

Bachelor of Computer Application (BCA) SCHEME First Semester

S.N	Subject	Subject Name	Marks Distribution				
•	Code		Internal Marks	Exto Ma	External Marks		Total Marks
		-	Max	Max	Min	Max	Min
1.	BCA101	Fundamentals of Computer	30	70	21	100	35
2.	BCA102	Programming Fundamentals using 'C'	30	70	21	100	35
3.	BCA103	Development of Entrepreneursh ip	30	70	21	100	35
4.	BCA104	Digital Electronics	30	70	21	100	35
5.	AECC01	Soft Skills	30	70	21	100	35
			Practica	l			
			Max	[Ν	/lin
1.	BCA152	Programming Fundamentals using 'C'-Lab	50			2	25
2.	BCA155	MS Office Lab	50		25		



S.N.	Subject Code	Subject Name	L	Т	Р	Credit
1.	BCA101	Fundamentals of Computer	3	1	0	4
2.	BCA102	Programming Fundamentals using 'C'	3	1	0	4
3.	BCA103	Development of Entrepreneurship	3	1	0	4
4.	BCA104	Digital Electronics	3	1	0	4
5.	AECC01	Soft Skills	3	0	0	3
6.	BCA152	Programming Fundamentals using 'C'-Lab	0	0	2	1
7.	BCA155	MS Office Lab			2	1
	Т	otal	15	4	4	21

BCA 2019-2022 Choice Based Credit System



Bachelor of Computer Applications (BCA)

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Semester- I

Course Content

Course	Subject Title	Subject Code
BCA	Fundamentals of Computer	BCA101

Unit - I

Introduction of Computers: Computer System, System Characteristics and capabilities, Types of Computers: Analog, Digital (Micro, Mini, Mainframe & Super Computers), Generation of Computers.

Unit –II

Computer Organisation: Block Diagram of Computer and its functional units. Input Devices KeyBoard, Scanner, Mouse, Light Pen, Bar Code Reader, OMR, OCR, MICR., Trackball, Joystick, Touch Screen etc., Output Devices: Monitors Classification of Monitors based on Technology (CRT Monitor & Flat panel LCD Monitor), Printers Dot Matrix Printer, Ink Jet Printer, Laser Printer and Plotters, Types of Plotters Drum Plotter and Flat Bed Plotters, LCD Projectors. Storage Devices: Magnetic tapes, Floppy Disks, Hard Disks, Compact Disc - CD-ROM, CD-RW, VCD, DVD, DVD-RW.

Unit- II

Programming Languages: History, Classifications Low Level, Assembly & High Level languages, Advantages & Disadvantages Programming Languages.

Unit- IV

Types Of Software: System Software - Translators (Compilers, Interpreters, Assemblers), Operating System, Linkers, Libraries & Utilities, Application Software - Packaged & Tailored Softwares. Operating Systems: Introduction, Types of O.S. - Single User, Multi User - Multi Programming, Multi Tasking, Real Time, Time Sharing, Batch Processing, Parallel Processing, Distributed Processing

Unit V

Program Planning: Purpose of Program Planning, Steps in Program Development, Characteristics of a Good Program, Algorithms, Flow Charts through examples.

TEXT BOOK:

1. Computer Fundamentals By P.K. Sinha

2. Operating System By Peterson

Reference Books:

- Easy Approach To Computer Course By G.K. Iyer
 Computer Today By S.K. Basandra
 Operating System By Godbole 4. 'O' Level Programming Concepts & Systems By V.K. Jain



Bachelor of Computer Application (BCA)

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Semester- I

Course Content

Course	Subject Title	Subject Code
BCA	Programming	BCA102
	Fundamentals using 'C'	

Unit I

Program Logic development Using algorithm and Flowchart, Historical development of C, Constants, variables and keywords, C instructions. Data types - int, float, double, char, void, short, long, longdouble, signed, unsigned

Unit –II

Decision control structure:- if statement, if-else statement, the conditional operators. Case control structure: switch statement, goto statement. C' operators: Arithmetic, relational and logical. Development of C' program using Decision control & Case control structure.

Unit- III

Operators:- Increment and Decrement operators, Bitwise operator, Operators precedence, arithmetic and logical expressions evolution. Loop Control Structure:- for loop, while loop and do while loop, Break statement, continue statement. Development of C' programs using loops.

Unit IV

Arrays: One dimension array, 2D array, 3D array, Introduction to Pointers. Functions: Function Declaration and prototypes, Passing values between functions:- call by value. Development of C programs using Arrays, functions.

Unit V

Storage classes in_C', Structures:- declaring a structure, accessing structure element, how structure elements are stored, array of structures, union.

Text Books:

- 1. Let US C by Yashwant Kanitkar
- 2. Programming in C by E. Balaguruswami

Reference Books:

- 1. Schaum's Series C' Programming
- 2. The complete reference in C/C++ Herbert Shield
- 3. Working with C by Yashwant Kanitkar



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Semester- I

Course Content

Course	Subject Title	Subject Code
BCA	Development of	BCA103
	Entrepreneurship	

Unit-I

Entrepreneurship- Definition, Characteristics and Importance, Types and Functions of an Entrepreneur, Merits of a Good Entrepreneur & Motivational Factors of Entrepreneurship.

Unit-II

Motivation to Achieve Targets and Establishment of Ideas. Setting Targets and Facing Challenges. Resolving problems and creativity. Sequenced planning and guiding capacIty, Development of Self Confidence. Communication Skills, Capacity to Influence, Leadership.

Unit Ill

Project Report - Evaluation of Selection Process. Detailed Project Report - Preparation of main part of a project report pointing out necessary and viability. Selecting the form of Organization -Meaning and characteristics of Sole Proprietorship, Partnership and Cooperative Committees, Elements Affecting Selection of a form of an Organisation. Economic Management- Role of Banks and Financial Institutions Banking, Financial Plans, Working Capital-Evaluation and Management, Keeping of Accounts.

Unit- IV

Production management. Methods of Purchase. Management of Movable Assets/Goods. Quality Management. Employee Management. Packaging. Marketing Management. Sales and the Art of Selling. Understanding the Market and Market Policy. Consumer Management. Time Management.

Unit- V

Role of regulatory institutions - District Industry Centre, Pollution Control Board, Food and Drug Administration, Special Study of Electricity Development and Municipal Corporation. Role of Development Organizations - Jharkhand State Khadi & Gram Udyog Board, Jharkhand State Mineral Development Corporation Ltd., etc. ,Self-employment-oriented schemes, Prime Minister's Employment schemes, Golden Jubilee Urban Environment Scheme, Rani Durgavati Self-Employment scheme/Pt. Deendayal Self Employment Scheme. d) Various grant schemes-Cost-of-Capital Grant, Interest Grant, Exemption from Entry Tax, Project Report, Reimbursement Grant, etc. (C)Role of Women Entrepreneurship in India, Women's Development Corporations (WDCs), Special Incentives for Women Entrepreneurs, Prospects & Possibilities

Reference Books :

- 1. Leadership in Organisation Published by I.S.T.E. Mysore
- 2. Motivation Published by I.S.T.E. Mysore
- 3. Motivation I.I.T. Kanpur Published by I.S.T.E. Mysore

4. AA Hand book on Project Appraisal and follow up, Govind Prakashan, 204, Saraswati Kunj, 90, S. V. Road, Goregoan, Bombay-400 062. - D. P. Sarda

5. Bihar Industrial Policy - Government of Bihar, Department of Industries.

6. Entrepreneurship Guide - Bihar State Financial Corporation, Fraser Road, Patna800 001.



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Semester- I

Course Content

Course	Subject Title	Subject Code
BCA	Digital Computer	BCA104
	Electronics	

Unit I

Representation of information, Number System: Binary, Octal, Hexadecimal, Conversions from one base to another base, Binary Arithmetic, Unsigned binary number, signed magnitude number, Complement representation, 2's complement arithmetic, ASCII Code, BCD Code, EBCDIC Code,Excess-3 Code and Gray Code

Unit -II

Basic logic designs: Logic gates AND, OR, NOT, NOR, NAND, xOR gates and their Truth Tables, Boolean algebra, Minimization techniques, Karnaugh map, sOP and POS forms, Combinational circuit design with gate: multiplexers & demultiplexers, Encoder-Decoder, Adders and Subtractors, Flip flops: RS, JK, Master slave flip flops, Introduction to counters and registers.

