SARDAR PATEL UNIVERSITY, BALAGHAT

School of Computer Application

Syllabus under NEP

Course: Bachelor of Computer Applications (BCA) **Semester: III**

Branch: Computer Science and Application **w.e.f. Academic Session: 2025-26**

Subject: Python Programming (BCAMA301T)

UNIT - I: Introduction to Python

Evolution of Python, features, and applications in industry. Installing Python, IDEs (IDLE, PyCharm, Jupyter Notebook). Python program structure, indentation rules, Variables, constants, and data types (numeric, boolean, string). Type conversion and type casting, Input and output functions (input(), print()). **Operators:** arithmetic, relational, logical, bitwise, assignment, identity, membership. Writing and executing Python scripts.

UNIT - II: Control Structures and Functions

Conditional statements: if, if-else, if-elif-else. **Looping constructs:** for, while, nested loops. **Loop control statements:** break, continue, pass. **Functions:** definition, parameters, return values. **Types of arguments:** positional, keyword, default, variable-length. Recursion and its applications. Anonymous functions (lambda). **Scope of variables:** local, global, nonlocal.

UNIT - III: Data Structures in Python

Strings: indexing, slicing, built-in methods. **Lists:** creation, indexing, slicing, methods (append, extend, sort, etc.). **Tuples:** immutable sequences, operations, packing/unpacking. **Sets:** creation, operations (union, intersection, difference), methods. **Dictionaries:** key-value pairs, methods (get, update, items, etc.). List comprehension and dictionary comprehension. Nested lists and dictionaries. Iterators and generators (yield).

UNIT - IV: File Handling and Exception Handling

File operations: opening, reading, writing, appending. **File modes** (r, w, a, rb, wb), Reading and writing text vs binary files. **File methods:** read(), readline(), write(), close(). **Exception handling:** try, except, else, finally. Built-in exceptions (ValueError, IOError, ZeroDivisionError, etc.). Raising exceptions using raise, Custom exceptions.

UNIT - V: Object-Oriented Programming in Python

Concept of classes and objects. Attributes and methods. Constructors (__init__) and destructors (__del__). **Inheritance:** single, multiple, multilevel, hierarchical. Method overriding and polymorphism. Encapsulation and data hiding. Abstract classes and interfaces (abc module). **Modules and packages:** importing, creating, using built-in modules (math, random, os).

Reference Books

1. **Learning Python** – Mark Lutz (O'Reilly)
2. **Python Programming: Using Problem Solving Approach** – Reema Thareja (Oxford University Press)
3. **Core Python Programming** – R. Nageswara Rao (Dreamtech Press)
4. **Python Crash Course** – Eric Matthes (No Starch Press)
5. **Programming in Python** – Poonam Bansal (Pearson)

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Python Programming Lab:

1. Swap two numbers without using a third variable.
2. Create a simple calculator using basic operators.
3. Check whether a number is prime.
4. Accept marks of 5 subjects and calculate percentage and grade.
5. Generate Fibonacci series using recursion.
6. Find factorial using recursion.
7. Calculate the sum of digits of a number.
8. Check Armstrong numbers.
9. Reverse a string without using built-in functions.
10. Find the largest and smallest element in a list.
11. Remove duplicates from a list.
12. Create a dictionary to store student names and marks, then display topper.
13. Read a text file and count the number of words.
14. Copy contents of one file into another.
15. Handle division by zero exception.
16. Store and retrieve student records from a file.
17. Create a class Student with attributes and methods.
18. Implement single and multiple inheritance with examples.
19. Demonstrate polymorphism using method overriding.
20. Create a package with multiple modules and import them in a program.

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Subject: Web Technology (BCAMI302T)

UNIT - I: HTML Basics

Introduction to Internet & Web Technologies. Structure of HTML documents. **Basic tags:** headings, paragraphs, lists, links, images, Attributes and their usage. **Tables:** rows, columns, merging cells, styling basics. **Forms:** input types, labels, buttons, text areas, checkboxes, radio buttons. Semantic elements in HTML5 (header, footer, article, section, nav). Difference between HTML and XHTML.

