KUVEMPU UNIVERSITY

SEP – 2024

CURRICULUM STRUCTURE AND SYLLABUS

Bachelor of Computer Applications (BCA) Programme

[According to SEP (State Education Policy): 2024]

w.e.f Academic Year 2024-25

Under Graduate Board of Studies

In

Computer Science and B.C.A.

Kuvempu University, Shankaraghatta,

Shimoga, Karnataka.

Curriculum Design / Syllabus Framing Committee

Sl. No.	Name	Designation
1.	**Dr. Prabhakar C J** Professor, Department of P.G Studies and Research in Computer Science, Kuvempu University, Shankaraghatta – 577541, Shimoga(D).	**Chairman**
2.	**Dr. Shoieb Ahamed** Assistant Professor, Department of Computer Science, Sir M V Government Science College – 577301, Bommanakatte, Bhadravathi, Shimoga(D).	**Member**
3.	**Mr. Shashidhara B** Assistant Professor, Department of Computer Science, IDSG Government College, Chikkamagaluru(D) – 577101,	**Member**
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The objectives of the BCA Programme

1. The primary objective of this program is to provide a foundation of computing principles for effectively using information systems and enterprise softwares.
2. It helps students analyze the requirements for system programming and exposes students for information systems
3. This Programme provides students with options to specialize in various software system.
4. To produce outstanding Computer Scientists who can apply the theoretical knowledge into practice in the real world and develop standalone live projects themselves
5. To provide opportunity for the study of modern methods of information processing and its applications.
6. To develop among students the programming techniques and the problem- solving skills through programming
7. To prepare students who wish to go on to further studies in computer science and related subjects.
8. To acquaint students to Work effectively with a range of current, standard, Office Productivity software applications

Program Outcomes

1. **Discipline knowledge:** Acquiring knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity
2. **Problem Solving:** Improved reasoning with strong mathematical ability to Identify, formulate and analyze problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.
3. **Design and Development of Solutions:** Ability to design and development of algorithmic solutions to real world problems.
4. **Programming a computer:** Exhibiting strong skills required to program a computer for various issues and problems of day-to-day scientific applications.
5. **Application Systems Knowledge**: Possessing a minimum knowledge to practice existing computer application software.
6. **Communication:** Must have a reasonably good communication knowledge both in oral and writing.
7. **Ethics on Profession, Environment and Society:** Exhibiting professional ethics to maintain the integrality in a working environment and also have concern on societal impacts due to computer-based solutions for problems.
8. **Lifelong Learning:** Should become an independent learner. So, learn to learn ability.
9. **Motivation to take up Higher Studies:** Inspiration to continue educations towards advanced studies on Computer Science.

Bachelor of Computer Applications -Semester Scheme

Curriculum Structure for Undergraduate Programme for 2024-25 as per SEP-2024

General degree in all 6 Semesters

(Course Structure, Scheme of Teaching and Evaluation - 2024-25)

Curriculum Framework for UG Programmes as suggested by KSHEC, Government of Karnataka

(As per G.O. No.: ED 166 UNE 2023, Bengaluru, dated: 08-05-2024)

Class I: Three Major Subjects combination in all Six Semesters

Semester-wise allocation of credits in Kuvempu University for BCA Programme for framing syllabus

Year	Semester	Credits	Total Credits
1	I	15	**30**
	II	15	
2	III	17	**34**
	IV	17	
3	V	17	**34**
	VI	17	
Total		**34**	**98**

BCA Programme - Course Structure and Scheme of Evaluation - 2024-25

Sem.	Course/ Paper Code	Title of the Paper	Subject Category	Teaching Hour/week	Semester End Exam.	Internal Assessment	Total Marks	Credits	Examination Duration
1	2	3	4	5	6	7	8	9	10
Semester-I									
1	24BCA11	Fundamentals of Computers	**MC-T**	04	80	20	**100**	04	3 Hrs.
	24BCA12	Programming in C	**MC-T**	04	80	20	**100**	04	3 Hrs.
	24BCA13	Mathematical Foundation	**MC-T**	03	80	20	**100**	03	3 Hrs.
	24BCA11P	C programming LAB	**MC-P**	04	40	10	**50**	02	3 Hrs.
	24BCA12P	Information Technology LAB	**MC-P**	04	40	10	**50**	02	3 Hrs.
	Total			**19**	**320**	**80**	**400**	**15**	---
Semester-II									
2	24BCA21	Data Structures Using C	**MC-T**	04	80	20	**100**	04	3 Hrs.
	24BCA22	Java Programming	**MC-T**	04	80	20	**100**	04	3 Hrs.
	24BCA23	Operating System	**MC-T**	03	80	20	**100**	03	3 Hrs.
	24BCA21P	Data Structures Lab using C	**MC-P**	04	40	10	**50**	02	3 Hrs.
	24BCA22P	Java Programming LAB	**MC-P**	04	40	10	**50**	02	3 Hrs.
	Total			**19**	**320**	**80**	**400**	**15**	---
Semester-III									
3	24BCA31	Database Management System	**MC-T**	04	80	20	**100**	04	3 Hrs.
	24BCA32	Design and Analysis of Algorithms	**MC-T**	04	80	20	**100**	04	3 Hrs.
	24BCA33	Computer Communication and Networks	**MC-T**	03	80	20	**100**	03	3 Hrs.
	24BCA31P	DBMS Lab	**MC-P**	04	40	10	**50**	02	3 Hrs.
	24BCA32P	ADA Lab	**MC-P**	04	40	10	**50**	02	3 Hrs.
	Elective I - Choose Any ONE								
	24BCAOE31	Internet Basics	**EL**	02	40	10	**50**	02	2 Hrs.
	24BCAOE32	E-Commerce	**EL**	02	40	10	**50**	02	2 Hrs.
	Total			**21**	**360**	**90**	**450**	**17**	---
Semester-IV									
4	24BCA41	Python Programming	**MC-T**	04	80	20	**100**	04	3 Hrs.
	24BCA42	Web Technologies	**MC-T**	04	80	20	**100**	04	3 Hrs.
	24BCA43	Software Engineering	**MC-T**	03	80	20	**100**	03	3 Hrs.
	24BCA41P	Python Lab	**MC-P**	04	40	10	**50**	02	3 Hrs.
	24BCA42P	Web Technologies Lab	**MC-P**	04	40	10	**50**	02	3 Hrs.
	Elective I I - Choose Any ONE								
	24BCAOE41	Software Testing	**EL**	02	40	10	**50**	02	2 Hrs.