Unit - III

Memory: Memory cell, Primary memory-RAM, ROM, PROM, EPROM, EEPROM, Cache memory, Secondary Memory and its types, Introduction to physical memory and Virtual memory, memory accessing methods : serial and random access

Unit - IV

Buses, Word Length of a Computer, Processing speed of a computer, Microprocessor, User Interface, Hardware, Software and Firmware concepts, General architecture of CPU, Instruction Format, Data transfer instructions, Data Manipulation instructions, Program control instructions. Types of CPU organization: Accumulator based machine, Stack based machine and general purpose register based machine, addressing modes: Direct, indirect, immediate, register and relative addressing modes.

Unit- V

Data transfer schemes: (1) Programmed data transfer- synchronous, asynchronous and interrupt driven data transfer scheme, (2) Direct memory access data transfer

TEXT BOOKS:

1. Digital Principles and applications by Malvino & Leach

2. Computer Fundamentals and Architecture by B.Ram

Reference Books:

1. Computer System Architecture by M.Morris Mano

2. Digital Computer Electronics by Malvino & Brown

3. Digital Computer Fundamentals by Bartee.



Bachelor of Computer Application(BCA)

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Semester- I

Course Content

Course	Subject Title	Subject Code
BCA	Programming Fundamentals	BCA152
	using 'C'-Lab	

SYLLABUS

List of Programs as Assignments:

- 1. Write an interactive program that will read in a +ve integer value and determine the following
 - i) If the integer is a prime number ii) If the integer is a Fibonacci number
- 2. WAP in C to compute $\sin x = x x^3/3! + x^5/3! x^7/7!$ Continue adding successive terms in the series until the value of the next term becomes smaller (in magnitude) than 10⁻⁵. Test the program for x = 1, x = 2, and x = 3. In each case display the number of terms used to obtain the final answer.
- **3.** WAP to generate every 3^{rd} integer beginning with I = 2 and continue for all integers that are less than 150. Calculate the sum of those integers that are evenly divisible by 5.
- **4.** WAP to find whether a given year is a leap year or not. Modify it to generate a list of leap years between two year limits given by user.
- 5. WAP to display the following pattern:

			11			
		11	10	11		
	11	10	9	10	11	
11	10	9	8	9	10	11

- 6. Using Ternary / Conditional operator find the greatest among 3 numbers.
- 7. WAP to convert a decimal number into an equivalent number of the input base. Test your program for base 2,8,10 & 16.
- **8.** WAP to read a number n, and print it out digit-by-digit, as a series of words. For e.g. 123 would be printed as "one two three".
- 9. WAP to check whether any input +ve integer is palindrome or not.
- 10. WAP to simulate a simple calculator (+ / * %) that takes two operands and an operator as input and displays the result.
- 11. WAP to find the GCD of two input +ve integer numbers.
- 12. WAP to swap the values of two variables without using a third variable.
- **13.** Read a line of mixed text, and then write it out with all lower case and uppercase letters reversed, all digits replaced by 0s and all other characters (non-letters and non- digits) replaced by '*'.
- **14.** WAP to find the product of two matrices A and B. Display the source matrices and product matrix C in matrix format.
- **15.** WAP to find whether a given matrix is a triangular matrix or not.
- **16.** WAP to find the transpose of a matrix. Display the source and the transposed matrix in matrix format.
- Implement Prob. No. 14 to 16 using functions for reading, manipulating and displaying the corresponding matrices in matrix form.
- **18.** WAP to sort a list of strings alphabetically using a 2-dim. Character array.
- **19.** WAP to display the row sum and the column sum of an input 2- dim. Matrix. Display the source matrix with row and column sum.
- **20.** Write a recursive function to calculate $S = 2 + 4 + 6 + 8 + \dots + 2N$. Implement the function in a complete C program.
- **21.** Write a function that accepts two arguments an array and its size n. It performs Bubble up sort on the array elements. Using indirection operator '*' implement this in a complete C program. Display the source and the sorted array.
- **22.** Using pointer, write a function that receives a character string and a character as argument. Delete all occurrences of this character in the string. The function should return corrected string with no holes.
- **23.** Write a function for reading character string using pointer. Calculate the length of the string (without using strlen ()). Finally print the string in reverse order, using pointer.
- 24. Implement prob. No. 14 using pointers representation of 2 dim. array.
- **25.** Implement prob. No. 15 using pointer representation of 2 dim. array.
- 26. Implement prob. No. 16 using pointer representation of 2 dim. array.
- 27. WAP to sort a list of strings into alphabetical order using array of pointers.
- 28. Create records of 60 students, where each record has fields-name, roll,

gpa and fees. Write a function update () to reduce the fees of those students who have obtained gpa greater than 8.5 by 25% of the original fees. Write a complete program to exercise this function in the main program and display all the records before and after updation.

- **29.** Define a structure that describes a hotel. It should have members that include the name, address, grade, average room charge and number of rooms. Write a function to perform the following operations:
 - a) To print out hotels of a given grade in order of charges.
 - b) To print out hotels with room charges less than a given value.
- **30.** WAP to concatenate the contents of two files into a third file.
- **31.** WAP to copy the content of one file into another file. Names of both the files are to be input as command line arguments

Text Books:

- 1. Jery R Hanly, "Problem solving and Program design in C", Paerson Education, 7th Edition. (T1)
- 2 Byron Gottfried, "Schaum's Outline of Programming with C", McGraw-Hill. (T2)
- 3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill. (T3)
- 4. R.G.Dromey, How to Solve it by Computer, Pearson Education. (T4)

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Prentice Hall India Learning Private Limited.(R1)



Bachelor of Computer Application (BCA)

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Semester- I

Course Content

Course	Subject Title	Subject Code
BCA	MS Office Lab	BCA155

Module – I

PERSONAL COMPUTER SOFTWARE TOOLS (MS WORD,

- 1. Open Office Word Processing using MS WORD: An introduction to MS-Word / ON INTRODUCTION TO WORD/Writer.
- 2. The Word work space, Starting and quitting word, Creating and Manipulating Various documents, Editing of proofing files, Merging documents and macros.
- 3. How to use Mouse and Menu, Working with dialog box
- 4. Primary Command in File Menu: The Open Commands, The File name commands, The New commands, The Save, Save As, and Save all commands, The Close command, The Page setup, The Print commands, The Exit commands
- 5. Edit Menu commands: The Cut, Copy, and Paste commands, The Undo and Repeat commands
- 6. Format commands: Font commands, Paragraph commands
- 7. Other Menu: The view menu, The Insert menu, The tool menu, The table menu, The Window menu

Module – II

EXCEL

- 1. BUILDING A SIMPLE WORKSHEET
- 2. Entering Text, Entering Values, Entering Dates and Times, Moving Around, Selecting Ranges, Using Menu, Using
- 3. Tool Bar, Using Shortcut Menus, Changing Entries, Copying Entries, Moving Entries, Inserting and Deleting cells
- 4. FORMATTING BASICS

