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DAVANGERE UNIVERSITY

Syllabus for **Bachelor of Computer Applications (BCA)**

3rd and 4th Semester

[As per SEP (State Education Policy): 2024-25]

WEF: 2025-26 & onwards

DEPARTMENT OF STUDIES IN COMPUTER SCIENCE,

DAVANAGERE UNIVERSITY, DAVANAGERE – 577007

BOS Chairman
Dept. of Computer Science
Davangere University
Shivagangotri, Davangere

Prof. M. Govindappa
Dean-Science & Technology
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Registrar
Davangere University
Shivagangotri, Davangere.

Bachelor of Computer Applications Semester Scheme Curriculum Structure for Undergraduate Programme

2025-26 and onwards (for 3rd and 4th Semester)

Semester	Course Code	Title of the Paper	Subject Category	Teaching Hours/We	Semester End Exam	Internal Assessme	Total Marks	Credits	Examinati on Duration
3	Lang 3.1	Kan/Hin/San/Urdu-3	AECC MC-P	04	80	20	100	03	3Hrs
	Lang 3.2	English-3		04	80	20	100	03	3Hrs
	BCA 2024 BC 03	Internet Programming	CC	04	80	20	100	04	3Hrs
	BCA 2024 BC 04	Java Programming		04	80	20	100	04	3Hrs
	BCA 2024 BC 05	Java Programming Lab		03 x 2 = 6	80	20	100	03	3Hrs
	BCA 2024 BC 06	Internet Programming Lab		03 x 2 = 6	80	20	100	03	3Hrs
	BCA 2024 BC 07	Personality Development, Productivity and Time Management	SEC	02	40	10	50	02	2Hrs
	BCA 2024 BC 08	i. Artificial Intelligence ii. Cyber Security iii. Computer Architecture	**Elective** (Candidates can select any one subject*)	04	80	20	100	03	3Hrs
Total				34	600	150	750	25	

Semester	Course Code	Title of the Paper	Subject Category	Teaching Hours/W	Semester End Exam	Internal Assessm	Total Marks	Credits	Examinat ion Duration
4	Lang 4.1	Kan/Hin/San/Urdu-4	**AECC MC-P**	04	80	20	100	03	3Hrs
	Lang 4.2	English-4		04	80	20	100	03	3Hrs
	BCA 2024 BD 03	Python Programming	**CC**	04	80	20	100	04	3Hrs
	BCA 2024 BD 04	Operating System & Shell Programming		04	80	20	100	04	3Hrs
	BCA 2024 BD 05	Python Programming Lab		03 x 2 = 6	80	20	100	03	3Hrs
	BCA 2024 BD 06	OS Lab		03 x 2 = 6	80	20	100	03	3Hrs
	BCA 2024 BD 07	Introduction to Quantum Computing	**SEC**	02	40	10	50	02	2Hrs
	BCA 2024 BD 08	i. Deep Learning ii. Data Science iii. Theory of Computation	**Elective** (Candidates can select any one subject*)	04	80	20	100	03	3Hrs
Total				34	600	150	750	25	

*The minimum candidates required for each selection are determined by the Govt. orders.

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Internet Programming	
Course code : BCA 2024 BC 03	**Total Teaching Hours:56**
IA Marks :20	**Teaching Hours /Week: 4Hrs**
Exam Marks: 80	**Examination Hours: 03**
Course Credits: 04	

Course Learning Objectives

By the end of this course, students will be able to:

- Understand how the **Internet and World Wide Web** function works.
- Able to design the **web pages** using Modern **HTML5** Markup Language
- Embed **multimedia** (audio, video) and use I frames for external content of any webpage.
- Get an information to handle the **responsive layout** of any webpage
- Able to design the webpage using **CSS** and know about **properties**
- Know about the **Box-model** of all elements.
- Will know to handle **dynamic** content of the webpage/site using **JavaScript.**
- Access and modify **HTML/CSS** dynamically using the Document Object Model (**DOM**)
- Will know the working of **front-end frameworks and JS Libraries.**

Course Outcomes:

By the end of this course, students will be able to:

- Implement the **Responsive** pleasant web pages with **dynamic** content handling.
- Know to deal with different **forms controls (input box, drop-down, checkbox... etc)**
- Able to apply styles for Basic structured HTML elements
- Know how to **validate the data** of the form or the any other content
- Know to engage the audience with interactable components of the website
- Applications that demonstrate **Java Script's** capabilities in real world scenarios.
- Gives a strong foundation in web development for future enhancement in the web applications and Front-end development

Chapter-1: Web basics and HTML	**14hrs**
Internet, World Wide Web, Client and Server Architecture, Browser, Server, Web Protocols (HTTP and HTTPS) Overview of Clint side and Server-Side Technologies. HTML Page Structure, HTML Elements and its types (paired and unpaired), HTML Comments, Attributes, Headings, Paragraphs, Tables, Images, Lists, Links, Frames (I frames), Colors, Forms and its input elements. Introduction to HTML – 5. Features of HTML5 (Semantic Elements, Multimedia Support).	
Chapter 2: Cascading Style Sheets	**14hrs**
Introduction, CSS Syntax, Selectors (Id, Name, Class, Group, Universal), Types of CSS (Inline, Internal, External) CSS Properties, CSS Colors, CSS Backgrounds, Borders, Margins, Padding, Height/Width, Box Model, Text and Fonts. CSS Shorthand properties. Introduction to responsive design, Overview of CSS Flex Box and Grid. Overview of CSS Frame works (Bootstrap 5, Materialize UI).	
Chapter 3: JavaScript	**14hrs**
Introduction, Purpose of JavaScript, JavaScript Program structure, Keywords, Identifiers, Literals, Variables and its types (var, let, const) Output Statements, Operators, Datatypes, Type Conversion, Loops, Conditional statements, Arrays and Array methods, Strings and String methods, Events. JavaScript Functions: JavaScript Function Definitions, Function Parameters, Function Invocation, Function Call, Function Apply, Function Bind, Function Closures.	
Chapter 4: Advanced JavaScript Concepts and DOM	**14hrs**

DOM Introduction, DOM Objects, Properties and Methods, DOM for Changing HTML, CSS, DOM for Form validation, DOM Events, Event Listeners, DOM Navigation, DOM Nodes, DOM Collections, DOM Node Lists. Introduction to ECMAScript, ECMAScript features. Overview of JavaScript libraries like jQuery, AJAX and React JS.
TextBook-1: HTML & CSS: The Complete Reference Thomas A. Powell, , Fifth Edition, Tata McGraw Hill, **TextBook-2**: WEB PROGRAMMING with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, First Edition **References Books:** Jon Duckett, "JavaScript & jQuery: Interactive Front-End Web Development", Wiley, 2014.
Web links :
Link1: https://www.w3schools.com/html/ Link2: https://www.w3schools.com/css Link3: https://www.w3schools.com/js

Java Programming	
Course Code: BCA 2024 BC 04	**Total Teaching Hours: 56**
IA Marks :20	**Teaching Hours /Week: 4Hrs**
Exam Marks: 80	**Examination Hours: 03**
Course Credits: 04	

Course Learning Objectives

By the end of this course, students will be able to:

- Course Learning Objectives: Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and understand the principles of inheritance, packages and interfaces, exception handling mechanisms and applets and Graphical User Interface.