	24BCAOE42	Digital Image Processing	**EL**	02	40	10	**50**	02	2 Hrs.
	Total			**21**	**360**	**90**	**450**	**17**	---
Semester-V									
5	24BCA51	PHP and MY SQL	**MC-T**	04	80	20	**100**	04	3 Hrs.
	24BCA52	Artificial Intelligence and Machine Learning	**MC-T**	04	80	20	**100**	04	3 Hrs.
	24BCA53	Cyber Security	**MC-T**	03	80	20	**100**	03	3 Hrs.
	24BCA51P	PHP LAB	**MC-P**	04	40	10	**50**	02	3 Hrs.
	24BCA52P	AI and ML Lab	**MC-P**	04	40	10	**50**	02	3 Hrs.
		Discipline Elective I- Choose Any ONE							
	24BCADE51	Data Mining and Data Warehouse	**EL**	02	80	20	**100**	02	3 Hrs.
	24BCADE52	Unix Operating System	**EL**	02	80	20	**100**	02	3 Hrs.
	Total			**21**	**400**	**100**	**500**	**17**	---
Semester-VI									
6	24BCA61	Full Stack Development	**MC-T**	04	80	20	**100**	04	3 Hrs.
	24BCA62	Cloud Computing	**MC-T**	04	80	20	**100**	04	3 Hrs.
	24BCA63	Big Data Analysis	**MC-T**	03	80	20	**100**	03	3 Hrs.
	24BCA61P	Full Stack Development Lab	**MC-P**	04	40	10	**50**	02	3 Hrs.
	24BCA62P	Project	**PRJ**	04	60	40	**100**	02	3 Hrs.
		Discipline Elective II- Choose Any ONE							
	24BCADE61	Internet of Things	**EL**	02	80	20	100	02	3 Hrs.
	24BCADE62	Mobile Application Development	**EL**	02	80	20	100	02	3 Hrs.
	Total			**21**	**420**	**130**	**500**	**17**	---
	Grand total			**122**	**2150**	**600**	**2800**	**98**	**---**

Electives -- BCA and BSc

Sl. No.	Course	Semester	Elective	Electives Offered
01	BCA/ BSc	THIRD SEMESTER	Elective I	• Internet Basics • E-Commerce
02	BCA	FOURTH SEMESTER	Elective II	• Software Testing • Digital Image Processing
03	BSc	FOURTH SEMESTER	Elective II	• Cyber Security • Office Automation

Scheme of Evaluation

Curriculum Structure for Undergraduate Programme for 2024-25

Case 1 : Three Majors with a General degree in all Six Semesters – Number of courses and credit course-wise in all semesters

Semester	Major Course (Papers) Major Credits	Elective/ Optional	Project
I	15	---	
II	15	---	
III	17	Open Elective 1= 2	
IV	17	Open Elective 2= 2	
V	18	Discipline Elective 1= 3	
VI	18	Discipline Elective 2= 3	02
Total	**100**	**10**	**02**
	Grand Total	**112 Credits**	

1. Credit for the three major courses includes theory, practical (skill enhancement course), and tutorial/assignment/survey-based assignment/internship.
2. Practical paper(s) (Compulsory/Skill enhancement course) should provide practical experience which is complementary to theory major paper(s).
3. Project Work/Dissertation/Internship/Apprenticeship Embedded Degree Programme (AEDP) should also be considered to be part of the curriculum.
4. **Project work/Dissertation/Internship during Semester-VI:** Students for Project work may be allotted as per following formula,

Project Allotment to Students

$$= \frac{\textit{Total number of students in a three subjects combination}}{\textit{Number of subjects in a combination (Three)}}$$

Theory - Continuous Assessment Programme/Internal Assessment

Sl. No.	Continuous Assessment Programme/Internal Assessment	Maximum Marks
01	Two Session Tests with proper record for assessment (5+5 = 10)	10
02	Assessment of Seminars/ Assignment with proper record	05
03	Attendance with proper record	05
	TOTAL MARKS	**20**

- **Attendance Marks-breakup**

<75% =**00 Marks** , 75-80% = **01 Mark** ,80-85% = **02 Marks** ,85-90% = **03 Marks** , 90-95%=**04 Marks** 95% >=**05 Marks**

Practical Paper -Continuous Assessment Programme/Internal Assessment

Sl. No.	Continuous Assessment Programme/Internal Assessment	Maximum Marks
01	Attendance	05
02	Record/Journal	05
	TOTAL MARKS	**10**

Practical Examination

Sl. No.	Component	Maximum Marks
Experimentation (Major & Minor/Spotters)	Writing Part-A +Part-B	10+10 =20 Marks
	Execution	10 Marks
Viva voice	Viva voice	10 Marks
	Total	40 Marks

Project Work / Internship - Continuous Assessment Programme/Internal Assessment

Sl. No.	Continuous Assessment Programme/Internal Assessment	Maximum Marks
01	Project work/Dissertation/Internship and preparation of Report -	25
02	Viva Voice/ Presentation	15
	TOTAL MARKS	**40**

Project Work/Internship - Examination

Sl. No.	Component	Maximum Marks
01	Certificate/Dissertation/ Report	40
02	Viva Voice	20
	TOTAL MARKS	**60**

I SEMESTER

Course Code: 24BCA11	Fundamentals of Computers
Course Credits: 04	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 20
Exam Duration: 03	Semester end Exam Marks: 80

Contents	hours
Unit-1 : Introduction to Computers - Computer Definition,Characteristics, History of Computers,Anatomy of Computer -Central Processing Unit, Storage units, Input and output Devices. Types of Computers, Types of Software - System Software and Utility Software; Computer Languages - MachineLevel, Assembly Level & High Level Languages, Translators - Assembler,Interpreter and Compiler.	12
Unit-2 : Number Systems - Binary,Octal, decimal hexadecimal, convert binary to decimal, Decimal to binary, Decimal to hexadecimal,hexadecimal to decimal.Binary 1's complement , binary 2's complement.Computer Codes-BCD, Gray Code,ASCII and Unicode. Basic logic gates and operations .	12
Unit-3 Operating Systems - Introduction, Functions of an Operating System, Type of Operating Systems. The User Interface,Using Mouse, Icons, File explorer ,Toolbar, Status Bar, Menu bar , Operations on File and Directories. Computer networks- LAN, WAN; Concept of Internet,www,search engines,IP address Applications of Internet.	14
Unit-4 Word Processing - Word Processing GUI, Opening and Closing of documents, Text creation and Formatting, Table handling,Page setup. Presentation - GUI,creating slides, text/content animation, slide transition.slide show. Spreadsheet: Structure of Spreadsheet, Manipulation of cells;, Formulas and Functions-sum,avg,min,max,if.charts- bar,pie,line.	14

References

1. Computer Fundamentals, V Rajaraman.
2. Computer System Architecture (3rd edition) Morris Mano PHI.
3. Pradeep K. Sinha and Priti Sinha: Computer Fundamentals (Sixth Edition)
4. Link : Word - ppt - sheet. https://support.microsoft.com/en-us/office/

Course Code: 24BCA11P	Information Technology LAB
Course Credits: 02	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 10
Exam Duration: 03	Semester end Exam Marks: 40

Contents
Part - A 1.Create biodata using word processor 2.Create timetable in word processor with text formatting 3.Create Content page with header and footer, including page number,date , title using word processor 4.Create Invitation card for College Event using word processor 5.Create a Presentation with content animation 6.Create a Presentation with Slide transition 7.Create student ID card with photo in Presentation PART- B 1.Create student marks card in Spreadsheet 2.Plot Bar Chart in Spreadsheet for tabular data 3.Plot Line Chart in Spreadsheet for tabular data 4.Create inventory Bill in Spreadsheet with formulas. 5.Create a Salary slip with Basic,DA,(20% of Basic Salary),HRA(8% of Basic Salary), and Deduction.(10% of Total Salary) using Spreadsheet 6. Demonstrate usage of Filters in Spreadsheet.