- 5. Changing Character Style, Changing Alignment, Changing Column Width
- 6. WORKING WITH MULTIPLE WORKSHEET
- 7. Copying entries between work books, Moving sheets between work books, Deleting sheets, Quitting Excel
- 8. OPENING EXISTING WORKBOOKS
- 9. Simple calculations, Doing Arithmetic, Totalling column of values, Naming cells and Ranges
- 10. FORMATTING TEXT
- 11. Displaying dollars and cents, Formatting decimal places, dates Format, Copying style and formats
- 12. FORMULAS THAT MAKE DECISIONS
- 13. Using the IF function, Using the nested IF function, Copying formulas
- 14. Checking Spelling, Printing Worksheets, Preview Worksheets, Setting up the pages,
- 15. Sorting data, Keeping Leading in View, Finding records, Adding and deleting Records, Filtering Records
- 16. Plotting charts, Sizing and moving charts, Updating charts, changing the chart type, Using chart auto format
- 17. Creating Macros, Recording Macros, Running Macros

Module – III

POWER POINT

- 1. Main Features of Power Point
- 2. MAKING THE PRESENTATION
- 3. Creating Template with the Auto Content Wizard. Creating a Presentation with a Template. Creating a presentation from Scratch
- 4. DIFFERENT VIEWS
- 5. Normal Slide, Outline, Slide Sorter, Slide Show, Notes, Slide Master
- 6. ANIMATION, ART AND SOUND
- Controlling Transitions between slides. Animating Different Parts of slide. Inserting a Motion Clip. Including
- 8. Sounds in slides.
- 9. INCLUDING GRAPHS, CHARTS, TABLES AND COLUMNS
- 10. Organization Chart Slide, Creating a table Slide. Creating two column Slide, Module 1: Showing A Presentation,
- 11. Rehearsing/ Timing a Presentation, Designation some slides as "Hidden", Viewing Slides Anywhere in a Slide Show.
- 12. Techniques for Making a Show Livelier
- 13. OFFICE CONNECTIONS
- 14. Presenting with the help of other Office Programs Importing the text from a World Document.
- 15. Printing a Presentation



Bachelor of Computer Application (BCA) SCHEME Second Semester

S.N	Subject	Subject Name	Marks Distribution				
•	Code		Internal Marks	External Marks			Total Marks
		-	Max	Max	Min	Max	Min
1.	BCA201	Object Oriented Programming with C++	30	70	21	100	35
2.	BCA202	Computer Architecture	30	70	21	100	35
3.	BCA203	Operating System	30	70	21	100	35
4.	BCA204	Database Management System	30	70	21	100	35
5.	BCA205	Discrete Mathematics	30	70	21	100	35
			Practical				
			Max	K		Μ	in
1.	BCA251	C++ Lab	50			25	5
2.	BCA254	DBMS Lab	50			25	5



BCA 2019-2022

Choice Based Credit System

S.N.	Subject Code	Subject Name	L	T	Р	Credit
1.	BCA201	Object Oriented Programming with C++	3	1	0	4
2.	BCA202	Computer Architecture	3	1	0	4
3.	BCA203	Operating System	3	1	0	4
4.	BCA204	Database Management System	3	1	0	4
5.	BCA205	Discrete Mathematics	3	1	0	4
6.	BCA251	C++ Lab	0	0	2	1
7.	BCA254	DBMS Lab	0	0	2	1
	Т	otal	15	4	4	22

Bachelor of Computer Applications (BCA)

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Semester- II

Course Content

Course	Subject	Subject Code
B.C.A.	Object Oriented Programming	BCA201
	with C++	

Unit –I

Principles of OOP, procedure oriented programming vs. object oriented programming, basic concepts, advantages, application of OOPs, object oriented languages. Beginning with C++: What is C++, structure of C++ program, creating, compiling, linking & executing a C++ program, Tokens, expressions & control structures, keywords, identifiers, basic data types, user-defined data types, derived data types, symbolic constants, type compatibility, variable declaration, dynamic initialization of variables, reference variables.

Unit –II

Operators in C++: scope resolution operator, memory management operators, manipulators, type cast operators, operators, operator precedence, control structures. Functions in C++: Main function, function prototyping, call by reference vs. call by value, inline functions, default arguments, const arguments, function overloading, friend functions. Classes and objects: specifying a class, defining member functions, making an outside functions inline, private member function; array within a class, memory allocation for object; static data members, static member functions, array of objects, objects as function arguments, returning objects.

Unit-III

Constructors and Destructors: Constructors, Parametric Constructors, Multiple Constructors in a class, constructors with default arguments. Dynamic initialization of objects, copy constructors, dynamic constructors, destructors. Operator Overloading & Type Conversions: Definition of Overloading, & Operator Overloading, rules for Overloading Operators, Overloading Unary Operators, Binary Operators, Binary Operators using Friends.

Unit –IV

Inheritance: defining derived classes, single inheritance, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance, virtual base class, abstract classes, constructors in derived classes, member class, nesting of class.

Unit –V

Pointers, virtual functions and polymorphism, pointers to objects, this pointer, pointers to derived class, pure virtual functions, exception handling in C^{++} , managing console I/O operations, working with files :open, close, basic read-write operations on files .

Suggested Readings:

- Object Oriented Programming with C++ by E Balagurusamy.
 Programming in C++ by Robert Lafore
 C++ -The complete Reference -by Herbert Schildt (TMH)
 Programming with C++, Schaum Series4.OOP's concepts -by David Parsson.



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Semester- II

Course Content

Course	Subject	Subject Code
B.C.A.	Computer Architecture	BCA202

Unit –I

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instruction, Timing and Control, Infarction Cycle, Memory Reference Instruction, Input-Output Interrupt, Design of Basic Computer, Design of Accumulator Logic.

Unit –II

Basic Computer Organizations and Design: Instruction Cycle, Memory –Reference Instructions, Register reference instructions, Input -Output Instructions, Design of Accumulator Logic Shift Unit. Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes.

Unit-III

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Format, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

Unit-IV

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Direct Memory Access, Input-Output Processor.

Unit –V

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

Suggested Readings:

Morris Mano, Computer System Architecture, 3rd Edition, Prentice -Hall of India Private Limited, 1999.
 WIliam Stallings, Computer Organization and Architecture, 4th Edition, Prentice Hall of India Private Limited, 2001

3.Harry & Jordan, Computer Systems Design & Architecture, Addison Wesley, Delhi, 2000.4.Malvino, "Digital Computer Electronics: An Introduction to Microcomputers", McGraw Hill, 1993.



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Semester- II

Course Content

Course	Subject	Subject Code	
B.C.A.	Operating System	BCA203	

Unit –I

Operating System Definitions, its Components, Evolution of Operating System, types of operating systems: batch, multiprogrammed, multitasking, desktop, multiprocessor, real-time, client-server, peer-to-peer, distributed, clustered and handheld. Operating system services, dual-mode operation, protection of I/O, memory and CPU. Non-virtual and virtual machines.

Unit –II

Scheduling:Basic Concepts, preemptive and non preemptive scheduling. Scheduling Algorithms. Types of scheduling: -batch, interactive and real-time. Goals of scheduling algorithms. FCFS, SJF, RR, priority, multiple queues, three-level scheduling.