Course Outcomes:

By the end of this course, students will be able to:

- Implement Object Oriented programming concept using basic syntaxes of control structures, strings and function for developing skills of logic building activity.
- Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem.
- Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
- Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.

Unit-I	**14 Hrs.**

Basic concepts of OOP's, Object-oriented paradigm, Basic concepts of object-oriented programming, Benefits of OOP, Application of OOP, JVM.

Java Fundamentals Features of Java, overview of java language, Constants, Variables, Data types, operators and Expressions, Decision making and Branching, Decision making and looping, Arrays-types of arrays.

Unit-II	**14 Hrs.**

Objects and Classes

Defining a class, Adding Variables, Adding Methods, creating objects, Accessing Class members, Constructors, finalize() method, Method Overloading, Overriding Methods, Final Variables and methods, Final Classes, Abstract classes and methods, Visibility control, Strings, and Vectors, Abstract classes, Static classes, Wrapper classes, This, Super.

Unit-III	**14 Hrs.**

Inheritance, Exception handling and Multi-threaded Programming:

Defining inheritance, types of inheritance, extending a Class, Multiple inheritance, interfaces, packages: Java API Packages, Creating Packages, accessing a package, using a package.

Exception handling: Exception as objects, Exception hierarchy Try, catch, finally, Throw. **Multi-threading:** Thread Life cycle, multi-threading advantages and issues, Simple thread program, Thread synchronization.

Unit-IV	**14 Hrs.**

Java Server Pages: JSP: Introduction, Architecture of JSP, Life Cycle of JSP, Scripting elements (Scriplets, JSP Declarations, JSP Expression), Directive Elements (page, include, taglib), JSP Actions (include, setproperty, getproperty, forward, text), Implicit objects (request, response, out, page, Exception), including HTML in JSP. Introduction to JDBC.

Text Books:

1. Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies

Reference:

1. The complete reference JAVA, Herbert Scheldt. TMH
2. Herbert Schildt, The Complete Reference Java2.0, Fifth edition, TATA McGraw-Hill Company.
3. Debasish Jana, Java and Object-Oriented programming Paradigm, PHI.
4. Jana, Java and Object Oriented Programming Paradigm, PHI (2007).

BCA 3rd Semester			Java Programming Lab	
Subject Code:	BCA 2024 BC 05		Total Teaching Hours:	84
IA Marks:	20		Teaching Hours/Week:	03*2 = 6 Hrs
Exam Marks:	80		Examination Hours:	03
Credits:	3			

PART-A
1. Programs Using Different Control Structures (Switch, If, While, Do, For etc.,) 2. Programs Using Arrays. 3. Programs Using Strings, String Buffer Classes and Vectors. 4. Programs using constructor and destructor. 5. Creation of classes and use of different types of functions. 6. Count the number of objects created for a class using static member function. 7. Write programs on interfaces and abstract classes. 8. Write programs on packages and importing. 9. Write programs using function overloading and overriding. 10. Programs using inheritance.
PART-B
1. Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer? 2. Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome? 3. Write a Java program for sorting a given list of names in ascending order? 4. Write a Java program to multiply two given matrices? 5. Write a Java program that reads a line of integers and then displays each integer and the sum of all integers. (use StringTokenizer class)? 6. Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes? 7. Write a Java program that displays the number of characters, lines and words in a text? 8. JSP Program to select record from database. 9. JSP Program to display given number in words. 10. Write an application that displays deadlock between threads. Program to display data from database table using JDBC.

Examination:		
• Two Questions has to be given from the above list A and B (one each).		
• Student has to write and execute both of the programs		
Marks Distribution:		
Criteria		**Marks**
		Questions from The List
Practical Proper	Writing & Execution of Program one from PART-A & one from PART-B	60 (Each 30 marks)
	Total	**60**
Viva		20
Total		**80**

Internet Programming Lab	
Course code : BCA2024 BC 06	Total Teaching Hours:84
IA Marks :20	Teaching Hours /Week: 3*2=6Hrs
Exam Marks: 80	Examination Hours: 03
Course Credits: 03	

Course Learning Objectives

By the end of this course, students will be able to:

- Understand how the Internet and World Wide Web function works.
- Able to design the web pages using Modern HTML5 Markup Language
- Embed multimedia (audio, video) and use iframes for external content of any webpage.
- Get an information to handle the responsive layout of any webpage
- Able to design the webpage using CSS and know about properties
- Know about the Box-model of all elements.
- Will know to handle dynamic content of the webpage/site using JavaScript.
- Access and modify HTML/CSS dynamically using the Document Object Model (DOM)

Course Outcomes:

By the end of this course, students will be able to:

- Implement the Responsive Beautiful sites with dynamic content handling.
- Know to deal with different forms controls (input box, drop-down, checkbox… etc)
- Able to apply styles for Basic structured elements
- Know how to validate the data of the form or the any other content
- Know to engage the audience with interactable components of the website
- applications that demonstrate JavaScript 's capabilities in real world scenarios.
- Gives a strong foundation in web development for future enhancement in the web applications and Front-end development

Part-A

1. Create an HTML5 page using tags to accomplish the following:
   a. A paragraph containing text "All that glitters is not gold". Bold face and italicize this text.
   b. Create equation: $x = 1/3(y_1^2 + z_1^2)$.
   c. Put a background image to a page and demonstrate all attributes of background image.
   d. Create unordered list of 5 fruits and ordered list of 3 flowers
2. Create an HTML5 page that include three divisions and each division should implement background properties with below attributes:
   a. **1st div** – Background Colour.
   b. **2nd div** – Background Gradient Colour.
   c. **3rd div** - Background image.
3. Create following table using HTML tags. Properly align cells, give suitable cell padding and cell spacing, and apply background colour, bold and emphasis necessary text

Department	**Sem1**	*SubjectA*
		SubjectB
		SubjectC
	Sem2	*SubjectE*
		SubjectF
		SubjectG
	Sem3	*SubjectH*
		SubjectI
		SubjectJ

4. Demonstrate the following HTML5 Semantic tags- <article>, <aside>, <details>, <figcaption>,

<figure>, <footer>, <header>, <main>, <mark>, <section> for a webpage that gives information about travel experience.