UNIT - II: Advanced HTML

Multimedia elements: audio, video, canvas. **HTML5 APIs:** Geolocation, Drag & Drop, Local Storage, Session Storage, Frames and iframes. **Meta tags:** description, keywords, viewport settings. **Accessibility features:** alt text, ARIA roles, screen reader support, Responsive design concepts with HTML. Introduction to Web Hosting and Domain Names. Best practices for writing clean and valid HTML.

UNIT - III: CSS Fundamentals

Introduction to CSS: inline, internal, external styles. Syntax, selectors (element, class, id, group, descendant, child), Colors, backgrounds, borders, margins, padding, Text formatting and fonts (Google Fonts, web-safe fonts). Box model concept and its applications. **Positioning:** static, relative, absolute, fixed, sticky. **Display properties:** block, inline, inline-block, none. **CSS units:** px, em, rem, %, vh, vw.

UNIT - IV: Advanced CSS

CSS features: transitions, transformations, animations. **Flexbox layout:** properties, alignment, ordering. **CSS Grid layout:** rows, columns, areas. Media queries for responsive design, Pseudo-classes (:hover, :focus, :nth-child) and pseudo-elements (::before, ::after), Styling forms, buttons, navigation menus, and tables, CSS variables (custom properties). **Best practices:** modular CSS, naming conventions (BEM), performance optimization.

UNIT - V: JavaScript Essentials

Introduction to JavaScript: history, role in web development, Variables, constants, data types, operators. **Control structures:** if-else, switch, loops (for, while, do-while). **Functions:** declaration, parameters, return values, scope. **Events:** onclick, onchange, onmouseover, addEventListener. **DOM manipulation:** getElementById, querySelector, innerHTML, style changes. Form validation using JavaScript (required fields, email, password strength). Arrays and objects basics. **Introduction to ES6 features:** let, const, arrow functions, template literals. **Debugging JavaScript:** console.log, browser developer tools.

Reference Books

1. **HTML & CSS: Design and Build Websites** – Jon Duckett
2. **Web Technologies: HTML, CSS, JavaScript** – Uttam K. Roy
3. **JavaScript: The Definitive Guide** – David Flanagan
4. **Beginning HTML, XHTML, CSS, and JavaScript** – Jon Duckett
5. **Programming in HTML5 with JavaScript and CSS3** – Glenn Johnson

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Practical Program List

HTML Programs

1. Create a simple webpage using basic HTML tags (headings, paragraphs, lists).
2. Design a webpage with hyperlinks to internal and external pages.
3. Create a webpage that displays images with captions and alt text.
4. Develop a student registration form using different input types.
5. Create a timetable using HTML tables with merged rows and columns.
6. Build a webpage using semantic HTML5 elements (header, nav, article, section, footer).
7. Embed audio and video files in a webpage.
8. Create a webpage using iframes to display another site.

CSS Programs

9. Apply inline, internal, and external CSS styles to a webpage.
10. Demonstrate the CSS box model with margins, borders, padding, and content.
11. Create a webpage with styled text (fonts, colors, alignment, spacing).
12. Design a navigation menu using CSS.
13. Build a responsive webpage layout using media queries.
14. Create a webpage using Flexbox for layout alignment.
15. Design a photo gallery using CSS Grid.
16. Apply CSS transitions and animations to buttons.

JavaScript Programs

17. Write a JavaScript program to validate a login form (username and password).
18. Create a JavaScript program to validate email and phone number in a form.
19. Develop a webpage where clicking a button changes the background color dynamically.
20. Create a JavaScript program to display a digital clock on a webpage.

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Subject: Computer Network (BCAMD303T)

UNIT - I: Introduction to Computer Networks

Concepts & Basics: Definition, evolution, and importance of networking, Types of networks: LAN, MAN, WAN, PAN. Network topologies: Bus, Star, Ring, Mesh, Hybrid. **Networking Hardware**: NIC, Hubs, Switches, Routers, Gateways, Modems, Transmission modes: Simplex, Half-duplex, Full-duplex. **Applications**: E-commerce, E-learning, Cloud computing, Social networking. **Practical/Lab:** Identify and configure basic networking devices, draw topology diagrams using simulation tools (e.g., Cisco Packet Tracer).