Deadlocks:System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. Banker's algorithm. **Unit-III**

Memory Management Concepts: Address Binding, logical and physical address space, dynamic loading etc., Contiguous allocation methods –static & dynamic partitioned memory allocation. Concepts of fragmentation, swapping, relocation, compaction, protection, sharing. Segmentation.Non–contiguous allocation methods –Paging: basic principle of operation, h/w support for paging, protection and sharing. Virtual memory: concept of demand paging, Page fault, page replacement algorithms –FIFO, LRU, OPT. Thrashing, Concept of Page fault frequency, pre-paging, decision about minimum number of frames, page size.

Unit –IV

File system implementation, Responsibilities of file management system, directory implementation as linear list/hash table, directory structure, disk organization, disk controller and driver, disk space management –contiguous allocation, non contiguous allocation –chaining and indexing, disk address translation. Idea about disk caching, disk mirroring. Disk scheduling algorithms. Disk management.

Unit –V

Device Management: I/O hardware, Techniques for device management. Dedicated devices, shared devices, virtual peripherals. Security & protection: Security threats and goals, penetration attempts, Security policies and mechanism, authentication, protection and access control. Interprocess communication, need for interprocess synchronization. Deadlocks –definition, avoidance, detection, prevention and recovery.

Suggested Readings:

- Operating System Concepts –by Silberschatz, Galvin and Gagne.
 Operating System Concepts and Design –by Milenkovic
 Operating System –by Tanenbaum.
 Operating System –by Peterson.



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Semester- II

Course Content

Course	Subject Title	Subject Code		
BCA	Database Management System	BCA204		

Unit – I

Introduction: Purpose of Database Systems, View of Data, Data Models, Database Languages, Relational Database, Database Architecture, Database Users and Administrators, Transaction Management.

Unit – II

Relational Data Models and Languages: Basic Concepts, Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R Features, Reduction of an E-R Diagram to Tables, The Relational Algebra, The Tuple Relational Calculus and The Domain Relational Calculus.

Unit – III

Relational-Database Design: Pitfalls in Relational-Database Design, Functional Dependencies, Decomposition, Desirable Properties of Decomposition, First Normal Form, Second Normal Form, Third normal Form, Boyce-Codd Normal Form, Fourth Normal Form and More Normal Forms.

Unit – IV

Query Processing and Optimization: Overview, Measures of Query Cost, Selection Operation, Join Operation, Other Operations, Evaluation of Expressions, Transformation of Relational Expressions, Estimating Statistics of Expression Results, and Choice of Evaluation Plans.

Unit – V

Transactions and Concurrency Control: Transaction Concept, Transaction State, Desirable Properties of Transactions, Concurrent Executions, Serializability, Recoverability, Lock-Based Protocols, Timestamp-Based Protocols and Deadlock Handling.

Text Books:

1. Silberschatz, Korth, & Sudarshan, "Database System Concepts", 6th Edition, McGraw Hill, 2011.

Reference Books:

- Elmasri, & Navathe, "Fundamentals of Database Systems", 5th Edition, Pearson Education, 2008.
 Date C.J., "An Introduction to Database System", Pearson Education, New Delhi, 2005.



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Semester- II

Course Content

Course	Subject Title	Subject Code	
BCA	DISCRETE MATHEMATICS	BCA205	

Unit – I

Sets and Propositions: Sets, Operations of sets, Finite and Infinite sets, Principle of inclusion and exclusion, Propositions, Conditional Propositions, Logical Connectivity, Propositional calculus, Universal and Existential Quantifiers, Normal forms, Mathematical Induction.

Unit – II

Relations and Functions: Relations, Properties of Binary Relations, Closure of relations, Warshall's algorithm, Equivalence relations. Functions, Types of functions, Composition of functions, Invertible functions.Permutations and Combinations, Pigeonhole Principle, Recurrence Relation.

Unit – III

Partially Ordered Sets: Introduction, Elements of Partially Ordered Sets, Lattices.

Unit – IV

Graph Theory and Trees: Basic terminology, representation of a graph in computer memory, Relations and Digraphs, Paths in Relations and Digraphs, Shortest path in weighted graphs (Dijkstra's algorithm). Basic terminology and characterization of trees, Tree traversal, Spanning trees, Minimal Spanning trees(Introduction).

Unit – V

Groups, Rings and Fields: Groups, Semi Groups, Monoids, Subgroups, Isomorphism and Homomorphism and Normal Subgroups, Rings, Integral Domain, Rings Homomorphism, Polynomial Rings, Fields.

Text Books:

- 1. KolmanB., BusbyR. and RossS., "Discrete Mathematical Structures", 6th Edition, PearsonEducation, 2002, ISBN 81-7808-556-9.
- 2. DeoN., "Graph Theory with application to Engineering and Computer Science", Prentice Hall of India, 1990, 0 87692 145 4.
- 3. JohnsonbaughR., "Discrete Mathematics", 5th Edition, Pearson Education, 2001 ISBN 81 7808 279 9.

Reference Books:

- 1. BiggsN., "Discrete Mathematics", 3rd Edition, Oxford University Press, ISBN 0-19-850717-8.
- 2. RosenKenneth H., "Discrete Mathematics and its Applications", 6th edition, McGraw-Hill, 2007, ISBN 978-0-07-288008-3.
- 3. LipschutzSemyour & Lipson Marc, "Discrete Mathematics", McGraw-Hill, 3rd Special Indian Edition, ISBN-13: 978-0-07-060174-1.
- 4. LiuC. L. and MohapatraD. P., "Elements of Discrete Mathematics", SiE Edition, Tata McGraw-Hill, 2008, ISBN 10:0-07-066913-9.
- 5. LipschutzS. and LipsonM., Schaum's Outline of Discrete Mathematics, Revised Third Edition, Tata McGraw Hill, 2010.
- 6. MottJ. L., KandelA.and BakerT. P., Discrete Mathematics for Computer Scientists and Mathematicians, 2nd Edition, Prentice Hall of India, 2001.

RKDF UNIVERSITY, RANCHI Bachelor of Computer Applications (BCA)

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Semester- II

Course Content

Course	Subject Title	Subject Code
BCA	C++ Lab	BCA251

- 1. WAP to show the characteristic of a number. {E.g. 24 it has two coefficients 2 in tens position and 4 in units position. It is composed of 2 and 3. It is a positive number. Also show whether it is odd or even.
- 2. WAP to take input through command line argument and do the following:
 - a) Check whether the number is prime.
 - b) Generate the reverse a number.
- 3. Write a menu driven program using switch in C++ to perform following:
 - a) For input of 1, check whether the number is prime
 - b) For input of 3, find the factors of the number
 - c) For input of 5, check the number is odd or even.
- 4. Write a program in C++ to generate hexadecimal equivalent of a number without using array.
- 5. WAP to take two number inputs through command line argument and do the following:
 - a) Check whether two numbers are prime to each other or not.
 - b) Find LCM of two numbers.
- 6. WAP to create a class and exhibit the role of static functions (other than main) by declaring, defining and calling them.
- 7. WAP to compute and display the count of occurrence of 4 in a number. E.g. 4564 will compute 2.
- 8. WAP to take an angle value in degrees and then compute the equivalent radians and then prove

 $\sin^2 \square \square \cos^2 \square \square 1.$ Note $180^o \square \square^c$.

- 9. WAP to sort a list of numbers in ascending order.
- 10. WAP to generate Pascal's Triangle using a square matrix.
- 11. Write a program in C++ to take input of two 3×3 matrices through command line argument and then:
 - a) Add them up and display the result
 - b) Subtract them and display the result

- c) Multiply them and display product
- 12. WAP to count the number of words, characters in a sentence.
- 13. Write a program in C++ to take input of a sentence through command line argument and then count the number of words and vowels.
- 14. WAP to handle the Exception using try and multiple catch block; the exceptions that you will handle are, number format error, array bound error and divide by zero.
- 15. WAP to create a class called **Room** with two data member length and width and then implement constructor overloading in it.
- 16. Write a program in C++ to explain the role of the following:
 - a) Non-parameterized constructor
 - b) Parameterized constructor
 - c) Copy constructor

Take input and display the output.