5. Implement Below Tasks :
   a. Create a class called **income**, and make it a background color of #0ff.
   b. Create a class called **expenses**, and make it a background color of #f0f.
   c. Create a class called **profit**, and make it a background color of #f00.

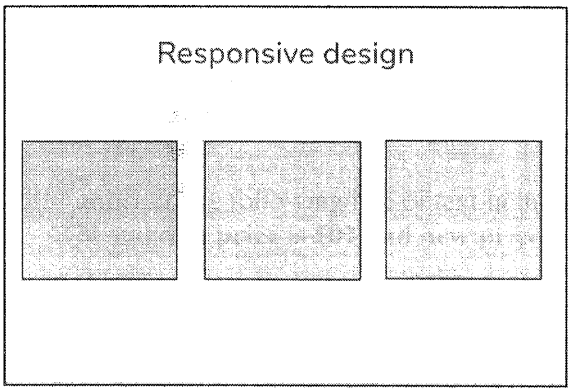
   Throughout the document, any text that mentions income, expenses, or profit, attach the appropriate class to that piece of text.

   Further create following line of text in the same document:
   ~~The current price is 50₹~~ and new price is 40₹

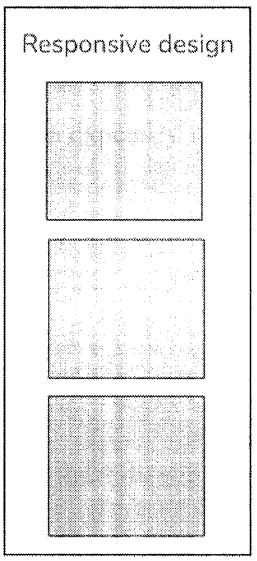
6. Insert 2 images using <img> tag and apply below styles:
   a. Make a rounded dotted edge.
   b. Make the Circle image with a double line edge

7. Create a responsive design using grid layout by inserting the 3 divisions.

   For Desktop



   For Mobile



8. Divide a webpage into two section and insert iframe tags for each section and load the external sites as given below:
   a. Iframe-1 - google.com
   b. Iframe-2 -any YouTube video.

9. Create webpage which consists of three divisions each division should implement shorthand properties for border, padding, margin respectively.

10. Implement all three CSS types (Inline, Internal and External) and illustrate the priorities with respect to types style sheets

Part-B

1. Create JavaScript program that illustrate the working of our statements (consol.log(), alert(), document.write()).
2. Write JavaScript program that finds the greatest of three inputted numbers.
3. Write JavaScript program that finds the length of the given string.
4. Write a JavaScript program that reads (using prompt) a number and calculate its factorial.
5. Write a JavaScript program that reads numbers and stores in an array and search the given number in an stored array using linear search.

6.	Write a JavaScript program that implements simple calculator Interface and perform athematic operations (+, - , / , *).
7.	Write a JavaScript program (using dom) that increase and decrease the font size of the text when an appropriate button get clicket on it.
8.	Write a JavaScript program using DOM loads the image of a flower, fruit and an animal with respect to clicking on the specified button.
9.	Write a JavaScript program that changes the entered text in a text box to the upper case using **onchange event** of the textbox.
10.	Write a JavaScript program using JS function that validate the HTML form controls like textbox, dropdown, text area, radio button and checkbox.

Examination:		
• Two Questions has to be given from the above list A and B (one each).		
• Student has to write and execute both of the programs		
Marks Distribution:		
Criteria		**Marks**
		Questions from The List
Practical Proper	Writing & Execution of Program one from PART-A & one from PART-B	60 (Each 30 marks)
	Total	**60**
Viva		20
Total		**80**

BCA 3rd Semester			Personality Development Productivity and Time Management	
Subject Code:	BCA 2024 BC 07		Total Teaching Hours:	28
IA Marks:	10		Teaching Hours/Week:	02 Hrs
Exam Marks:	40		Examination Hours:	02
Credits:	2			

Course Learning Objectives (CLOs):

1. Understand Personality Development Concepts:
2. Master Time Management Principles:
3. Apply SWOT Analysis and Positive Attitude Strategies:

Course Outcomes (COs):

1. Demonstrate Knowledge of Personality Development:
2. Implement Effective Time Management Techniques:
3. Utilize SWOT Analysis and Positive Attitude:

UNIT-I Introduction to Personality Development: 14Hrs

The concept of personality - Dimensions of personality – Theories of Freud & Erickson- Significance of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analysis. Attitude & Motivation Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude – Advantages –Negative attitude- Disadvantages - Ways to develop positive attitude - Differences between personalities having positive and negative attitude. Concept of motivation - Significance – Internal and external motives - Importance of self- motivation- Factors leading to de-motivation

UNIT-II Effective Time Management 14Hrs

Basic Information And Concepts About Time Management: Time And Time Concept,Time Types. Time Management Concept And Approaches:Time Management Concept,Time Management Approaches.Time Traps:Time Traps Caused By Individual,Time Traps Causd By Exterior Reasons,Time Traps Caused By Organisational Reasons, Time Traps Caused By Mechanical Reasons. Effective Time Techniques:Methods That Enable Productive Usage Of Time, Not Getting Caught In Time Trap And Points To Be Considered To Use Time Effectively,Rules Of Good Usage Of Time.

Reference Books:

1. Personality Development, Interpersonal Skills and Career Management by C.S.G. Krishnamacharyulu and Lalitha R.
2. Boslough, J. (March, 1990). "Time", National Geographic, (Der. F. Mefkure Ekici, 1999).
3. Smith, H. W. (1998). 10 Natural Rules of Managing Life and Time. (Çev. Adalet Çelbiş). İstanbul: Sistem Yayıncılık
4. Tezcan, M. (1982). Psychologically Making Use of Leisures . Ankara: A. Ü.E.B. F.
5. Açıkalın, A. (1998). School Management with Social, Intstitutional and Technical Sides. (4. Printing), Ankara: Pegem.