Course Code: 24BCA12	Programming in C
Course Credits: 04	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 20
Exam Duration: 03	Semester end Exam Marks: 80

Contents	hours
Unit-1 : Problem solving with a Computer - Algorithm and Flowchart- Notations ,Examples- Area of a circle, find largest of 3 numbers ,sum N number. Overview of C - History and Features of C, Structure of a C Program, Creating and Executing a C Program. C Character Set, C tokens - keywords,identifiers, constants, and variables. Data types - Declaration & initialization of variables, Symbolic constants.Header files - stdio,conio,maths,string,ctype.	14
Unit-2 : Input and output with C: Formatted I/O functions - printf and scanf, control stings and escape sequences. Unformatted I/O functions - getchar, putchar, gets and puts functions. Arithmetic operators,Relational operators,Logical operators, Assignment operators, Increment & Decrement operators, Bitwise operators, Conditional operator, Special operators, Operator Precedence and Associativity, Evaluation of arithmetic expressions. Control Structures - if, if_else, Switch Case, goto, break & continue statements. Looping Statements - while, do-while, for loops, Nested loops.	14
Unit-3 Arrays - One Dimensional arrays - Declaration, Initialization and Memory representation. Two Dimensional arrays - Declaration, Initialization and Memory representation. Structures - Structure Definition, Advantages of Structure, declaring , initialization accessing structure members. Unions - Union definition,declaration,initialization. difference between Structures and Unions.	12
Unit-4 Pointers in C - Definition, Declaring and initialising pointers, accessing address and value of variables using pointers,Pointer Arithmetic, Advantages and disadvantages of using pointers. User Defined Functions - Need , structure of C user defined functions.Categories of user defined functions - With and without parameters and return type. function call - call by value, call by reference.	12

References

1. E. Balagurusamy: Programming in ANSI C (TMH)
2. V. Rajaraman: Programming in C (PHI – EEE)
3. S. Byron Gottfried: Programming with C (TMH)
4. Yashwant Kanitkar: Let us C
5. Kamathane: Programming with ANSI and TURBO C (Pearson Education)

Course Code: 24BCA12P	C Programming LAB
Course Credits: 02	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 10
Exam Duration: 03	Semester end Exam Marks: 40

Contents

PART - A

1. Write a C Program to read radius and find surface area and volume of a sphere.
2. Write a C Program to read three numbers and find the biggest of three
3. Write a C Program to demonstrate library functions in math.h (at least 5)
4. Write a C Program to read a number, find the sum of the digits, reverse the number and check it for palindrome
5. Write a C Program to read percentage of marks and to display appropriate grade (using switch case)
6. Write a C program to read marks scored in 3 subjects by n students and find the average of marks and result (Demonstration of single dimensional array)
7. Write a C Program to remove Duplicate Element in a single dimensional Array
8. Program to perform addition and subtraction of Matrices

PART- B

1. Write a C Program to find the length of a string without using built in function
2. Write a C Program to demonstrate string functions (at least 3).
3. Write a C Program to demonstrate pointers in C
4. Write a C Program to generate n prime number
5. Write a C Program to find the trace of a square matrix using function
6. Write a C Program to read, display and multiply two matrices using function
7. Write a C Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.
8. Write a C Program to demonstrate structure to read & display student information.

Course Code: 24BCA13	Mathematical Foundation
Course Credits: 03	Teaching Hours per Week: 03
Total Contact Hours: 48	Internal Assessment : 20
Exam Duration: 03	Semester end Exam Marks: 80

Contents	hours
Unit-1 : **Set and Function** Definition of set, methods of representation of sets (property method and listing method), set operation (union, intersection, complement, Cartesian product of sets), properties of sets (commutative, associative and distributive), Definition of function, types of function (linear, quadratic, polynomial) with example, exponential and logarithmic function with their properties and related example.	12
Unit-2 : **Matrix and Determinants:** Introduction-Types of matrices-matrix operations-transpose of a matrix -determinant of matrix - inverse of a matrix, Cramer's rule, finding rank of a matrix – normal form-echelon form, Cayley Hamilton Theorem-Eigenvalues.	12
Unit-3 : **Logic, Counting and Proof** Propositions and Logical Operations, Conditional Statements, Methods of Proof, Counting-Permutations, Combinations, Pigeonhole Principle, Elements of Probability. Introduction to Proofs, Proof Methods and Strategy.	12
Unit-4 :**Graphs** Introduction to Graphs and Graph models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Colouring.	12

References

1. Discrete Mathematics and Its Applications, Kenneth H. Rosen: Seventh Edition, 2012.
2. P. R. Vittal-Business Mathematics and Statistics, Margham Publications, Chennai,
3. Discrete Mathematical Structure, Bernard Kolman, Robert C, Busby, Sharon Ross, 2003.
4. Graph Theory with Applications to Engg and Comp. Sci: Narsingh Deo-PHI 1986.
5. Discrete and Combinatorial Mathematics Ralph P. Grimaldi, B. V. Ramatta, Pearson, Education, 5 Edition.
6. Discrete Mathematical Structures, Trembley and Manohar.

II SEMESTER

Course Code: 24BCA21	Data structure using C
Course Credits: 04	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 20
Exam Duration: 03	Semester end Exam Marks: 80

Contents	hours
Unit-1 : Data structures - Definition, Types of data structures - Primitive & Non-primitive, Linear and Nonlinear. **Stacks** - Definition and Representation of stacks, Operations on stacks.Applications of stacks; Infix, postfix and prefix notations, convert infix to postfix,Evaluation of postfix expression using stack.Recursive function -Definition ,Examples - Fibonacci number, factorial of number.	12
Unit-2 : **Queues** - Definition and Representation of queues; Types of queues – Simple queue and Operations , Circular queue and Operations. Priority queue (concept only), Double ended queue (concept only). Sorting – Selection sort, Bubble sort,insertion sort, Merge sort, Searching - Sequential Search, Binary search.	12
Unit-3 **Linked list:** Definition and Representation of linked list, Types of linked lists - Singly linked list, doubly linked list, Circular linked list; Operations on Singly linked lists – Traversing, Searching, Insertion, Deletion; Memory allocation, Garbage collection . Doubly Linked List: Memory Representation of Singly Linked List and Doubly Linked Lists. Applications of Linked List.	14
Unit-4 **Trees**: Definition; Tree terminologies –node, root node, parent node, ancestors of a node, siblings, terminal & non-terminal nodes, degree of a node, level, edge, path, depth; Binary tree: Type of binary trees - strict binary tree, complete binary tree, binary search tree; Array representation of binary tree. Traversal of binary tree; preorder, inorder and postorder traversal.	14