- 16. WAP to create a class called **Fraction** with data member numerator and denominator; take input (through command line argument) of two fractions and then add, subtract, multiply and divide, finally display the result in reduced term.
- 17. Write a program in C++ to create a class for Employee having 2 data member code and name. Then create 3 classes Officer, AdminStaff and MStaff. The Officer class has data members designation and pay-scale; the AdminStaff has data members grade and pay-band; the MStaff has data member department and two sub-classes Regular and Casual. The Regular staff has data members level and consolidated-pay and Casual has data member daily-wage. Take all inputs through constructors and write appropriate methods for displaying one data for each type of class.
- 18. WAP to design a class called **Account** using the inheritance and static that show all function of bank (withdrawal, deposit) and generate account number dynamically.
- 19. WAP to design an application *Password*.*C*++ that produces and prints a random password depending upon name of an individual. If the input is Abdul Kalam then the password would be *33421LAM*. Note: take the first name A=1, B=2, D=4, U=21 where 2+1=3, and L=12, where 1+2=3; so the number comes to be *12433*, so u can find out.

20. WAP to draw a format like

* *** ***** ***** *** ***

- 21. WAP to take a string count all vowels and then delete the same from the string.
- 22. Write a **Patient** class which inherits from the **Person** class. Patient can again be of two types, indoor and outdoor. The Patient class requires the following:
 - a) a variable to store the patient ID for the patient
 - b) a variable to store the department of hospital
 - c) a variable to store the ward of hospital
 - d) a variable to store the patient 's date of joining the hospital
 - e) a variable to store the patient 's address
 - f) a variable to store the medical fees that the patient pays
 - g) constructor methods, which initialize the variables
 - h) a method to calculate the medical fees (for both indoor and outdoor patient)
- 23. WAP to take a string as password and check whether it contains at least two numbers, 3 alphabets and no space in it. If any contrary throw message.
- 24. Write a program in C++ to create a class called Rational having two data members for numerator and denominator. Take two inputs of rational numbers and perform multiplication and division. Display the result in reduced form.
- 25. Write a program in C++ to print a format like,



- 26. Write a class called **Shape** which contains a user-defined interface for **Computation**, which contains methods for calculation of area, perimeter and volume. Write four classes for **circle**, **rectangle**, **sphere** and **rectangular parallelepiped**, and all these classes inherit from Shape. Now take input for the following:
 - a) radius of circle and compute its area and perimeter
 - b) Length and breadth of rectangle and compute its area and perimeter
 - c) Length, breadth and height for **rectangular parallelepiped** and compute its area and volume
 - d) Radius of sphere and compute its area and volume

** Area of circle= $\Box r^2$, perimeter of circle= $2\Box r$, area of sphere= $4\Box r^2$, volume of sphere= $4\Box r^3$, volume

3

of rectangular parallelepiped = $l \square b \square h$ area of rectangular parallelepiped = $2(l \square b \square b \square h \square h \square l)$

- 27. Write a class called Employee, which requires the following:
 - a) a variable to store the employee ID
 - a. employee ID should be of format EMPM1234, EMPS1234, EMPA1234, EMPC1234, where M=manager, S=supervisor, A=analyst, C=clerk; number can be any no. but first three characters should be EMP
 - b) a variable to store the employee name

- c) a variable to store department
- d) a variable to store city
- e) a variable to store basic salary
- f) a method to calculate the salary of employee
 - a. if the city is metro then the HRA would be 30% else 20%
 - b. if the employee ID contain M then DA would be 120%, if S then DA would be 110%, if A then DA would be 100%, and if C then DA would be 90%
- g) constructor methods, which initialize the variables
- 28. WAP to create 4 threads and show exhibit their execution after the call of the "start ()" method.

Write a program in C++ to create 3 threads and exhibit their behaviour by changing their priorities in the "main" thread. Display the possible output.



Bachelor of Computer Applications (BCA)

New Scheme Based on AICTE Flexible Curricula

Semester- II

Course Content

Course	Subject Title	Subject Code
BCA	DBMS Lab	BCA254

Consider the following tables:

emp(empno,ename,job,mgr,hiredate,sal,comm,deptn

o,gr), dept(deptno,dname,loc)

Write the following queries:

- 1. List all information about all department from emp table.
- 2. List all employee names along with their salaries from emp table.
- 3. List all department numbers, employee numbers and their managers numbers
- in descending order of deptno from emp table.
- 4. List department names and locations from the dept table.
- 5. List the employees belonging to the department 20.
- 6. List the name and salary of the employees whose salary is more than 1000.
- 7. List the names of the clerks working in the department 20.
- 8. List the names of analysts and salesmen.
- 9. List the details of the employees who have joined before the end of September 81.
- 10. List the names of employees who are not managers.
- 11. List the names of employees whose employee number are 7369, 7521, 7839, 7934, 7788.
- 12. List the employee details not belonging to the department 10, 30, and 40.
- 13. List the employee name and salary, whose salary is between 1000 and 2000.
- 14. List the employee names, who are not eligible for commission.(salary having

>15,000 eligible for commission)

- 15. List the employees who are eligible for commission.
- 16. List the details of employees, whose salary is greater than 2000 and commission is NULL.
- 17. List the employees whose names start with an "S" (not"s").
- 18. List the name, salary and PF amount of all the employees(PF is calculated as 10% of salary).
- 19. List the empno, ename, sal in ascending order of salary.

List the employee name, salary, job and Department no descending order of 20. Department No and salary.

List the employee details in ascending order of salary. 21.

List the employee details in descending order of salary 22.

23. Display name, and sal and commission of all employees whose monthly salary is greater than their commission.

- Select SMITH HAS WORKED IN THE POSITION OF CLERK IN 24. DEPT 20.Display result in this format.
- Generate a statement which prompts the user at runtime. The 25. intention is to display employees hired between 2 given dates.

26. Define a variable representing an expression used to calculate total annual remuneration. Use the variable in a statement which finds all employees who earn \$30000 a year or more.

27. List all the employees name and salaries increased by 15% and expressed as a whole number of dollars.

28.Produce the following

	EMPLOY	<u>EE AND JOB</u>	
	SMITH		CLERK
	ALLEN		SALESMAN
29.	Produce the		
	following		
	output:		
	SMITH	(Clerk)	
	ALLEN	(Salesman)	
30.	Do a case sens	sitive search for a	list of employees

- with a job that the user enters. 30
- 31. It has been discovered that the sales people in dept. 30 are not all male. Please produce the Followingoutput.

ENAME DEPTNO JOB

ALLEN 30 Sales Person

- 32. Display each employees name and hiredate of dept 20.
- 33. Display each employees name, hiredate and salary review date. Assume salary review date is one year from hiredate. Output should be in ascending review date.

Print list of employees displaying just salary, if more than 1500. If exactly 34. 1500 display " On Target". If less than 1500 display "Below 1500".

- 35. Write a query which returns DAY of the week (i.e. MONDAY) for any date entered in the format DD/MM/YY.
- 36. Write a query to calculate length of service of each employee.
- 37. Find the minimum salary of all employees.
- 38. Find the maximum, minimum, and average salaries of all employees.
- 39. List the maximum and minimum salary of each job type.
- 40. Find how many managers are in each dept.
- 41. Find the average salary and average total remuneration of each job type.

Remembers sales man earn commission.