Elective Title: **Artificial Intelligence**	
Course Code: BCA	Total Teaching Hours : 56
Semester: 3rd	Teaching Hours Per Week: 4hrs
IA Marks: 20	Examination Hours:3hrs
Exam Marks: 80	Course Credits: 3

Course Learning objectives: The course aims to:

1. To introduce the fundamental concepts and techniques of Artificial Intelligence.
2. To develop the ability to solve AI problems using heuristic and algorithmic approaches.
3. To provide insights into knowledge representation, reasoning, and learning in AI.
4. To equip students with practical skills using AI tools and libraries (e.g., Python, NLTK, scikit-learn).

Course Outcomes: After successful completion of this course, students will be able to:

- **CO1**: Describe the foundational principles and approaches of Artificial Intelligence.
- **CO2**: Apply AI algorithms such as search strategies, logic, and knowledge representation.
- **CO3**: Implement machine learning models using Python-based libraries.
- **CO4**: Analyze real-world problems and propose AI-based solutions.

Unit I: : Introduction to Artificial Intelligence **14hrs**

History and Evolution of AI, Foundations and Applications of AI, Intelligent Agents and Environments. Types of Agents, Problem-solving Agents. AI vs Machine Learning vs Deep Learning, Turing Test and Rationality.

Unit II: Search Strategies and Problem Solving **14hrs**

Problem Formulation, Search Strategies: Uninformed: BFS, DFS, UCS, Informed: Greedy Search, A*. Heuristics and Evaluation Functions, Game Playing: Minimax and Alpha-Beta Pruning, Constraint Satisfaction Problems.

Unit III: Knowledge Representation & Reasoning **14hrs**

Propositional Logic & Predicate Logic, Inference Rules, Forward and Backward Chaining, Ontologies and Semantic Web, Knowledge Representation using Graphs and Frames, Uncertainty: Bayesian Networks, Fuzzy Logic.

Unit IV: Machine Learning and AI Applications **14hrs**

Introduction to Machine Learning: Supervised, Unsupervised, and Reinforcement Learning. Basic ML Algorithms: k-NN, Decision Trees, Naive Bayes. AI Tools and Libraries (scikit-learn, Tensor Flow basics). Applications of AI in NLP, Robotics, and Vision. Ethical and Social Implications of AI.

Textbooks & References

Textbooks

1. **Elaine Rich, Kevin Knight, Shivashankar B Nair**-*Artificial Intelligence* – Tata McGraw-Hill, 3rd Edition
2. **Artificial Intelligence" by Dr. Saroj Kaushik Publisher:** Cengage Learning.
3. **Stuart Russell and Peter Norvig-** *Artificial Intelligence: A Modern Approach* – Pearson Education, 3rd Edition
4. **Ethem Alpaydin** – *Introduction to Machine Learning* – MIT Press
5. **Tom M. Mitchell** – *Machine Learning* – McGraw-Hill Education
6. **Dan W. Patterson** – *Introduction to AI and Expert Systems* – Pearson
7. **Sebastian Raschka and Vahid Mirjalili** – *Python Machine Learning* – Packt Publishing

Elective Title: **Cyber Security**	
Course Code: BCA	Total Teaching Hours : 56
Semester: 3rd	Teaching Hours Per Week: 4hrs
IA Marks: 20	Examination Hours:3hrs
Exam Marks: 80	Course Credits: 3

Course Learning objectives: The course aims to:

5. Introduce students to the fundamental principles and concepts of cybersecurity.
6. Familiarize students with common cyber threats, vulnerabilities, and mitigation strategies.
7. Enable students to apply cybersecurity tools, technologies, and legal practices in real-world scenarios.

Course Outcomes: After successful completion of this course, students will be able to:

- **CO1:** Explain the key concepts, goals, and terminology of cybersecurity.
- **CO2:** Identify various types of cyberattacks and apply basic defence mechanisms.
- **CO3:** Use essential cybersecurity tools to detect and prevent threats.
- **CO4:** Demonstrate understanding of cybersecurity laws, ethics, and best practices.

Unit I: Introduction to Cybersecurity
14hrs

Fundamentals of Cybersecurity, Security Goals: Confidentiality, Integrity, Availability (CIA Triad), Difference between Cybersecurity and Information Security, Threats, Vulnerabilities, and Risk, Types of Hackers: White hat, Black hat, Grey hat, Security Architecture and Security Models, Cybersecurity Policy and Governance.

Unit II: Cyber Threats and Attacks
14hrs

Malware: Viruses, Worms, Trojans, Spyware, Ransomware, Phishing, Social Engineering, Identity Theft, Denial of Service (DoS), Distributed DoS (DDoS), SQL Injection, Cross-Site Scripting (XSS), Brute Force Attacks, Advanced Persistent Threats (APT), Case Studies of Real Cyberattacks.

Unit III: Security Technologies and Practices
14hrs

Network Security: Firewalls, IDS/IPS, VPN, Authentication Mechanisms: Passwords, Biometrics, Multi-factor Authentication, Encryption Basics: Symmetric vs Asymmetric Cryptography, Secure Software Development & Patch Management, Backup and Disaster Recovery Strategies, Cybersecurity Tools: Wireshark, Kali Linux, Antivirus, Password Managers.

Unit IV: Cyber Laws, Ethics, and Industry Standards
14hrs

Cybersecurity Laws in India: IT Act 2000 and Amendments, Global Standards: GDPR, ISO/IEC 27001, Cyber Ethics and Responsible Use of Technology, Intellectual Property Rights and Digital Piracy, Incident Response and Reporting, Roles and Responsibilities of a Cybersecurity Professional

- **Textbooks:**
  - *Computer Security: Principles and Practice* by William Stallings
  - *Cybersecurity Essentials* by Charles J. Brooks
- **Online Platforms:**
  - NPTEL Cybersecurity Lectures
  - Cybrary, Cisco Networking Academy, Coursera

Elective Title: **Computer Architecture**	
Course Code: BCA	Total Teaching Hours : 56
Semester: 3rd	Teaching Hours Per Week: 4hrs
IA Marks: 20	Examination Hours:3hrs
Exam Marks: 80	Course Credits: 3

Course Learning Objectives:

1. Understand fundamental principles of computer organization and architecture.
2. Learn how data is transferred and processed at the register and microoperation level.
3. Gain knowledge of CPU design, instruction formats, and addressing modes.
4. Explore memory systems and I/O organization in computer systems.

Course Outcomes: After successful completion of this course, students will be able to:

- **CO1:** Understand basic computer architecture and instruction execution.
- **CO2:** Apply register transfer and microoperations in system design.
- **CO3:** Analyze CPU structure, instruction formats, and addressing modes.
- **CO4:** Explain memory hierarchy and I/O organization techniques.

