Intelligence
1.6 Video 2: Applications and Implications of AI
1.7 Video 3: Fundamentals of Generative AI
1.8 Video 4: Applications of Generative AI

Unit-2. Generative AI Platforms & Prompt Engineering

2.1 Overview of popular Generative AI platforms
2.2 ChatGPT, Gemini, Copilot
2.3 Principles of Prompt Engineering
2.4 Designing effective prompts
2.5 Working with basic and advanced prompts
2.6 Video 5: Introduction to ChatGPT
2.7 Video 6: Introduction to Gemini
2.8 Video 7: Introduction to Copilot
2.9 Video 8: Harnessing the Power of Prompt Engineering
2.10 Video 9: Practical Examples of Prompt Engineering
2.11 Video 10: Working with Basic Prompts
2.12 Video 11: Working with Advanced Prompts

Unit-3. Generative AI Applications in Professional, Educational Domains & Digital Marketing

3.1 Generative AI in office environments
3.2 AI-assisted correspondence, documentation, meetings, proposals
3.3 Generative AI in education (content creation, curriculum, research, assessment)
3.4 AI in healthcare and agriculture
3.5 AI-assisted programming
3.6 Video 12–15: Generative AI in Office Environment
3.7 Video 16–20: Generative AI in Education (Part 1 & 2)
3.8 Video 21–27: AI in Digital Marketing (Part 1–3)

Unit-4. Generative AI in Healthcare, Agriculture, Programming, Creativity, Media & Emerging Tools

4.1 Generative AI in Digital Marketing (YouTube, Facebook, Instagram, X, LinkedIn, Email, E-Commerce)
4.2 AI in art, design, and music
4.3 AI in gaming and movies
4.4 Automated customer services and chatbots
4.5 Hands-on exposure to various AI tools and platforms
4.6 Video 28: AI Application in Healthcare
4.7 Video 29: AI Application in Agriculture
4.8 Video 30: AI-Assisted Programming
4.9 Video 31–32: Generative AI in Art & Music
4.10 Video 33–34: AI in Gaming and Movies
4.11 Video 35: Automated Customer Services with AI
4.12 Video 36–40: Working with Various AI Tools

Mapping Matrix of POs, PSOs, and Cos

Cos	Pos													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	1	2	3	2	2	0	2	0	1	3	1.75	2	1	1	2	1.5
CO-2	2	2	3	0	2	2	3	1	2	1	2	2	1.83	3	3	1	2	2.25
CO-3	2	3	3	0	2	2	3	1	2	2	2	1	1.92	3	2	2	2	2.25
CO-4	3	3	2	2	3	2	3	2	3	2	3	3	2.58	3	2	3	3	2.75
Avg	2.5	2.5	2.25	1	2.5	2	2.75	1	2.25	1.25	2	2.25	2.02	2.75	2	1.75	2.25	2.19

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1) CO-2 (Unit: 2) CO-3 (Unit: 3) CO-4 (Unit: 4)	• Classroom Teaching, Group Discussion, Assignment, Examples, Questioning

Assessment Method (as per the MOOC Guideline)

			Exam Component			
Continuous Comprehensive Evaluation 40 Marks	COs	Marks	Class Test	Assignment	Presentation	Involvement
	CO-1					
	CO-2					
	CO-3					
	CO-4					

Term-End Evaluation 60 Marks	COs	Marks	Exam Component
	CO-1		Term End Examination
	CO-2		
	CO-3		
	CO-4		

References

Online Resources & Tools:

- Swayam, IGNOU

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 6

Course Code 255510245031	Name of Course Lab Based on Advanced Data Structures	Elective
Credit: 02	Teaching Scheme: Theory (0) - Practical (60)	Lab Hours: 60

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Understand and apply tree data structures including traversals, binary search trees, and recursive operations in various applications.

CO-2: Implement graph representations and perform standard graph traversal algorithms including BFS, DFS, and Warshall's algorithm.

CO-3: Apply multilinked structures like sparse matrices and simulate dynamic storage management techniques such as First-Fit and Fixed Block Allocation.

CO-4: Analyze and implement advanced sorting techniques and hashing mechanisms with appropriate collision resolution strategies.

Mapping Matrix of POs, PSOs, and Cos

Cos	Pos													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	3	3	--	1	2	2	1	1	--	--	--	**1.67**	3	2	2	1	**2**
CO-2	3	3	3	--	1	1	2	1	1	--	--	--	**1.58**	3	2	2	1	**2**
CO-3	3	2	3	1	1	--	2	1	--	--	--	--	**1.42**	3	2	2	1	**2**
CO-4	3	3	3	--	1	1	2	1	1	--	--	--	**1.58**	3	2	2	1	**2**
Avg	**3**	**2.75**	**3**	**0.25**	**1**	**1**	**2**	**1**	**1**	--	--	--	**1.56**	**3**	**2**	**2**	**1**	**2**

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Teaching Pedagogy

CO-1 (Unit: 1) **CO-2 (Unit: 2)** **CO-3 (Unit: 3)** **CO-4 (Unit: 4)**	• Experimental Learning • Demonstration and Guided Practice • Project-Based Learning • Reflective Practice

Assessment Method

			Exam Component		
	COs	**Marks**	**Class Test**	**Assignment**	**Participation/ Performance**
Continuous Comprehensive Evaluation 40 Marks	**CO-1**	10	5	13	7
	CO-2	10	5		
	CO-3	10	5		
	CO-4	10	5		
Term-End Evaluation 60 Marks	**COs**	**Marks**	**Exam Component**		
	CO-1	15	Term End Examination		
	CO-2	15			
	CO-3	15			
	CO-4	15			

Program - BCA (Faculty of Information, Communication and Technology)

Semester- 6

Course Code 265511645035	Name of Course Internship	Compulsory
Credit: 16	Teaching Scheme: Theory (--) - Practical (--)	Hours: --

Course Outcomes (COs)

After completing this course, students will be able to

CO-1: Apply theoretical knowledge of programming, databases, web development, and software engineering to real-world projects in industry, NGOs, or campus-based environments.

CO-2: Demonstrate problem-solving, critical thinking, and teamwork skills through the design, development, and documentation of socially responsible software solutions.

CO-3: Integrate professional tools, industry-standard practices, and ethical computing principles in the planning, execution, and delivery of ICT-based systems or applications.

CO-4: Communicate project outcomes effectively through structured documentation, presentations, and code repositories, while reflecting on the societal impact and future scope of the solution developed.

Mapping Matrix of POs, PSOs, and Cos

COs	Pos													PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	Avg	1	2	3	4	Avg
CO-1	3	2	3	--	1	2	3	2	2	3	2	2	**2.27**	3	2	3	2	**2.5**
CO-2	2	3	2	2	2	2	2	3	2	3	3	3	**2.42**	2	3	2	3	**2.5**
CO-3	3	2	3	1	3	2	3	2	2	3	3	2	**2.42**	3	3	3	2	**2.75**
CO-4	2	2	2	2	3	3	2	2	3	2	2	3	**2.33**	2	2	3	3	**2.5**
Avg	**2.50**	**2.25**	**2.50**	**1.67**	**2.25**	**2.25**	**2.50**	**2.25**	**2.25**	**2.75**	**2.50**	**2.50**	**2.36**	**2.5**	**2.5**	**2.75**	**2.5**	**2.56**

3= Strong Contribution, 2 = Moderate Contribution, 1 = Slight Contribution, --- = No Significant Contribution

Assessment Method

	As per the BCA Internship guideline