References

1.Ellis Horowitz and Sartaj Sahni: Fundamentals of Data Structures
2.Tanenbaum: Data structures using C (Pearson Education)
3.Kamathane: Introduction to Data structures (Pearson Education)
4.Y. Kanitkar: Data Structures Using C (BPB)
5.Kottur: Data Structure Using C
6.Padma Reddy: Data Structure Using C

Course Code: 24BCA11P	Data Structure using C LAB
Course Credits: 02	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 10
Exam Duration: 03	Semester end Exam Marks: 40

Contents

Part - A

1.Write a C Program to find GCD using recursive function
2.Write a C Program to generate N Fibonacci numbers using a recursive function.
3.Write a C Program to generate Factorial of a given number using a recursive function.
4. Write a C Program to sort the given list using Bubble sort technique.
5.Write a C Program to sort the given list using selection sort technique.
6.Write a C Program to sort the given list using insertion sort technique
7.Write a C Program to sort the given list using merge sort technique - recursive
8.Write a C Program to search an element using linear search technique

PART- B

1.Write a C Program to implement Stack.
2. Write a C Program to convert an infix expression to postfix.
3. Write a C Program to implement a simple queue.
4. Write a C Program to implement a Circular queue.
5. Write a C Program to implement insert at the beginning of a singly linked list and display.
6.Write a C Program to delete a node at the end of a singly linked list.
7. Write a C Program to search an element using recursive binary search technique.
8. Write a C Program to implement inorder traversal of a binary tree.

Course Code: 24BCA22	Java Programming
Course Credits: 04	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 20
Exam Duration: 03	Semester end Exam Marks: 80

Contents	hours
Unit-1 : Object oriented concepts and paradigm, Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, method Overloading, Math class, Arrays in java. Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, File, this reference, I/O streams.	12
Unit-2 : Inheritance - Inheritance in java, Super and subclass, Overriding, Object class, Polymorphism - Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class. Interfaces - Interfaces Vs Abstract classes, defining an interface, implementing interfaces ,extending interfaces. Packages - Defining, creating and accessing a package, Understanding CLASSPATH, importing packages.	12
Unit-3 Exception handling- Dealing with errors, benefits of exception handling, the classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally. Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronisation, Exception handling with try catch-finally, Collections in java, Introduction to JavaBeans and Network Programming	14
Unit-4 Event and GUI programming: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing.	14

Reference Books:

1. Programming with Java, By E Balagurusamy – A Primer, Fourth Edition,
2. Core Java Volume I – Fundamentals, By Cay S. Horstmann, Prentice Hall
3. Object Oriented Programming with Java : Somashekara, M.T., Guru, D.S.,Manjunatha, K.S
4. Java 2 - The Complete Reference – Tata McGraw Hill publication.

Course Code: 24BCA22P	JAVA Programming LAB
Course Credits: 02	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 10
Exam Duration: 03	Semester end Exam Marks: 40

Contents

Part - A

1.Program to add two integers and two float numbers. When no arguments are supplied, give a default value to calculate the sum. Use function overloading.

2. Program to perform mathematical operations. Create a class called AddSub with methods to add and subtract. Create another class called MulDiv that extends from AddSub class to use the member data of the super class. A main function should access the methods and perform the mathematical operations.

3.Program with class variable that is available for all instances of a class. Use static variable declaration. Observe the changes that occur in the object's member variable values.

4.Program to create a student class with following attributes; Enrollment No: Name, Mark of sub1, Mark of sub2, mark of sub3, TotalMarks. The pass mark for each subject is 50. Using this condition write a constructor for this class.Write separate functions for accepting and displaying student details. In the main method create an array of n student objects and display the details.

5.Create a Class Named College having data members Name of the class (BCA, BCom, BSc), Name of the staff ,No of the students in the class, use constructors

6.Program to define a class called employee with the name and date of appointment. Create employee objects as an array and sort them as per their date of appointment. ie, print them as per their seniority.

7.Program to demonstrate interface in java program.
8.Program to Demonstrate exception handling in java.

PART- B

1. Program to catch Negative Array Size Exception. This exception is caused when the array is initialised to negative values.
2. Program which creates and displays a message on window
3. Program to draw several shapes in the created window
4. Program which creates a frame with two buttons: father and mother. When we click the father button the name of the father, his age and designation must appear. When we click mother, similar details of mother also appear.
5. Program to move any one shape according to the arrow key pressed.
6. Program to create a window when we press M or m the window displays Good Morning, A or a the window displays Good After Noon E or e the window displays Good Evening, N or n the window displays Good Night
7. Demonstrate the various mouse handling events using suitable examples.
8. Program to create menu bar and pull-down menus

Course Code: 24BCA22	Operating System
Course Credits: 03	Teaching Hours per Week: 03
Total Contact Hours: 48	Internal Assessment : 20
Exam Duration: 03	Semester end Exam Marks: 80

Contents	hours
Unit-1 : Introduction to Operating System: Definition, Early systems – Batch Systems, Multiprogramming, Time Sharing,Real time system, Handheld systems and Distributed systems. Open Source Operating Systems. Process Management: Process Concept- Process Definition, Process State, Process Control Block, Process scheduling- Scheduling Queues, Schedulers, Context switch. Inter process communication (IPC) .	12
Unit-2 : CPU Scheduling - CPU I/O burst cycle, CPU Scheduler, Preemptive scheduling, Dispatcher. Scheduling criteria, Scheduling Algorithms- First-Come-First-Served (FCFS), Shortest Job First (SJF), Priority Scheduling, Round Robin scheduling algorithms. Deadlocks - Definition with example, System Model, Deadlocks Characterization- – Necessary Conditions, Resource Allocation Graph, Methods for Handling Deadlocks - Deadlock Prevention, Deadlock Avoidance.	12
Unit-3 Memory Management - Logical and Physical Address Space, Swapping, Contiguous Allocation,Fragmentation, Paging, Segmentation. Virtual Memory: Definition, Demand Paging, Page Replacement Algorithms -First In First Out (FIFO),Optimal Page replacement.Thrashing.	12
Unit-4 File System - File Concepts, Attributes, Operations and Types of Files. File Access methods, Directory Structure, Protection and consistency semantics. File System Implementation- File System Structure, File Allocation Methods, Free Space Management.Disk Structure, Disk Scheduling-Definition, Algorithms- FCFS, SSTF, SCAN.	12

References :

1. Operating System Concepts, Silberschatz' et al., 10thEdition, Wiley, 2018.
2. Operating System Concepts - Engineering Handbook, Ghosh PK, 2019.
3. Understanding Operating Systems, McHoes A et al., 7th Edition, Cengage Learning,2014.
4. Operating Systems - Internals and Design Principles, William Stallings, 9th Edition,Pearson.
5. Operating Systems – A Concept Based Approach, Dhamdhere, 3rd Edition, McGrawHill Education India.
6. Modern Operating Systems, Andrew S Tanenbaum, 4th Edition, Pearson

III SEMESTER

Course Code: 24BCA31	Database Management Systems
Course Credits: 04	Teaching Hours per Week: 04
Total Contact Hours:52	Internal Assessment : 20
Exam Duration: 03	Semester end Exam Marks: 80