Unit I: Basic Computer Organisation and Design:
14hrs

Instruction Codes, Computer registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory reference instructions, Input-Output and Interrupt, Design of Basic computer, Design of accumulator logic.

Unit II: Register Transfer and Microoperations:
14hrs

Register Transfer Language (RTL), register transfer, Bus and Memory Transfers, Arithmetic Microoperations, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit, Microprogrammed Control: Control memory; address sequencing, microprogram sequencer, Design of Control Unit

Unit III: Central Processing Unit:
14hrs

General registers Organization, Stack Organization, Instruction formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Program Interrupt, RISC, CISC.

Unit IV: Memory & I/O Organization:
14hrs

Memory hierarchy, Auxiliary Memory, Associative Memory, Interleaved memory, Cache memory, Virtual Memory, Memory Management Hardware,

Input Output Organization : Peripheral devices , Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access(DMA),Input-Output Processor(IOP).

Reference Books:

1. **M. Morris Mano** – *Computer System Architecture*, Pearson Education
2. **Carl Hamacher, Zvonko Vranesic, Safwat Zaky** – *Computer Organization*, McGraw Hill Education
3. **P. Pal Chaudhuri** – *Computer Organization and Design*, Prentice-Hall India (PHI)
4. **Govindarajalu** – *Computer Architecture and Organization*, Tata McGraw-Hill

BCA 4th Semester		Python Programming	
Subject Code:	BCA 2024 BD 03	Total Teaching Hours:	56
IA Marks:	20	Teaching Hours/Week:	04
Exam Marks:	80	Examination Hours:	03
Credits:	4		

Course Learning Objectives

By the end of this course, students will be able to:

- Understand Python fundamentals syntax, data types, and program execution.
- Apply control structures oops, conditionals, and functions for problem-solving.
- Work with data structures lists, tuples, sets, and dictionaries for data manipulation.
- Implement object-oriented programming (OOP) classes, objects, inheritance, and polymorphism.
- Handle files and exceptions reading/writing files and managing runtime errors.
- Establish database connectivity using MySQL and SQLite for CRUD operations.
- Use data science libraries NumPy, Pandas for data analysis, and Matplotlib for visualization.
- Develop real-world applications mini-projects integrating multiple Python concepts.

Course Outcomes:

By the end of this course, students will be able to:

- **Demonstrate proficiency in Python programming** by writing efficient and structured code.
- **Apply control structures** (loops and conditionals) to solve real-world problems.
- **Utilize built-in data structures** to store, manipulate, and process data efficiently.
- **Develop OOP-based applications** using classes, objects, and advanced concepts.
- **Handle files and exceptions** to ensure robust and error-free execution of programs.
- **Perform database operations** using Python to interact with MySQL and SQLite.
- **Analyze datasets using NumPy and Pandas** for data-driven decision-making.
- **Create data visualizations** using Matplotlib to represent data graphically.
- **Develop mini-projects and applications** that demonstrate Python's capabilities in real-world scenarios.
- **Build a strong foundation in Python** for future advancements in software development, web applications, and data science.

UNIT 1 14 Hrs

Introduction to Python: History of Python and Features, Installing Python and Setting up Environment, Writing and Running Python Scripts, Python Syntax, Indentation, and Comments, Variables, Data Types, and Type Conversion, Input and Output Operations. **Control Structures:** Conditional Statements (if, if-else, nested if),Looping Statements (for, while, nested loops),Loop Control Statements (break, continue, pass),Iterators and Generators,

UNIT 2 14 Hrs

Functions: Defining and Calling Functions, Function Arguments and Return Values, Lambda Functions, Recursive Functions, Built-in Modules (math, random, date time, etc.), Creating and Importing User-defined Modules. Strings: creating and sorting strings, Accessing string characters, the str() function, Operations on strings-Concatenation, Comparison, Slicing and Joining, Traversing, String Methods.

UNIT 3 14 Hrs

Data Structures in Python: Lists: Operations, Slicing, Methods, Tuples: Characteristics,

Operations, Sets: Operations, Methods, Dictionaries: Keys, Values, Methods, **File Handling:** Reading and Writing Files (Text and Binary), File Methods (open, close, read, write, append), **Exception Handling:** Introduction to Errors and Exceptions, Handling Exceptions using try, except, Using else, finally Blocks,
UNIT 4 14 Hrs
NumPy (Numerical Python): Introduction to NumPy, Creating and Manipulating NumPy Arrays, Indexing, Slicing, and Iterating, Mathematical and Statistical Functions, Working with Multidimensional Arrays, **Pandas (Data Analysis):** Introduction to Pandas, Creating and Manipulating Data Frames and Series, Importing and Exporting Data (CSV, Excel),Data Cleaning and Pre-processing, Handling Missing Data, Grouping and Aggregations. **Matplotlib(Data Visualization):** Introduction to Matplotlib, Creating Line Plots, Bar Charts, Histograms, Customizing Plots (Labels, Titles, Legends),Subplots and Multiple Graphs, Plotting with Pandas,
Text books: Python Programming: A Modern Approach – V. K. Jain (BPB Publications) Programming in Python – Dr. Pooja Sharma (BPB Publications) Core Python Programming – Dr. R. Nageswara Rao (Dreamtech Press) **Reference Books:** Python: The Complete Reference – Martin C. Brown (McGraw-Hill Education) Python Crash Course – Eric Matthes (No Starch Press) Learning Python – Mark Lutz (O'Reilly Media) Python for Data Analysis – Wes McKinney (O'Reilly Media) (For NumPy & Pandas) Fluent Python – Luciano Ramalho (O'Reilly Media) (For Advanced Python Programming)

BCA 4th Semester		Operating System and Shell Programming	
Subject Code:	BCA 2024 BD 04	Total Teaching Hours:	56
IA Marks:	20	Teaching Hours/Week:	04
Exam Marks:	80	Examination Hours:	03
Credits:	4		

Course Learning Objectives

- Explain the fundamentals of the operating system.
- Comprehend multithreaded programming, process management, process synchronization, memory management and storage management.
- Compare the performance of Scheduling Algorithms
- Identify the features of I/O and File handling methods.

Course Outcomes:

- Students will learn how Operating System is Important for Computer System.
- To make aware of different types of Operating System and their services.
- To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- To know virtual memory concepts.
- To learn secondary memory management

UNIT 1 14 Hrs

Introduction to Operating System:Definition, Computer System organization, Types of Operating Systems, Functions of Operating System, Systems Calls, Linux and GNU, The Unix Architecture, Features of Unix. Process Concept- Process Definition, Process State, Process Control Block.