UNIT - II: Network Models and Protocols

OSI Model: Functions of each layer (Physical → Application), Encapsulation and decapsulation process. **TCP/IP Model**: Comparison with OSI, Protocols: IP, ICMP, ARP, RARP. **Application Protocols**: HTTP/HTTPS, FTP, SMTP, POP3, IMAP, DNS, DHCP. **Practical/Lab:** Simulate data transfer across layers, configure IP addresses, test connectivity with ping and trace route.

UNIT - III: Data Transmission and Switching

Transmission Media: Wired: Twisted pair, Coaxial, Fiber optics, Wireless: Radio waves, Microwaves, Infrared, Satellite. **Data Encoding & Error Handling**: Encoding schemes: NRZ, Manchester, Error detection: Parity, CRC, Error correction: Hamming code. **Switching & Multiplexing**: Circuit, Packet, Message switching, FDM, TDM, WDM. **Practical/Lab:** Demonstrate error detection using CRC, simulate packet switching in a network simulator.

UNIT - IV: Network Layer and Routing

IP Addressing: IPv4 structure, subletting, CIDR, IPv6 basics. **Routing**: Static vs. Dynamic routing, Algorithms: Distance Vector, Link State, and Dijkstra's. **Congestion Control**: Causes, prevention techniques, Quality of Service (QoS) parameters. **Practical/Lab:** Perform subletting exercises, configure static routing in Packet Tracer, and observe routing table changes.

UNIT - V: Transport & Application Layer + Security

Transport Layer: TCP vs. UDP, Flow control (Sliding window), Error control (ARQ protocols). **Application Layer**: Email protocols (SMTP, POP3, IMAP), File transfer (FTP), Web protocols (HTTP/HTTPS). **Network Security**: Firewalls, VPNs, Encryption basics (symmetric vs. asymmetric), Authentication methods. **Practical/Lab:** Configure a simple web server, test FTP transfers, and demonstrate firewall rules.

Reference Books

1. **Andrew S. Tanenbaum & David J. Wetherall** – *Computer Networks*
2. **Behrouz A. Forouzan** – *Data Communications and Networking*
3. **James F. Kurose & Keith W. Ross** – *Computer Networking: A Top-Down Approach*
4. **William Stallings** – *Data and Computer Communications*
5. **Olivier Bonaventure** – *Computer Networking: Principles, Protocols and Practice* (Free online resource).

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Subject: Business English (BCAAEC304T)

UNIT - I: Introduction

Introduction to Business Communication, Communication Barriers, Communication Media Choices, Inter cultural and Team Communication, Interpersonal. Communication: Respecting social protocol, Networking and Socializing professionally, Non-Verbal Communication, Listening, Communication through Social Media, Business Meetings.

UNIT - II: Developing Business Writing Skills: Process of Writing, Drafting, revising Visuals, Editing, proofreading and formatting, Writing positive and Neutral Messages, Persuasive Messages, Bad News Messages, Business Letter Writing, Kinds of Business Letters, Communicating with e-mail and memos.

UNIT - III: Business Reports and Proposals: Writing the report, planning the Report, Steps in writing Business Reports, Parts of a Report, Corporate Report and Business Proposal, citing sources.

UNIT - IV: Oral and Employment Communication: The role of Business Presentations, Planning and organizing presentations, Team Presentations, online Presentations. Understanding yourself, Career, Goal Setting, Preparing Resume, Resume Formats, Writing Covering Letters, and Enquiry mails, Preparing for the job interview.

UNIT - V: Contemporary Aspects in Communication: Business etiquette, developing professional telephone skills, Mass Media, Public Relations Management, Cross Cultural and Global Communication, Communication in Information Technology, e-Business related operations.

Reference Books:

1. Ober Newman, Communicating in Business, Cengage Learning, 2015.
2. P.SubbaRao, B.AnitaKumar, C.HimaBindu, Business Communication, Cengage Learning India. Pvt. Ltd. 2012.
3. Rebecca Moore Howaward, Writing Matters, 3e, McGrawHill Education, 2018.
4. Jeff Butterfield, SoftSkills for Everyone, Cengage Learning, 2017.
5. Rajendra Pal, JSK or lahahi, Essentials of Business Communication, Sultan Chand and Sons, New Delhi, 2013.