Contents	hours
Unit-1 : Introduction to Database : Database system applications.Characteristics and Purpose of database approach. People associated with a Database system. Data models. Database schema. Database architecture. Data independence . Database languages, E-R Model: Entity-Relationship modeling: E – R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes.Relationships between the entities. Relationship types, structural constraints. Weak entity types, E -R diagram - examples.	14
Unit-2 : Relational Data Model: Relational model concepts. Characteristics of relations. Relational model constraints: Domain constraints, key constraints, integrity constraints Relational Algebra: Basic Relational Algebra operations-union ,intersection, selection, projection, cartesian product. JOIN operations.- inner , outer, equi .	12
Unit-3 SQL and Data Normalization: SQL -DML,DDL,DCL,TCL Commands. Aggregate Functions and Grouping. Nested Sub Queries, Views. Normalization - Anomalies in relational database design. . Functional dependencies. Normalization.Types of Normal forms- First normal form, Second normal form, Third normal form. Boyce-Codd normal form.	12
Unit-4 Introduction to PL/SQL programming: Features and Advantages, PL/SQL Blocks - basic syntax, Variables and their scope, Constants, Literals, Data Types, Operators, Executable Statements. Conditional Control: IF Statements , CASE Statements ,Iterative Control: Basic Loops - WHILE and FOR Loops, Reverse FOR LOOP Statement, Nested Loops, Labeling a PL/SQL Loop, exception handling.	14

References :

1. Fundamentals of Database Systems, Ramez Elamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015
2. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
3. Introduction to Database System, C J Date, Pearson, 1999.
4. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S.Sudarshan, 6 th Edition, McGraw Hill, 2010.
5. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3 rd Edition, McGraw Hill, 2002

Course Code: 24BCA32	Design and Analysis of Algorithms
Course Credits: 04	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 20
Exam Duration: 03	Semester end Exam Marks: 80

Contents	hours
Unit-1 : Introduction: Fundamentals of Algorithmic problem solving, strategies to design algorithms ,Limitations and Improvements .Basics of Time Complexity .Fundamentals of the Analysis of Algorithm Efficiency (Worst-case, Best-Case and Average-case efficiencies) , Analysis Framework, Orders of Growth(logarithmic, linear, polynomial, exponential, factorial),	14
Unit-2 : Asymptotic Notations and Basic Efficiency classes, Informal Introduction, O-notation, Ω-notation, θ-notation, mathematical analysis of non-recursive algorithms, mathematical analysis of recursive algorithms. **Brute Force :**(definition ,algorithm, example, analysis, advantage, limitation) **Sequential Search :**	12
Unit-3 **Greedy Algorithms**-(definition ,algorithm, example, analysis,advantage, limitation) Huffman Coding: Optimal prefix codes for data compression. Fractional Knapsack Problem: Maximizing value with weight constraints. **Divide and Conquer :** (definition ,algorithm, example, analysis,advantage, limitation) **Binary Search:** Analysis and variants. **Merge Sort:** Algorithm, analysis, and recurrence relation.	12
Unit-4 **Dynamic Programming** :(definition ,algorithm, example,analysis of time complexity ,advantage, limitation) -Longest Common Subsequence (LCS) **All-Pairs Shortest Paths:** Floyd-Warshall Algorithm. **Graph Algorithms** : (definition ,algorithm, example, analysis of time complexity ,advantage, limitation) .Types of Graphs,Graph Representations. Breadth-First Search (BFS). Depth-First Search (DFS).	14

References :

1. **"Introduction to Algorithms"** by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein (CLRS) (MIT Press) - *The definitive textbook, highly recommended.*

2."Algorithm Design" by Jon Kleinberg and Éva Tardos (Pearson Addison Wesley) - *Excellent for design paradigms.*

3."The Algorithm Design Manual" by Steven S. Skiena (Springer) - *Great for practical insights and problem-solving.*

Course Code: 24BCA33	Computer Communication and Networks
Course Credits: 03	Teaching Hours per Week: 03
Total Contact Hours: 48	Internal Assessment : 20
Exam Duration: 03	Semester end Exam Marks: 80

Contents	hours
Unit-1 : Introduction: Computer Network-Types & Applications, Network Software Protocol Hierarchies, **Network Topologies:** Mesh, Star, Bus, Ring, Tree, Hybrid. **Network Types:** LAN, WAN, MAN, PAN. **Network Models** :OSI reference model, TCP/IP reference model, Comparison between OSI & TCP.	12
Unit-2 : Physical Layer : Data and Signals,Data Rate Limits, Transmission Media – Twisted pair, coaxial cable, optical fiber,radio transmission, microwave transmission and infrared transmission, switching – Circuit switching, Packet switching, Difference between Circuits witching & Packet switching.	12
Unit-3 Data Link Layer : Data Link Layer design issues, Error detection – Types of Errors,Single parity checking, Checksum, polynomial codes – CRC, Error correction- Hamming code, data link protocols- Unrestricted Simplex Protocol and Simplex Stop-and-Wait Protocol	12
Unit-4 Network Layer: Network layer design issues, Routing algorithms –Distance Vector Routing , Link State Routing (OSPF) , IPv4 Packet Format, Transport Layer : Transport Service primitives, UDP header &TCP segment header,Difference between TCP & UDP. Congestion & Congestion control algorithms – General Principles of Congestion control, Traffic Shaping-Leaky bucket algorithm, token bucket algorithm.	12

References :

1. Computer Networks, Andrew S. Tanenbaum, 5th Edition, Pearson Education, 2010.
2.Data Communication & Networking, Behrouza A Forouzan, 3rd Edition, Tata McGrawHill, 2001.
3.Data and Computer Communications, William Stallings, 10 th , Edition, PearsonEducation, 2017.
4. Data Communication and Computer Networks, Brijendra Singh, 3rd Edition, PHI, 2012.
5. Data Communication & Network, Dr. Prasad, Wiley Dreamtech.
6. http://highered.mheducation.com/sites/0072967757/index.htmls

Course Code: 24BCA31P	DBMS Lab
Course Credits: 02	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 10
Exam Duration: 03	Semester end Exam Marks: 40

Contents

PART - A

1. Create a table Students with fields: StudentID (Primary Key)Name (VARCHAR)Age (INT)Grade (CHAR).Alter the Students table to add a new column Email (VARCHAR).Rename the Students table to display.

2. Create a table employee table(employee_id, employee_name, employee_dept salary) , insert 5 records into the employee table. perform Update the salary on table referencing the key ,example employee_id = XX .

3.Implementation of different types of constraints.-PRIMARY KEY, FOREIGN KEY, UNIQUE, CHECK.

4. Create two table and Demonstrate different types of Joins operations
a) Inner Join b) Outer Join c) Natural Join

5.Create student table and Implement Aggregation Functions a) Group By & having clause b) Order by clause

PART- B

1.Write a simple anonymous PL/SQL block to display "Hello, PL/SQL World!".
2.Write a PL/SQL block to check if a number is positive, negative, or zero.
3.Write PL/SQL blocks to demonstrate NO_DATA_FOUND, TOO_MANY_ROWS, ZERO_DIVIDE, DUP_VAL_ON_INDEX

4.Create Simple Cursor : Write a PL/SQL block to retrieve and display the employee_id and employee_name for all employees from an employees table (assume it exists with these columns). display employee names with distinct salaries.