UNIT 2 14 Hrs

Process Management: Introduction to Threads; Types of Threads Multithreading- Definition, Advantages; Multithreading Models; Thread Libraries, Threading Issues. Context Switch, Operations on Processes- Creation and Termination of Processes; Inter process communication (IPC)- Definition and Need for Inter process Communication.

UNIT 3 14 Hrs

CPU Scheduling: CPU Scheduling: Basic concepts: Scheduling Criteria, Scheduling Algorithms. Deadlocks: System Model; Deadlocks Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection and Recovery from Deadlock. Memory Management: Paging; Segmentation, Segmentation with Paging. Introduction to Virtual Memory, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT 4 14 Hrs

The File System: The File, What's a (File) name?, The Parent–Child Relationship, The HOME Variable, pwd, cd, mkdir, rmdir, Absolute Pathnames, Relative Pathnames. ls, The UNIX File System. The vi Editor: vi Basics, I/P Mode, The ex ode, Navigation, Editing Text, Undoing Last Editing Instructions (u and u), Repeating the Last Command, Searching for a pattern, Substitution, Conclusion.

Text Books:

1. Abraham Silberschatz and Peter Baer Galvin, Greg Gagne, "Operating System Principles", Seventh edition
2. "UNIX Concepts and Applications" by Sumitabha Das, Third Edition, Tata McGraw-Hill

Reference book:

1. Milan Milonkovic, Operating System Concepts & Design, II Edition, McGRaw Hill 1992.
2. Stallings, Operating Systems, Pearson Edition.
3. Tanenbaum, Operating System Concepts, Pearson Education
4. Nutt : Operating System, 3/e Pearson Education 2004
5. System Programming by John J. Donovan.
6. Unix Complete Reference Ken Rosen, Rachel Klee

BCA 4th Semester		Python Programming Lab	
Subject Code:	BCA 2024 BD 05	Total Teaching Hours:	84
IA Marks:	20	Teaching Hours/Week:	03 * 2 =6Hrs
Exam Marks:	80	Examination Hours:	03
Credits:	3		

PART-A

1. Write a program create list with N elements. find all unique elements in the list. If an element is found only once in the list, then add that element to the unique list.
2. Program, using user-defined functions to find the area of rectangle, square, circle and triangle byaccepting suitable input parameters from user.
3. Consider a tuple t1= (1,2,5,7,9,2,4,6,8,10). Write a program to perform following operations:
   a. Print half the values of tuple in one line and the other half in the next line.
   b. Print another tuple whose values are even numbers in the given tuple.
   c. Concatenate a tuple t2= (11,13,15) with t1.
   d. Return maximum and minimum value from this tuple.
4. Write a function that takes a sentence as input from the user and calculates the frequency of eachletter. Use a variable of dictionary type to maintain the count.
5. Write a program to create a text file and compute the number of characters, words and lines in a file.Program using user defined exception class that will ask the user to enter a number until he guesses astored number correctly. To help them figure it out, a hint is provided whether their guess is greaterthan or less than the stored number using user defined exceptions.
6. Write Python programs to demonstrate the following: i) input( ) ii) print( ) iii) 'sep' attributeiv) 'end' attribute v) replacement Operator ({ })
7. Demonstrate the following control transfer statements in Python with suitable examples. i)break ii) continue iii) pass

PART B

1. Program to create a class Employee with empno, name, depname, designation, age and salary and perform the following function.
   i) Accept details of N employees
   ii) Search given employee using empno
   iii) Display employee details in neat format.
2. Write a program menu driven to create a BankAccount class. class should support the following methods for i) Deposit ii) Withdraw iii) GetBalanace . Create a subclass SavingsAccount class that behaves just like a BankAccount, but also has an interest rate and a method that increases the balance by the appropriate amount of interest.
3. Create a GUI to input Principal amount, rate of interest and number of years, Calculate Compound interest. When button submit is pressed Compound interest should be displayed in a textbox. When clear button is pressed all contents should be cleared.
4. Write a GUI program to implement Simple Calculator
5. Create a table student table (regno, name and marks in 3 subjects) using Sqlite3/MYSQL and perform the followings
   a. To accept the details of students and store it in database.
   b. To display the details of all the students
   c. Delete particular student record using regno.
6. Create a table employee (empno, name and salary) using Sqlite3/MySQL and perform the followings
   a. To accept the details of employees and store it in database.
   b. To display the details of a specific employee
   c. To display employee details whose salary lies within a certain range
7. WAP in Python for Linear Search and Binary Search.
8. WAP in Python for Selection Sort and Bubble Sort.

Examination:		
• Two Questions has to be given from the above list Aa and B(one each)		
• Student has to write and execute both of the programs		
Marks Distribution:		
Criteria		**Marks**
		Questions from The List
Practical Proper	Writing & Execution of Program one from PART-A & one from PART-B	60 (Each 30 marks)
	Total	**60**
Viva		20
Total		**80**

BCA 4th Semester		**OS Lab**	
Subject Code :	**BCA 2024 BD 06**	**Total Teaching Hours :**	**84**
IA Marks:	**20**	**Teaching Hours/Week :**	**03*2 = 6Hrs**
Exam Marks:	**80**	**Examination Hours :**	**03**
Credits:	**3**		

PART A:

1. Write Shell script program to read two numbers (start and ending endlimit) and display all the odd numbers between start and endlimit.
2. Write Shell script program to to verify whether string is palindrome or not.
3. Write Shell script program to sort given list of numbers using bubble sort.
4. Write Shell script program to change filename Extension.
5. Write shell script to show various system configuration like
   a) Currently logged user and his logname, b) Your current shell, c) Your home directory
   d) Your operating system type, e) Your current path setting,
   f) Your current working directory, g) Show currently logged number of users
   h) About your os and version, release number, kernel version, i) Show all available shells
   j) Show mouse settings, k) Show computer CPU information like processor type, speed etc
   Show memory information Show hard disk information like size of hard-disk, cache memory, model etc
6. Write a shell script that adds, subtracts, multiplies and divides the given 2 integers (using case conditional).
7. Write a shell script to reverse the rows and Columns of a matrix.
8. Write Shell script program to find biggest of 3 numbers.
9. Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.
10. Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.