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Subject: Computer Organization (BCADSE305AT)

UNIT - I: Introduction to Computer Organization

Basic structure of computers: Input, Output, Memory, CPU, Von Neumann architecture and stored program concept, Instruction cycle: Fetch, Decode, Execute, Store, Performance measures: MIPS, FLOPS, CPI, Evolution of computer systems: Microprocessors, Microcontrollers, Functional units: ALU, Control Unit, Registers.

UNIT - II: Data Representation and Arithmetic

Number systems: Binary, Octal, Decimal, Hexadecimal conversions, Binary arithmetic: Addition, subtraction, multiplication, division, Signed numbers: Sign-magnitude, 1's complement, 2's complement, Floating point representation (IEEE 754 standard), BCD (Binary Coded Decimal), Gray code, ASCII, Unicode, Arithmetic algorithms: Addition/subtraction of signed numbers, Booth's multiplication algorithm, Division algorithms (Restoring and Non-restoring).

UNIT - III: Central Processing Unit (CPU) Organization

CPU components: ALU, Registers, Control Unit, Instruction formats: Fixed length, Variable length, Addressing modes: Immediate, Direct, Indirect, Register, Indexed, Relative, Instruction set architecture (ISA): RISC vs. CISC, Control unit design: Hardwired control, Micro programmed control, Pipeline processing: Instruction pipelining, Hazards (structural, data, control), Superscalar architecture basics.

UNIT - IV: Memory Organization

Memory hierarchy: Registers → Cache → Main memory → Secondary storage, RAM types: SRAM, DRAM, ROM types: PROM, EPROM, EEPROM, Cache memory: Mapping techniques (Direct, Associative, Set-associative), Cache replacement policies (FIFO, LRU, Random), Virtual memory: Paging, Segmentation, Memory management concepts: Page table, TLB (Translation Look aside Buffer), Secondary storage: Magnetic disks, Optical disks, SSDs.

UNIT - V: Input/Output Organization

I/O devices: Keyboard, Mouse, Printers, Disk drives, I/O techniques: Programmed I/O, Interrupt-driven I/O, DMA (Direct Memory Access), Interrupts: Types (maskable, non-maskable), interrupt handling, I/O channels and controllers, Buses: Data bus, Address bus, Control bus, Bus arbitration techniques: Daisy chaining, Polling, Independent request, Parallel vs. Serial communication, Introduction to modern interfaces: USB, PCIe, SATA.

Reference Books

1. **William Stallings** – *Computer Organization and Architecture*
2. **Carl Hamacher, Zvonko Vranesic, Safwat Zaky** – *Computer Organization*
3. **M. Morris Mano** – *Computer System Architecture*
4. **Andrew S. Tanenbaum** – *Structured Computer Organization*
5. **David A. Patterson & John L. Hennessy** – *Computer Organization and Design: The Hardware/Software Interface*

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Subject: Operating System (BCADSE305BT)

UNIT - I: Introduction to Operating Systems

What is an Operating System (OS)?, Functions of OS: Process management, memory management, file management, I/O management, security, Types of OS: Batch, Multiprogramming, Time-sharing, Real-time, Distributed, Mobile OS, Structure of OS: Kernel, Shell, System calls, Examples of OS: Windows, Linux, macOS, Android.

UNIT - II: Process Management

What is a process? Difference between program and process, Process states: New, Ready, Running, Waiting, Terminated, Process Control Block (PCB). Scheduling: Types: Long-term, Medium-term, Short-term, Algorithms: FCFS (First Come First Serve), SJF (Shortest Job First), Priority Scheduling, Round Robin, Multilevel Queue. Threads: Concept of multithreading and advantages.

UNIT - III: Memory Management

Memory hierarchy: Registers, Cache, RAM, Disk, Contiguous memory allocation: Fixed and variable partitions, Paging: Concept, page table, page faults, Segmentation: Concept and differences from paging, Virtual memory: Demand paging, Page replacement algorithms (FIFO, LRU, Optimal), Thrashing and working set model.

UNIT - IV: File System and Storage Management

File concepts: File types, file attributes, file operations (create, read, write, delete), Directory structures: Single-level, Two-level, Tree, Acyclic graph, File allocation methods: Contiguous, Linked, Indexed, Disk scheduling algorithms: FCFS, SSTF, SCAN, C-SCAN, File protection and security.