5.Create Simple Cursor : Write a PL/SQL block to retrieve and display the student table and Create a program to categorize students based on CGPA: 'A' for CGPA ≥ 9 , 'B' for CGPA ≥ 7, 'C' for CGPA ≥ 4 , 'D' for others.

Course Code: 24BCA32P	ADA Lab
Course Credits: 02	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 10
Exam Duration: 03	Semester end Exam Marks: 40

Contents

PART - A

1.Write a program to demonstrate Time complexity - constant and logarithmic time
2.Write a program to demonstrate Time complexity - linear and quadratic time
3.Write a program to find element using sequential search.
4.Write a program to sort a list of N elements using Selection Sort Technique
5.implement Merge sort algorithm for sorting a list of integers in ascending order.
6.Write a program to perform Knapsack Problem using Greedy Solution
7.Write a program to perform Travelling Salesman Problem

PART- B

1. Write a program to show graph representation basics.
2. implement binary search to demonstrate divide and conquer.
3. implement Greedy Algorithm for job sequencing with deadlines.
4. implement a Dynamic Programming algorithm for the Longest Common Subsequence.
5. implements Prim's algorithm to generate minimum costs panning Tree.
6. implement the DFS algorithm for a graph.
7. implement the BFS algorithm for a graph

IV SEMESTER

Course Code: 24BCA41	Python Programming
Course Credits: 04	Teaching Hours per Week: 04
Total Contact Hours:52	Internal Assessment : 20
Exam Duration: 03	Semester end Exam Marks: 80

Contents	hours
Unit-1 : Introduction to Features and Applications of Python, Python Versions, Installation of Python, Python IDEs, Simple Python Program. Comments, Indentation. Identifiers, Variables, Operators, Precedence and Association, **Python Libraries** : Importing Libraries ,installing new packages. **Libraries overview** - NumPy,Pandas ,Matplotlib. **Built-in Data Type** - int, float, complex . Type Conversions **Built-in Functions**- Console Input and Console Output.	14
Unit-2 : **Strings**: Creating and Storing Strings; Accessing String Characters, String Methods : Concatenation, Comparison, Slicing and Joining, Format Specifiers. **Python Control Flow**: Types of Control Flow, Control Flow Statements-if, else, elif, nested if, while loop, break, continue statements, for loopStatement; range () and exit () functions, pass statement. **Python Functions**: Types of Functions, Function Definition- Syntax,Function Calling, Passing Parameters/arguments, the return statement,Default Parameters; keyword Arguments; Recursive Functions.	12
Unit-3 **Arrays**: Creating Array, Access the element of an array, Arrays Built-in Methods. **Lists**: Creating Lists,Operations on Lists, Built-in Functions on Lists,Nested Lists. **Dictionaries**: Creating Dictionaries, Operations on Dictionaries, Dictionary Built-in Methods, Populating and Traversing Dictionaries. **Tuples**: Creating Tuples, Operations ,Tuple Built-in Methods. **Sets** :Creating Sets,Operations ,Set Built-in Methods.	14
Unit-4 **Object Oriented Programming**: Classes and Objects, Creating Classes and Objects, Constructor Method, Classes with Multiple Objects, Objects as Arguments, Objects as Return Values. **File Handling**: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator. **Exception Handling:** Types of Errors, Exceptions,Exception Handling using try, except and finally.	12

References :

1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition,
2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
3. Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python

Programming Language, Fabio Nelli, Apress®, 2015
4. Advanced Core Python Programming, MeenuKohli, BPB Publications, 2021.
5. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall, 2012.
6. Automate the Boring Stuff, Al Sweigart, No Starch Press, Inc, 2015.
7. Data Structures and Program Design Using Python, D Malhotra et al., Mercury Learning and Information LLC, 2021.
8. http://www.ibiblio.org/g2swap/byteofpython/read/
9. https://docs.python.org/3/tutorial/index.html

Course Code: 24BCA42	Web Technologies
Course Credits: 04	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 20
Exam Duration: 03	Semester end Exam Marks: 80

Contents	hours
Unit-1 : **HTML Basics** : HTML Document Structure, Text Formatting Tag:Headings: <h1> to <h6>. : <p>. . Horizontal Rule: <hr>. , . <i>, <b>. : <sup>, : <sub> Metadata Tags - <title> ,<link>,<style>,<script> Media Tags - ,anchor <a>, Images <img>, Lists Table relatedTags<table>:<thead>, <tbody>, <tfoot> , <tr>, <th>,<td>. Form-related Tags: <form>: <input>: Input fields (text, number, checkbox, radio, etc.).<button>: <select>, <option>: Drop-down lists.<label>. HTML Attributes: id, class, style, title. HTTP Methods: GET, POST,HTTP Status Codes	16
Unit-2 : **JavaScript**: General syntactic characteristics, Primitives, operations, and expressions, Control Structures,Error Handling , user define function, Event handling. DOM Manipulation:Tree Structure,Selecting Elements-getElementById, querySelector.Object and Functions : document ,window, console object Properties and Functions . Frameworks Introduction :Node.js & npm .	12
Unit-3 **Introduction to CSS** : Overview and features of CSS3. CSS Syntax,Selectors,Box Model.CSS Selectors and Specificity. Type of CSS, . CSS Box Model:margin, border, padding, Box-sizing , Borders ,Measurements. Positioning, CSS Grid Layout. Pseudo-classes: :hover, :active, :focus, :first-child, :last-child, :nth-child(),	12
Unit-4 **CSS Animation** : Keyframes Properties ,Syntax,2D Transforms Functions . **CSS Transitions**: CSS Transition Properties ,Syntax,example. **HTML5- SVG**: Viewing SVG Files, Embedding SVG in, SVG Circle, SVG Rectangle, SVG Line. **HTML5-CANVAS**: Browser Support, Canvas Examples, Canvas - Drawing Rectangles, Canvas - Drawing Paths,Canvas - Drawing Lines.	12

References :

1. "Web Technologies: A Developer's Perspective" by N. P. Gopalan and J. Akilandeswari (PHI Learning) - *Good for foundational web concepts.*

2. "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" by Jennifer Robbins (O'Reilly Media) - *Excellent for beginners, covering the basics comprehensively.*

3.] "HTTP: The Definitive Guide" by Brian Totty, et al. (O'Reilly Media) - *For a more in-depth understanding of HTTP, though parts might be too advanced for Chapter 1*

Course Code: 24BCA43	Software Engineering
Course Credits: 03	Teaching Hours per Week: 03
Total Contact Hours: 48	Internal Assessment : 20
Exam Duration: 03	Semester end Exam Marks: 80