42. Find out the difference between highest and lowest salary.

- 43. Find all department s which have more than three employees.
- 44. Check whether all employee nos are unique. (No Duplicate)
- 45. List lowest paid employee working for each Manager. Exclude any groups where the minimum salary is less than 1000. Sort the output by salary.
- 46. Produce a list showing employees 'salary grade'.(> 10000 A, >10000 &<20000 B, >20000 C)
- 47. Show only employee on Grade C.
- 48. Show all employee in Dallas.
- 49. List the employees name, job, salary, grade and department for everyone in the
- company except clerks. Sort on salary, displaying the highest first.
- 50. List the following details of employees who earn \$36000 a year or who are clerks.

Ename Job Annual Sal Dept no Dname Grade

- 51. Display all employees who earn less than their managers.
- 52. Display all employees by name and eno along with their managers name and number.
- 53. Modify above spoliation to display KING who has no MANAGER.
- 54. Find the job that was files in the first half of 1983 and the name job that was filled in the same period in 1984.
- 55. Find all employees who have joined before their manager.

EMPLOYEE HIREDATE MANAGER HIREDATE

56. Find the employees who earn the highest salary in each job, type, sort in descending order of salary.

- 57. Find the employees who earn the minimum salary for their job, Display the result in descending order of salary
- 58. Find the most recently hired employees in the department. Order by hiredate.
- 59. Show the details of any employee who earns a salary greater than the average for their department. Sort in department number order.
- 60. List all department where there are no employees.

TEXT BOOK

1.SQL, PL/SQL the programming Language of Oracle, Ivan Bayross, 4th edition



Bachelor of Computer Application (BCA) SCHEME Third Semester

S.N	Subject	Subject Name	Marks Distribution				
•	Code		Internal Marks	External Marks		Total Marks	
		-	Max	Max	Min	Max	Min
1.	BCA301	Software Engineering	30	70	21	100	35
2.	BCA302	Data Structure using C++	30	70	21	100	35
3.	BCA303	Computer Oriented Numerical Methods	30	70	21	100	35
4.	BCA304	Data Communicatio ns and Computer Networks	30	70	21	100	35
5.	BCA305	E-Commerce	30	70	21	100	35
			Practica	ıl			
			May	<u> </u>		Ν	1 in
1.	BCA351	Data Structure Lab	50			2	25
2.	BCA354	CONM Lab	50 25 50 25		25		



S.N.	Subject	Subject Name	L	Т	Р	Credit
	Code					
1.	BCA301	Software	3	1	0	4
		Engineering				
2.	BCA302	Data Structure	3	1	0	4
		using C++				
3.	BCA303	Computer	3	1	0	4
		Oriented				
		Numerical				
		Methods				
4.	BCA304	Data	3	1	0	4
		Communications				
		and Computer				
		Networks				
5.	BCA305	E-Commerce	3	1	0	4
6.	BCA351	Data Structure	0	0	2	1
		Lab				
7.	BCA354	CONM Lab	0	0	2	1
	Т	otal	15	4	4	22

BCA 2019-2022 Choice Based Credit System Third Semester


New Scheme Based on AICTE Flexible Curricula

Semester- III

Course Content

Course	Subject Title	Subject Code
BCA	Software Engineering	BCA301

UNIT-I

Introduction to Software Engineering: Characteristics, Emergence of Software Engineering, Software Metrics & Models, and Process& Product Metrics. Software Life Cycle Models: Waterfall, Prototype and Spiral Models and their Comparison.

UNIT-II

Software Requirements Specification: SRS Documents, their Characteristics and Organization.

UNIT-III

Software Project Management: Size Estimation- LOC and FP Metrics, Cost Estimation-Delphi and Basic COCOMO.

UNIT-IV

Software Design: Classification, Software Design Approaches, Structured Analysis Data flow Diagrams and Structured Design, Introduction to Object Oriented Design. Coding and Testing of Software: Unit Testing, Black Box Testing, White Box Testing, Debugging, Program Analysis Tools, System Testing.

UNIT-V

Software Quality Assurance: ISO 9000 and SEI CMM and their Comparison. Software Maintenance: Maintenance Process Models and Reverse Engineering, Estimation of Maintenance Costs.

Reference Books:

1) Pankaj Jalote- An Integrated Approach to Software Engineering, 3rd Edition, Narosa Publishing House, New Delhi,2005

- 2) Richard Fairley- Software Engineering Concepts, Tata McGraw Hill, New Delhi, 2006.
- 3) Software Engineering by Pressman.



New Scheme Based on AICTE Flexible Curricula

Semester- III

Course Content

Course	Subject Title	Subject Code
BCA	Data Structure using C++	BCA302

UNIT-I

A First look at a C++ Program, Variables and Constants, Arithmetic Expressions, Logical Expressions and if-else Statements, Iterative Statements, The switch Statement, Arrays, Strings, Structures Pointers, References, Dynamic Memory Allocation. Introduction, Public and Private Members, Encapsulation, Implementation of a Class, Syntax for Accessing Class Members, Constructors and Destructors, Arrays of Class Objects, Operator Overloading for Classes, Classes and Efficiency.

UNIT-II

Data Structures and Abstract Data Types, Linked List Data structure, Linked List-Single Linked Lists, Circular Linked List, Doubly Linked Lists, Traversal, The Insert Function, Remove Function, Linked Lists vs. Arrays.

UNIT-III

Introduction, Array Implementation and linked implementation of Stack. Introduction, Array Implementation and linked implementation of Queue.

UNIT-IV

Introduction, Binary Search Trees, Tree Traversals, Graph- adjacency lists & adjacency matrix.

UNIT-V

Introduction, Sequential and Binary Search, Selection Sort, Insertion Sort, Bubble Sort, Quick sort.

Reference Books:

- 1. S.Sahni- Data Structures, Algorithms and Applications in C++, 2nd Edn. Universities Press, India, 2005.
- 2. 1. M.Litvin&G.Litvin- Programs with C++ and Data structures-Vikas Publishing Home, New Delhi, 2005
- 3. Introduction to Algorithms by Thomas H. Cormen



New Scheme Based on AICTE Flexible Curricula

Semester- III

Course Content

Course	Subject Title	Subject Code
BCA	Computer Oriented	BCA303
	Numerical Methods	

UNIT-I

Errors in Numerical Calculations: Numbers and their accuracy, Errors and their Computations-Absolute, Relative and Percentage, General Error Formula. Solution of Algebraic and Transcendental Equations: Introduction, Bisection method, Iteration method, Method of False Position, Newton- Raphson method.

UNIT-II

Interpolation: Introduction, Errors in Polynomial Interpolation, Finite DifferencesForward, Backward Difference tables, Differences of a Polynomial, Newton's formulae for Interpolation, Lagrange's Interpolation Formula, Divided Differences and their properties- Newton's General Interpolation Formula, Inverse Interpolation.

UNIT-III

Numerical Differentiation and Integration: Introduction, Numerical Differentiation and Errors, Numerical Integration – Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule.

UNIT-IV

Numerical Solution of Linear System of Equations: Direct Methods- Matrix Inversion Method, Gauss-Jordan Method, Gauss Elimination Method.

UNIT-V

Numerical Solution of Ordinary Differential Equations: Solution by Taylor's Series, Euler's method, Modified Euler's method, Runge-Kutta method of 2nd order.

Text/References:

1. 1) S.S.Sastry -Introductory methods of Numerical Analysis, 4thEdition, Prentice Hall of India, New Delhi, 2006

- 2) V.N.Vedamurthy et.al.-Numerical Methods, Vikas Publishing House, New Delhi, 2005.
- 3) B.S.Grewal- Numerical Methods in Engineering & Science, Khanna Publishers, Delhi, 2005.
- 4) S.C.Gupta and V.K.Kapoor Elements of Mathematics, Statistics, Sultan Chand and Sons.