PART B:

1. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
2. Write a shell script to compute gross salary of an employee according to the following rules:If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic.
   If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic
   The basic salary is entered interactively through the key board.
3. Write an interactive file handling shell program. Let it offer the user the choice of copying, removing, renaming or linking files. Once the use has made a choice, have the program ask the user for necessary information, such as the file name, new name and so on.
4. Develop an interactive script that asks for a word and file name and then tells how many times that word occurred in the file.
5. Write a shell script to perform the following string operations. a) To extract a sub string from a given string b) To find the length of a given string
6. Write a Shell Script that accepts a file name, starting and ending line numbers as arguments and displays all lines between the given line numbers.
7. Write a shell script to find factorial of a given number.
8. Write a shell program to generate prime numbers up to given limit.
9. Write a shell script that receives any number of file names as arguments checks if Every argument supplied is a file or directory and reports accordingly. whenever the argumentis a file it reports no of lines present in it
10. Write a shell script that deletes all lines containing the specified word in one or more filessupplied as arguments to it.

Examination:

- Two Questions has to be given from the above list A and B(one each).
- Student has to write and execute both of the programs

Marks Distribution:

Criteria		**Marks**
		Questions from The List
Practical Proper	Writing & Execution of Program one from PART-A & one from PART-B	60 (Each 30 marks)
	Total	**60**
Viva		20
Total		**80**

BCA 4th Semester		Introduction to Quantum Computing	
Subject Code :	BCA 2024 BD 07	Total Teaching Hours :	32
IA Marks:	10	Teaching Hours/Week :	2 Hrs
Exam Marks:	40	Examination Hours :	02
Credits:	2		

Course Learning Objectives:

After successful completion of this course, students will be able to:

- Basic concepts and principles of quantum computing.
- Fundamental behaviour of quantum systems, including superposition and measurement.
- Represent and visualize qubit states using state vectors and Bloch sphere representation.
- apply basic quantum operations such as quantum gates and measurement and Interpret, read, and construct simple quantum circuit diagrams.

Course Outcomes(COs):

By the end of this course, students will be able to:

- Students understand basic idea of quantum computing and how quantum systems behave.
- Students visualize qubit state representation.
- Students understand how quantum operations are performed.
- Students can read and draw simple quantum circuits.

Total Course Marks	**50 Marks**

Unit-I	16Hrs

Introduction to Quantum Computing: What is Quantum Computing? History of Quantum Computing, Bits vs Qubits, Quantum Properties- Quantum Superposition and Quantum Entanglement. Advantages of Quantum Computers, Disadvantages of Quantum Computers, Companies Building Quantum Computers, Comparison: Classical vs. Quantum Computers, Applications of Quantum Computing. **Basics of Quantum Mechanics:** What is Quantum Mechanics? Quantum Mechanics Basics, Wave-Particle Duality, Uncertainty principle, Quantum States, State Space (in simple words), Dirac Notation ($|0\rangle$, $|1\rangle$) **Qubits and Bloch Sphere:** What is a Qubit? Representation of a Qubit, Bloch Sphere visualization, Probability amplitudes, Difference between classical bit and qubit.

Unit-II	16Hrs

Quantum Gates: What is a Quantum Gate? Important gates (Basic concept): Pauli-X Gate, Pauli-Y Gate, Pauli-Z Gate, Hadamard Gate, CNOT Gate, Single qubit vs Two qubit gates. **Linear Algebra for Quantum Computing (Only required basics):** Vectors, **Matrices. Quantum Circuits:** What is a Quantum Circuit? Circuit symbols, Building simple circuits. **Quantum Entanglement:** What is Entanglement? Bell States, Real-life explanation (simple analogy), Why entanglement is important. **Real Quantum Computers:** Types of Quantum Hardware: Superconducting qubits, Ion traps, Photonic qubits, Key challenges facing quantum computing.

Text-books:

1. Phillip Kaye, Raymond Laflamme et. al., An introduction to Quantum Computing, Oxford University press, 2007.
2. Chris Bernhardt, Quantum Computing for Everyone, The MIT Press, Cambridge, 2020
3. David McMahon-Quantum Computing Explained-Wiley-Interscience, IEEE Computer Society (2008)

References :

1. Quantum Computation and Quantum Information, M. A. Nielsen &I.Chuang, Cambridge University Press (2013).
2. Quantum Computing, A Gentle Introduction , Eleanor G. Rieffel and Wolfgang H. Polak MIT press (2014)

Elective Title: **Deep Learning**	
Course Code: BCA	Total Teaching Hours : 56
Semester: 4th	Teaching Hours Per Week: 4hrs
IA Marks: 20	Examination Hours:3hrs
Exam Marks: 80	Course Credits: 3

Course Learning Objectives:

1. To introduce the fundamental concepts of machine learning and deep learning..
2. To explain the architecture and functioning of neural networks.
3. To train students in designing, optimizing, and evaluating deep learning models.
4. To expose learners to advanced models like CNN, RNN, LSTM, and Transformers for real-world applications.

Course Outcomes: After successful completion of this course, students will be able to:

- CO1: Understand the difference between traditional machine learning and deep learning techniques.
- CO2: Apply deep learning algorithms using tools such as neural networks and backpropagation..
- CO3: Design and implement convolutional and recurrent neural networks..
- CO4: Use transfer learning and modern deep learning frameworks for solving practical problems in vision and NLP.

Unit 1: **Introduction to Deep Learning** **14hrs**

Basics of machine learning, types of learning (supervised, unsupervised), difference between ML and deep learning, neural networks, biological vs artificial neuron, perceptron and MLP, input, hidden, and output layers, activation functions (sigmoid, tanh, ReLU), feedforward networks, advantages, limitations, applications (image classification, speech recognition, recommendations).

Unit 2: **Training Deep Neural Networks** **14hrs**

Forward pass, activation, loss functions (MSE, cross-entropy), backpropagation, weight updates, gradient descent methods (stochastic, batch, mini-batch), optimizers (momentum, Adam, RMSProp), performance metrics (accuracy, precision, recall, F1-score), confusion matrix.

Unit 3: **CNN and Transfer** **14hrs**

Need for CNN, CNN structure, convolution, filters, feature maps, stride, padding, pooling (max, average), layers (conv, pooling, fully connected), transfer learning, pretrained models (VGG, ResNet, MobileNet), applications (image recognition, object detection).

Unit 4:**RNN, LSTM, and Transformers** **14hrs**

Recurrent neural networks (RNN), handling sequences, vanishing gradient problem, LSTM (gates: forget, input, output), GRU, attention, encoder-decoder, transformers, BERT, GPT, NLP tasks.