Contents	hours
Unit-1 : Introduction to Software Engineering, Software engineering ethics. Software process. Software process models: Waterfall Model,Incremental Model,Evolutionary Models. Agile software development: Principles of Agile, **Requirements Engineering**: Feasibility Study, Requirements Elicitation,Requirements Analysis, Requirements Specification,Requirements Management , Requirements Modeling: Use Case Diagrams, Sequence Diagrams,	13
Unit-2 : **Software Design** :Design Process and Quality Attributes (Maintainability, Reliability, Usability, Performance, Security,).Design Concepts: Abstraction, Architecture, Patterns, Modularity, Information Hiding, Functional Independence.Coupling and Cohesion. **Architectural Design**: Layered, Client-Server, Peer-to-Peer, Pipe-and-Filter, Microservices.	13
Unit-3 Component-Level Design: Class diagrams, interaction diagrams. Designing Components(concept, representation ,example): Flowcharts, pseudocode. User Interface Design (UI/UX Principles):Golden rules of interface design,User interface analysis and design process,Prototyping and evaluation.	10
Unit-4 **Software Testing Fundamentals (concepts)**:Verification vs. Validation.Testing Principles.Testability.Test Plan, Test Case, Test Report. **Testing Strategies**: Unit Testing: White-box testing (basis path testing, control structure testing), black-box testing (equivalence partitioning, boundary value analysis). Integration Testing: Top-down, bottom-up, sandwich, regression testing. Validation Testing: Alpha, Beta testing, user acceptance testing.	12

References :

1. **"Software Engineering: A Practitioner's Approach"** by Roger S. Pressman and Bruce Maxim (McGraw-Hill Education) - *A classic and comprehensive guide for practitioners.*

2."Software Engineering" by Ian Sommerville (Pearson Education) - *Covers a broad range of topics with a strong focus on fundamental concepts*

Course Code: 24BCA41P	Python Lab
Course Credits: 02	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 10
Exam Duration: 03	Semester end Exam Marks: 40

Contents
PART - A 1.Write a Program to Check if a given number is a Prime Number or not 2.Write a Program to check if number is positive, negative or zero 3.Write a Program to Count Digits in a Number using while loop 4.Write a Program to generate random number and Calculate the sum of elements using for loop 5.Write a Program to remove punctuations from a string 6.Write a Program to find factorial of a number 7.Write a Program to Create a calculator program PART- B 1.Demonstrate basic operation on list - sum() ,max(), min() ,sort(). 2.Write a Program to Demonstrate use of Tuples 3.Write a Program to Demonstrate use of Dictionaries 4.Write a python program to create Simple Class and Object 5.Write a Program to count number of lines in a text file 6.Write a Program to Create data frame from excel sheet and perform simple operations 7.Write a Program to Demonstrate exception handling

Course Code: 24BCA42P	Web Technology Lab
Course Credits: 02	Teaching Hours per Week: 04
Total Contact Hours: 52	Internal Assessment : 10
Exam Duration: 03	Semester end Exam Marks: 40

Contents

PART - A

1. Develop and demonstrate a HTML document that illustrates a) Image as a background
2. Multimedia: - a) Develop a web page to play audio file using <a>Tag. b) Develop a web page to play video file using <Embed>Tag.
3. Develop and demonstrate a HTML document that illustrates a) the use of Formatting Text. b) Headings tags (H1, H2, H3, H4, H5, H6) c) Font Details (Font Size, Style, Type, Color) d) Setting Color (BG Color)
4. Write a JavaScript program to convert temperatures to and from Celsius, Fahrenheit
5. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
6. Demonstrate canvas in HTML5.

PART- B

1. Develop and demonstrate a HTML document that illustrates a) Unordered List (UL) b) Ordered List (OL) and Definition list (DL) c) Table Alignment (Cell Spacing, Cell Padding, Height, Width, Border, Rowspan, colspan) d) Setting Different Table Attributes (Color, Image)
2. Create Style sheet to set formatting for text tags and embed that style sheet on web pages created for your site.
3. Design a timetable and display it in tabular format using html.
4. Design signup form to validate username, password, and phone numbers etc. using Java script
5. Write an HTML page that contains a selection box with a list of 5 countries .. Add CSS to customize the properties of the font of the capital (color, bold and font size).

ELECTIVE I - BCA & B.Sc Cs III Semester

Course Code: 24BCAEL31/ 24BScEL31	**Internet Basics**
Course Credits: 02	Teaching Hours per Week: 02
Total Contact Hours: 32	Internal Assessment: 10
Exam Duration: 02	Semester end Exam Marks: 40

Contents	Hours
Unit-1: Internet Basics: Basic concepts, communicating on the Internet, Internet, Difference between the Internet and the World Wide Web (WWW). Basic networking concepts (LAN, WAN) Web server, Web browser – understanding how a browser communicates with a web server, Client issues a request and sends a response, server terminates the connection.	**8**
Unit-2: Search Engines: What are search engines and how do they work? Popular search engines (Google, Bing, DuckDuckGo). Effective search strategies (keywords, advanced search operators). Evaluating search results for credibility. Internet Service Providers (ISPs) and types of connectivity (Dial-up, Broadband, Wi-Fi, Fiber, Mobile Data)	**8**
Unit-3: Web Addresses (URLs): Structure of a URL (Scheme, Domain, Subdomain, Subdirectory). Top-Level Domains. Domain Name Extension, establishing connectivity on the internet, IP Address – assigning IP Address static / dynamic. Internet Protocols: TCP/IP. HTTP/HTTPS, FTP, DNS.	**8**
Unit- 4: Network hardware: Network Interface Devices, Network Interface Cards (NIC), Wired vs Wireless NICs, MAC Address and ARP, Networking Devices-Hubs, Switches, and Bridges, Routers-Routing basics, static and dynamic routing. Access Points (AP) Firewalls (Hardware)	**8**

References:

1. "The Internet Book: Everything You Need to Know about Computer Networking and How the Internet Works" by Douglas E. Comer

ELECTIVE I - BCA & B.Sc Cs III Semester

Course Code: 24BCAEL32/ 24BScEL32	E-Commerce
Course Credits: 02	Teaching Hours per Week: 02
Total Contact Hours: 32	Internal Assessment: 10
Exam Duration: 02	Semester end Exam Marks: 40

Contents	hours
Unit-1: E-Commerce and Online Shopping: E-commerce structure, Popular online shopping websites, Safe online shopping practices. Distinction between E-commerce and E-business. Benefits and limitations of E-commerce. E-commerce Business Models: Business-to-Consumer (B2C), Business-to-Business (B2B), Consumer-to-Consumer(C2C), Consumer-to-Business (C2B), Government-to-Citizen (G2C), Government-to-Business (G2B), etc., Emerging models.	**8**
Unit-2: E-commerce Platforms and Solutions: Types of e-commerce platforms (SaaS, open-source, custom-built). Popular platforms (Shopify, WooCommerce, Magento, BigCommerce). Features and considerations for choosing a platform Building an E-Commerce Website, Building an E-commerce Presence: Website design principles for e-commerce (UX/UI, mobile responsiveness). Content Management Systems (CMS) in e-commerce.	**8**
Unit-3: Digital Marketing Strategies: Search Engine Optimization (SEO) for e-commerce. Search Engine Marketing (SEM) - Paid advertising (Google Ads). Social Media Marketing (SMM) and social commerce. Email Marketing and customer relationship management (CRM). Content Marketing for e-commerce. Affiliate Marketing.	**8**
Unit-4: E-Commerce Security: Common security threats (phishing, malware, DDoS attacks, data breaches). Security measures (SSL/TLS, firewalls, encryption). Digital certificates and authentication. Anti-virus, and Anti-malware, Data Protection and Privacy Intellectual Property Rights (IPR) .	**8**