UNIT - V: Input/Output and Deadlocks

I/O devices: Keyboard, Mouse, Printers, Disk drives, I/O techniques: Programmed I/O, Interrupt-driven I/O, DMA (Direct Memory Access), Deadlocks: Definition and examples, Conditions for deadlock (Mutual exclusion, Hold & wait, No preemption, Circular wait), Deadlock prevention, avoidance (Banker's algorithm), detection, recovery, Case studies: Basics of Windows and Linux OS.

Reference Books

1. **Operating System Concepts** – Abraham Silberschatz, Peter B. Galvin, Greg Gagne
2. **Modern Operating Systems** – Andrew S. Tanenbaum
3. **Operating Systems: Internals and Design Principles** – William Stallings
4. **Operating Systems: A Concept-Based Approach** – D.M. Dhamdhere
5. **Operating Systems** – Achyut S. Godbole.

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Subject: Numerical Method (BCADSE305CT)

UNIT - I

Extrapolation Method (Richardson Extrapolation),Partial Differential and Its Estimation, Ordinary Differential Equations: Initial value Problem, Reduction of Higher Order equation, Existence and Uniqueness, Test equation, System of Linear First Order Differential Equation with constant coefficients and its theorem, Multistep Method and Examples.

UNIT - II

Maximums order of k-step method and theorems, Convergence of Multi step method, Predicator and Corrector Method, Modified Predictor and Corrector Method, stability analysis of Multi step Methods and theorem: first and second order ODE.

UNIT - III

Ordinary Differential Equation, Boundary Value Problem, Shooting Method Alternate Method, Nonlinear Second order Differential Equation.

UNIT - IV

Finite Difference Method Linear Second Order Differential Equation, Local Truncation Error, Derivative Boundary Conditions, Solution Of Tridiagonal system, Nonlinear Second Order Differential Equation, Convergence of Difference Schemes and theorem, stability of finite difference Schemes.

UNIT - V

Finite Element Method ,solution of the variation Problem, Ritz Method (Gelerkin equation),Finite elements, Linear Lagrange polynomial, Ritz Finite Element Method, Finite element solution of Linear Boundary Value Problems, Assembly Of Element Eqtions,Mixed Boundary Conditions.

Reference Book

1. Numerical Methods Jain,Iyanger and Jain New Age International Edition 2012.

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Subject: Personality Development (BCAVAC306T)

UNIT - I: Introduction to Personality Development

Meaning and importance of personality development, Components of personality: Physical, intellectual, emotional, social, moral, Factors influencing personality: Heredity, environment, culture, education, Self-awareness and self-analysis, Building self-confidence and positive attitude, Personality types (introvert, extrovert, ambivert), Role of discipline and habits in personality.

UNIT - II: Communication Skills

Basics of communication: Verbal, non-verbal, written, Listening skills and barriers to effective communication, Public speaking and presentation skills, Group discussions and debates, Business communication etiquette (emails, reports, meetings), Voice modulation and clarity of speech, Importance of feedback in communication, Cross-cultural communication skills.

UNIT - III: Interpersonal Skills

Importance of interpersonal relationships, Teamwork and collaboration, Leadership qualities and styles, Conflict management and negotiation skills, Emotional intelligence and empathy, Building trust and rapport, Networking skills for career growth, Handling criticism and giving constructive feedback.

UNIT - IV: Professional Skills

Time management and stress management, Goal setting and motivation techniques, Decision-making and problem-solving skills, Creativity and innovation in workplace, Adaptability and resilience in professional life, Critical thinking and analytical skills, Professional ethics and responsibility, Workplace etiquette and corporate culture.

UNIT - V: Personality Enrichment

Grooming and professional etiquette, Body language and social manners, Values and ethics in personal and professional life, Building a strong character and integrity, Continuous learning and self-improvement, Positive thinking and mindfulness practices, Work-life balance strategies, Developing leadership presence and charisma,

Reference Books

1. **Personality Development and Soft Skills** – Barun K. Mitra
2. **Personality Development** – Harold R. Wallace & L. Ann Masters
3. **Soft Skills: Enhancing Employability** – Shalini Verma
4. **Personality Development** – E.B. Hurlock
5. **The 7 Habits of Highly Effective People** – Stephen R. Covey