Reference Books:

1. **Fundamentals of Deep Learning** – Nikhil Buduma & N. Srinivas
2. **Deep Learning** – Charu C. Aggarwal
3. **Artificial Intelligence and Deep Learning** – Rajiv Chopra
4. **Deep Learning** – Ian Goodfellow, Yoshua Bengio, Aaron Courville
5. **Deep Learning with Python** – François Chollet

Elective Title: **Data Science**	
Course Code: BCA	Total Teaching Hours : 56
Semester: 4th	Teaching Hours Per Week: 4hrs
IA Marks: 20	Examination Hours:3hrs
Exam Marks: 80	Course Credits: 3

Course Learning Objectives:

1) Understand the fundamental concepts and scope of Data Science.
2) Learn methods for data collection, cleaning, and preprocessing.
3) Explore techniques for data exploration and visualization.
4) Study basic statistical methods used in data analysis.

Course Outcomes: After successful completion of this course, students will be able to:

- CO1: Describe key concepts of Data Science and its real-world applications.
- CO2: Apply data collection and cleaning techniques on sample datasets.
- CO3: Perform exploratory data analysis and create basic visualizations.
- CO4: Use statistical methods to interpret data and derive insights.

UNIT I: **Introduction to Data Science** **14hrs**

Data, Information, Knowledge, Evolution of Data Science, Data Science Life Cycle, Applications of Data Science, Role of Data Scientist, Tools and Technologies in Data Science, Data Ethics and Privacy.

Unit II:Data Collection and Cleaning **14hrs**

Structured and Unstructured Data, Data Collection Methods, Data Cleaning Techniques, Handling Missing Data, Removing Duplicates, Data Transformation, Tools: Excel, Pandas, NumPy.

Unit III: Data Exploration and Visualization **14hrs**

Introduction to Matplotlib and Seaborn to plot data using figures and subplots, Plots - Line plots, scatter plots, and bar plots, Visualizing distributions using histogram and box plots, Customizing plot aesthetics and adding annotations.

Unit IV: Statistical Analysis **14hrs**

Measures of Central Tendency, Measures of Dispersion, Probability Distributions, Hypothesis Testing, t-test, z-test, Chi-square Test, Correlation, Regression Analysis, Statistical Libraries in Python.

Reference Books:

1. **Data Science** by **V.K. Jain** – Khanna Publishing
2. **Fundamentals of Data Science** by **Niraj Kumar** – BPB Publications
3. **Doing Data Science** by Cathy O'Neil and Rachel Schutt – O'Reilly Media
4. **Python for Data Analysis** by Wes McKinney – O'Reilly Media
5. **The Elements of Statistical Learning** by Trevor Hastie, Robert Tibshirani, and Jerome Friedman – Springer

Elective Title: **Theory Of Computation**	
Course Code: BCA	Total Teaching Hours : 56
Semester: 4th	Teaching Hours Per Week: 4hrs
IA Marks: 20	Examination Hours:3hrs
Exam Marks: 80	Course Credits: 3

Course Learning Objectives:

1. Introduce core concepts of automata, grammars, and formal languages.
2. Build foundational skills in modeling computation using abstract machines.
3. Explain regular and context-free languages and their properties.
4. Provide insight into language recognition and parsing techniques.

Course Outcomes: After successful completion of this course, students will be able to:

- Understand and construct deterministic and nondeterministic finite automata.
- Apply regular expressions and grammars to define formal languages.
- Analyze and design context-free grammars and derivation trees.
- Simulate pushdown automata for context-free language processing.

UNIT – I Introduction to the Theory of computation 14 Hours

Mathematical Preliminaries and Notation: Sets, Functions and Relations, Graphs and Trees, Proof Techniques. Three Basic Concepts: Languages, Grammars, Automata. Some Applications

UNIT – II Finite Automata 14 Hours

Deterministic Finite Accepters: Deterministic Accepters and Transition Graphs, Languages and Dfa's Regular Languages. Nondeterministic Finite Accepters: Definition of a Nondeterministic Accepter, Why Nondeterminism?. Equivalence of Deterministic and Nondeterministic Finite Accepters. Reduction of the Number of States in Finite Automata.

UNIT – III Regular Languages and Regular Grammars 14 Hours

Regular Expressions: Formal Definition of a Regular Expression, Languages Associated with Regular Expressions. Connection Between Regular Expressions and Regular Languages: Regular Expressions Denote Regular Languages, Regular Expressions for Regular Languages, Regular Expressions for Describing Simple Patterns. Regular Grammars: Right- and Left-Linear Grammars, Right-Linear Grammars Generate Regular Languages, Right-Linear Grammars for Regular Languages, Equivalence of Regular Languages and Regular Grammars.

UNIT – IV Context-Free Languages 14 Hours

Context-Free Grammars: Examples of Context-Free Languages, Leftmost and Rightmost Derivations Derivation Trees, Relation Between Sentential Forms and Derivation Trees. Parsing and Ambiguity: Parsing and Membership, Ambiguity in Grammars and Languages, Context-Free Grammars and Programming Languages. Introduction to Pushdown Automata.

Reference Books:

1. An Introduction to Formal Languages and Automata By Peter Linz Fourth Edition
2. Introduction to Automata Theory, Languages, and Computation By John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman.
3. Finite Automata and Formal Languages: A Simple Approach By A. M. Padma Reddy

Main Examination Question Paper Pattern

Third/Fourth Semester BCA Degree Examinations-2025

BCA

Paper :< Subject>

Time: 3 Hours **Max. Marks: 80**

SECTION-A

Answer **all of the following questions:** **(2×10= 20)**

1.

a.
b.
c.
d.
e.
f.
g.
h.
i.
j.

SECTION-B

Answer **any Six** of the following: **(5×6= 30)**

2. From Unit-1
3. From Unit-1
4. From Unit-2
5. From Unit-2
6. From Unit-3
7. From Unit-3
8. From Unit-4
9. From Unit-4

PART-C

Answer **any Three** of the following: **(10×3= 30)**

10. From Unit-1
11. From Unit-2
12. From Unit-3
13. From Unit-4

Main Examination Question Paper Pattern

Third/Fourth Semester BCA Degree Examinations-2025

BCA

Paper :< Subject>

Time: 2 Hours **Max. Marks: 40**

SECTION-A

Answer **all of the following questions:** **(2×5= 10)**

1.

2.

3.

4.

5.

SECTION-B

Answer **any Six** of the following: **(5×6= 30)**

6. From Unit-1
7. From Unit-1
8. From Unit-1
9. From Unit-1
10. From Unit-2
11. From Unit-2
12. From Unit-2
13. From Unit-2

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