References:

1. Kenneth C. Laudon, Carol Guercio Traver - E-Commerce, Pearson, 10th Edition, 2016

2. Laudon, K. C., & Traver, C. G. (Latest Edition). *E-commerce: Business. Technology. Society.* Pearson.

ELECTIVE II – BCA IV Semester

Course Code: 24BCAEL41	**Software Testing**
Course Credits: 02	Teaching Hours per Week: 02
Total Contact Hours: 36	Internal Assessment: 10
Exam Duration: 02	Semester end Exam Marks: 40

Contents	hours
Unit-1: Fundamentals of Software Testing: Definition, purpose, and importance of testing, Goals of testing (finding defects, preventing defects, gaining confidence, providing information). Debugging vs. Testing. Quality Assurance (QA), Quality Control (QC), Seven Principles of Testing-Testing shows presence of defects, not absence, Exhaustive testing is impossible, Early testing, Defect clustering, Pesticide paradox, Testing is context dependent, Absence of errors fallacy.	**8**
Unit-2: Software Development Life Cycle (SDLC) Overview of common SDLC models (Waterfall, V-Model, Iterative, Agile, DevOps),Role of testing in different SDLC models, Software Testing Life Cycle (STLC)-Phases: Test Techniques Overview: Black-Box Testing Techniques: Equivalence Partitioning, Boundary Value Analysis (BVA),Decision Table Testing, State Transition Testing, Use Case Testing White-Box Testing Techniques: Statement Coverage, Decision Coverage, Path Testing, Loop Testing.	**8**
Unit-3: Acceptance Testing (User Acceptance Testing - UAT, Alpha, Beta), Test Types: Functional Testing- Smoke Testing, Sanity Testing, Regression Testing, Re-testing, Localization Testing, Globalization Testing, Usability Testing, Non-Functional Testing-Performance Testing (Load, Stress, Endurance, Spike), Security Testing, Compatibility Testing, Reliability Testing, Maintainability Testing, Portability Testing.	**8**
Unit- 4: Maintenance Testing: Impact Analysis, Regression Testing, Automation: Selenium WebDriver Basics, Selenium Suite (IDE, RC, WebDriver, Grid). Selenium Architecture, Automation Frameworks- Robot Framework, Cypress, Appium, Configuration Management Tools -Git, SVN.	**8**

References:

1. "Foundations of Software Testing ISTQB Certification" by Dorothy Graham, Rex Black, Erik van Veenendaal.
2."Introduction to Software Testing" by Paul Ammann and Jeff Offutt.

ELECTIVE II – BCA IV Semester

Course Code: 24BCAEL42	**Digital Image Processing**
Course Credits: 02	Teaching Hours per Week: 02
Total Contact Hours: 32	Internal Assessment: 10
Exam Duration: 02	Semester end Exam Marks: 40

Contents	hours
Unit-1: Digital Image Processing: Definition, advantages, Applications. **Image Sensing and Acquisition:** Image formation model, image capturing devices (cameras, scanners). **Image Sampling and Quantization:** Spatial resolution, intensity resolution, aliasing, staircase effect. **Basic Concepts in Digital Images:** Pixels, intensity levels, grayscale images, color images (RGB, CMYK, HSV models).	**8**
Unit-2: Basic Relationships Between Pixels: Neighbors, Adjacency, Connectivity, Paths, Distance Measures. **Image File Formats:** BMP, JPEG, PNG, GIF, TIFF **Image Restoration and Reconstruction**: Model of image degradation, noise models **Noise Filters:** Mean filters, Median filter, Max/Min filter	**8**
Unit-3: Image Compression: Redundancy (coding, interpixel, psychovisual), fidelity criteria. **Compression Models:** Source encoder, channel encoder. Image Segmentation, Representation: Point, Line, and Edge Detection (Sobel, Canny edge detector).	**8**
Unit – 4: Image Segmentation Methods: **Thresholding methods:** global, adaptive, Otsu's method **Edge-based segmentation:** Canny, Sobel, Laplacian **Region-Based Segmentation:** Region growing, region splitting and merging. **Clustering methods:** K-Means, Mean Shift **Morphological operations:** Dilation, Erosion, Opening, Closing	**8**

References:

1. **"Digital Image Processing"** by Rafael C. Gonzalez and Richard E. Woods (Pearson) - *The foundational and most widely used textbook. Essential reference for almost every unit.*

2."Digital Image Processing using MATLAB" by Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins (Pearson) .

THEORY EXAMINATION QUESTION PAPER PATTERN FOR MAJOR SUBJECTS

(Semesters I –VI)

B.Sc. (CS) Semester-I Degree Examination; 2024-25

(Semester Scheme; New Syllabus: 2024-25)

SUBJECT: COMPUTER SCIENCE

Paper –_____: _____

Paper Code: _____

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

Instructions to candidates:

1) All sections are compulsory
2) Draw neat and labelled diagrams wherever necessary.

SECTION-A

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

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

SECTION-B

Answer any **SIX** of the following: **(Two Questions From each Unit)** **(5×6=30)**

2.
3.
4.
5.
6.
7.
8.
9.

SECTION -C

Answer **Any Three** of the following:

(10×3=30)

10. **From Unit-I**

11. **From Unit-II**

12. **From Unit-III**

13. **From Unit-IV**

THEORY EXAMINATION QUESTION PAPER PATTERN FOR ELECTIVE/OPTIONAL PAPERS

(Semesters III & IV)

B.Sc. Semester-I/II/III/IV/V Degree Examination; 2024-25

(Semester Scheme; New Syllabus: 2024-25)

SUBJECT: COMPUTER SCIENCE

Paper – ELECTIVE/OPTIONAL III & IV _____: _____

Paper Code: _____

Time: 2 Hours

Max. Marks: 40

Instructions to candidates:

1) All sections are compulsory
2) Draw neat and labelled diagrams wherever necessary.

SECTION-A

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

1.

2.

3.

4.

5.

SECTION-B

Answer any **SIX** of the following:

(5×6=30)

6.

7.

8.

9.

10.

11.

12.

13.

Syllabus Distribution for Question Paper Setting		
Section-A	Ten Questions of each carrying 02 marks	Two questions each from unit-1 and Unit-2. And Three questions each from Unit-3 and unit-4.
Section -B	Eight Questions carrying 06 marks each.	Two questions from each unit.
Section -C	Four Questions carrying 10 marks each	One question from each unit. (There shall be sub-Questions.)