New Scheme Based on AICTE Flexible Curricula

Semester- I

Course Content

Course	Subject Title	Subject Code
BCA	Data Communications and Computer Networks	BCA304

Unit I

Introduction to data communication and networking, Network models: Components of data communication, data flow, topology-bus, ring, star, hybrid, protocols and standards, The OSI reference model, Layers in OSI reference model, TCP/IP protocol suite

Unit II

Media and Transmission modes: Data and signals, Periodic analog signals, Digital signals, Transmission impairment, Digital to digital, Analog to digital conversion, Transmission modes, Digital to analog conversion, Analog to analog conversion, Guided media and Unguided media.

Unit III

Switching and routing algorithms: Switching basics, circuit switching, packet switching and Message switching. datagram networks and virtual circuit networks, routing algorithms- distance vector routing and link state routing Information Encoding, Error Detection and Correction Introduction, representing different symbols, Minimizing errors, Error classification, types of errors, redundancy, detection versus correction, hamming distance, cyclic redundancy check, checksum and Flow control.

Unit IV

IP: PV4 addressing, IPv6 addresses, IPv6 header formats, IPv6 extension headers, IPv6 auto configuration.

Unit V

Network Security: Requirements, conventional encryption, public key encryption & digital signatures.

Books:

1) A. Behrouz Forouzan, Data communications and Networking, McGraw-Hill Education, 2006.

2) William Stallings, Data and Computer Communications, Pearson Education India, 2007, Eighth Edition.



New Scheme Based on AICTE Flexible Curricula

Semester- III

Course Content

Course	Subject Title	Subject Code
BCA	E-Commerce	BCA305

UNIT-I

Introduction to E-commerce: E-commerce: The revolution is just beginning, The visions and forces behind E-commerce, Understanding E-commerce.

UNIT-II

E-commerce business models and concepts: E-commerce business models, Major business-toconsumer (B2C) business models, Major business-to-business (B2B) business models, Business models in emerging E-commerce areas, How the internet and the Web change business.

UNIT-III

E-commerce infrastructure: The Internet, Technology background, The internettoday, The world wide web. Building an E-commerce web site: A systematic approach, choosing server software, choosing the hardware for an E-commerce site, other E-commerce site tools.

UNIT-IV

Security and Encryption: The E-commerce security environment, Security threats in the E-commerce environment, Technology solutions, Policies, Procedures and Laws.

UNIT-V

Ethical, Social, and Political issues in E-commerce: Understanding ethical, social, and political issues in E-commerce, Privacy and information rights, Intellectual property rights, Governance, Public safety and welfare.

Reference Books:

- 1) R. Kalakota&A.B. Whiilston-' Frontiers of Electronic Commerce, Pearson Education-2006.
- 2) K.K.Bajaj&D.Nag- E-Commerce, Tata McGraw Hill, New Delhi, Second Edition.
- 3) K.C. Laudon& C.G. Traver, E-commerce, Pearson Education, 2003



New Scheme Based on AICTE Flexible Curricula

Semester- III

Course Content

Course	Subject Title	Subject Code
BCA	Data Structure Lab	BCA351

SYLLABUS

- 1. Program to Find the Number of Elements in an Array
- 2. Develop and Implement a menu driven program in C for the following Array operations
 - a. Creating Array of N Integer elements.
 - b. Display of Array elements with suitable headings.
 - c. Inserting an element (ELEM) at a given valid position (POS).
 - d. Deleting an element at a given valid position (POS).
 - e. Exit
- 3. Programs for Stack, Queues and Circular Queues using Arrays
- 4. Program to convert an Infix Expression into Postfix and Postfix Evaluation
- 5. Program to implement stack using arrays
- 6. Program to implement stack using linked list
- 7. Program to implement multiple stack in a single array
- 8. Program to convert infix notation to postfix notation using stacks
- 9. Program to implement queue using arrays
- 10. Program to implement queue using pointers
- 11. Program to reverse elements in a queue
- 12. Program to implement circular queue using arrays
- 13. Program to create add remove & display element from single linked list
- 14. Program to create add remove & display element from double linked list
- 15. Program to count number of nodes in linear linked list
- 16. Program to create add remove & display element from circular linked list
- 17. Programs to implement stack & queues using linked representation
- 18. Program to concatenate two linear linked lists
- 19. Program to accept a singly linked list of integers & sort the list in ascending order.
- 20. Program to reverse linked list
- 21. Program to represent polynomial using linked list
- 22. Program to add two polynomials using linked list
- 23. Program for the creation of binary tree, provide insertion & deletion in c

- 24. Program for pre-order, post-order & in-order traversals of a binary tree using non recursive.
- 25. Program to count no, of leaves of binary tree
- 26. Program for implementation of B-tree (insertion & deletion)
- 27. Program for implementation of multi-way tree in c
- 28. Program for implementation of AVL tree
- 29. Program to implement bubble sort program using arrays
- 30. Program to implement merge sort using arrays
- 31. Program to implement selection sort program using arrays
- 32. Program to implement insertion sort program using arrays
- 33. Program to implement topological sort using arrays
- 34. Program to implement heap sort using arrays
- 35. Program to implement heap sort using pointers
- 36. Program to implement bubble sort program using pointers
- 37. Program to implement linear search using pointers
- 38. Program to implement binary search using pointers
- 39. Program to implement linear search using arrays
- 40. Program to implement binary search using arrays

Text Books:

- 1. Baluja G S, "Data Structure through C", Ganpat Rai Publication, New Delhi, 2015.
- 2. Pai G A V, "Data Structures and Algorithms: Concepts, Techniques and Applications", 2nd Edn, Tata McGraw-Hill, 2008.
- 3. Horowitz E., Sahni S., Susan A., "Fundamentals of Data Structures in C", 2nd Edition, University Press, 2010.

Reference Books:

- 1. Tremblay J. P., Sorenson P. G, "An Introduction to Data Structures with Applications", 2nd Edn, McGraw-Hill, Inc. New York, NY, USA.
- 2. Lipschutz Seymour, "Data Structures", 6th Edn, 9th Reprint 2008, Tata McGraw-Hill.
- 3. Drozdek Adam, "Data Structures and Algorithms in C++", Thomson Learning, New Delhi 2007.
- 4. Feller J., Fitzgerald B., "Understanding Open Source Software Development", Pearson Education Ltd. New Delhi



New Scheme Based on AICTE Flexible Curricula

Semester- III

Course Content

Course	Subject Title	Subject Code
BCA	CONM Lab	BCA354

Assignment 1

Write a program in C to solve the equation $x^4 + x^2 - 1 = 0$, correct to eight decimal places using bisection method.

Assignment 2

Write a program in C to find the root (which lies between 2 and 3) of the following equation correct to six significant figures using bisection method:

$$x^2 - 5log_{10}(5x^2 + 2x + 3) = 0$$

Assignment 3

Write a program in C to find the root of the equation $x^3 - 4x^2 + 10x - 10 = 0$ correct to six significant figures using Regula-Falsi Method.

Assignment 4

Write a program in C to find the root (which lies between 1 and 2) of the following equation correct to six decimal places using Regula-Falsi Method and the method of Bisection. Compare the number of iterations required in both the cases:

$$2x - 3\cos x = 1.85$$

Assignment 5

Write a program in C to find root of the equation $x^3 - 8x - 4$ using Newton-Raphson method correct to seven significant figures.

Assignment 6

Write a program in C to solve the equation $3x - \cos x - 1 = 0$, by the method of Iteration, for the root lying between 0 and 1, correct to 6 decimal places.

Assignment 7

Write a program in C to compare the rate of convergence of the Newton-Raphson method, Regula-Falsi method and the method of Bisection to find the root of the equation $2x \sin x = \cos x$ lying between 0 and 1.

Assignment 8

Write a program in C to compute a difference table for the following data and hence find the value of $\Delta^{p} y_{q}$ and $\nabla^{p} y_{q}$; *p* and *q* are to be taken from the users.

X	0.30	0.32	0.34	0.36	0.38	0.40
Y	1.7596	1.7698	1.7804	1.7912	1.8024	1.8139

Assignment 9

Write a program in C to find f(2.02) having given the following table, using Newton's forward Interpolation formula correct to five significant figures.

X	2.0	2.2	2.4	2.6	2.8	3.0
f(x)	0.30103	0.34242	0.38021	0.41497	0.44716	0.47721

Assignment 10

Write a program in C to find f(2.91) having given the following table, using Newton's Interpolation formula, correct to five significant figures.

X	2.0	2.2	2.4	2.6	2.8	3.0
f(x)	0.30103	0.34242	0.38021	0.41497	0.44716	0.47721

Assignment 11

Write a program in C to find the missing element in the following table:

Х	22	25	28	31	34	37
f(X)	14	27	35	?	50	65

Assignment 12

Write a program in C to find the value of X when it is given that f(X) = 55 in the table given in Assignment 11 after finding the value of f(31).

Assignment 13

Solve by Gauss elimination method with partial pivoting, the following system of equations correct up to four significant figures.

$$x + 3y = 2z = 5$$
$$2x - y + z = -1$$
$$x + 2y + 3z = 2$$

Assignment 14

Find the inverse of the following matrix by Gauss-Jordan method.

537 152 7210

Hence find the root of the following system of equations correct up to five decimal places:

$$5x + 3y + 7z = 5$$

 $x + 5y + 2z = -1$
 $7x + 2y + 10z = 5$

Assignment 15

Solve, by Gauss-Jacobi iterative method, the following system of equations correct up to four significant figures.

$$4.50x + 0.15y + 0.30z = 1.57$$
$$0.15x - 10.50y + 0.45z = -3.86$$
$$0.45x + 0.30y - 15.00z = 14.28$$

Assignment 16

Solve, by Gauss-Seidel iteration method, the following system of equations, correct up to four significant figures.

$$6.32x - 0.73y - 0.65z + 1.06t = 2.95$$
$$0.89x + 4.32y - 0.47z + 0.95t = 3.36$$
$$0.74x + 1.01y + 5.28z - 0.88t = 1.97$$
$$1.13x - 0.89y + 0.61z + 5.63t = 4.27$$

Assignment 17

Write a program in C to calculate the approximate value of the following definite integrals using Trapizoidal rule, taking 20 subintervals, correct up to 6 significant figures. Calculate the percentage of error present in the result for (i).

(i)
$$\int_{1}^{3} (11 + 4x + 5x^2) dx$$

(*ii*)
$$\int_{0}^{0.5} \sqrt{\frac{1 - 0.75x^2}{1 - x^2}} dx$$

Assignment 18

Write a program in C to calculate the approximate value of $\int_{0}^{0.5} \frac{dx}{\sqrt{(1-x^2)(1-0.75x^2)}}$ correct up to 7 significant figures, using Simpson's 1/3 rule, taking 30 subintervals.

Assignment 19

Write a program in C to calculate the approximate value of $\int_{0}^{1} \frac{dx}{x^2 - 2x + 3}$ correct up to 4 significant figures, using Simpson's 1/3 rule and Trapizoidal rule, taking 18 subintervals. Compare the results by calculating percentage error. (Assume the result correct up to 7 significant digits as the exact value.)

Assignment 20

Write a program in C to calculate the approximate value of $\int_{2}^{3} \frac{dx}{(x-1)\sqrt{x^{2}-2x}}$ correct up to 6 significant figures, using Simpson's 3/8 rule.

Assignment 21

Write a program in C to compute y(1.0), correct up to 7 significant figures, by Euler's method

$$\frac{dy}{dx} = -\frac{y}{1+x}$$
; y(0.2) = 2, taking step length h = 0.01.

Assignment 22

Write a program in C to compute y(1.0), correct up to 5 significant figures, by Euler's method and Modified Euler's method from the following differential equation:

$$\frac{dy}{dx} = 1 + x + x^2; \quad y(0) = 1,$$

taking step length h = 0.25. Compare the results (approximate values) obtained in both the cases with the exact value.

Assignment 23

Write a program in C to compute y(0.6), correct up to 7 significant figures by the method of Runge-Kutta of second order from the following differential equation:

$$dy/dx = (0.5 - x + y^2) / (x^2 + y + 1); y(0) = 0$$
, taking step length $h = 0.1$.

Assignment 24

Write a program in C to compute y(0.5), correct up to 7 significant figures, by the Modified Euler's method and Runge-Kutta method of second order from the following differential equation:

$$dy/dx = 0.25 y^2 + x^2; y(0) = -1,$$

taking step length h = 0.1. Hence, compare the results.

Assignment 25

Write a program in C to represent a set of 100 bivariate data of the form (x, y) into a two way frequency table and then calculate \mathbb{T} and \mathbb{Y} from the marginal distributions. Generate the (x, y) tuples using random numbers so that $0 \le x \le 51$ and $150 \le y \le 250$.

Assignment 26

Write a program in C to compute the correlation coefficient between X and Y.

X	2.52	2.49	2.49	2.45	2.43	2.42	2.41	2.40
Y	740	720	780	900	960	1020	980	1040

Assignment 27

Ten students obtained the following marks in Mathematics and Statistics. Calculate the rank correlation coefficient between these two sets of data using a C program.

Student	1	2	3	4	5	6	7	8	9	10
Marks in Mathematics	78	36	98	25	75	82	90	62	65	39
Marks in Statistics	84	51	91	60	68	62	86	58	53	47

Assignment 28

Write a program in C to predict the value of x when the value of y is given and vice versa from a given bivariate data set.

Reference books:

- 1. Mollah S. A., "Numerical Analysis and Computational Procedures," Books and Allied (P) Ltd., Kolkata, 2017.
- 2. Sastry S.S., "Introductory Methods of Numerical Analysis," PHI, Private Ltd., New Delhi.
- 3. Pal N. & Sarkar S., "Statistics: Concepts and Applications," PHI, New Delhi, 2005.
- 4. Das N. G., "Statistical Methods," Tata McGraw Hill Edu. P. Ltd., New Delhi, 2010.



Bachelor of Computer Application (BCA) SCHEME Fourth Semester

S.N	Subject	Subject Name	Marks Distribution					
•	Code		Internal Marks	Exto Ma	External Marks		Total Marks	
		-	Max	Max	Min	Max	Min	
1.	BCA401	Fundamentals of Computer Algorithms	30	70	21	100	35	
2.	BCA402	Web Programming	30	70	21	100	35	
3.	BCA403	Organizational Behaviour	30	70	21	100	35	
4.	BCA404	System analysis and Design	30	70	21	100	35	
5.	BCA405	Object Oriented Programming using Java	30	70	21	100	35	
		<u> </u>	Practica	1				
			Max			Ν	1 in	
1.	BCA452	Web Programming Lab	50			25		
2.	BCA455	OOP in Java Lab	50			25		



Bachelor of Computer Application (BCA) 2019-2022 SCHEME Fourth Semester Choice Based Credit System

S.N.	Subject	Subject Name	L	Т	Р	Credit
	Code					
1.	BCA401	Fundamentals of	3	1	0	4
		Computer				
		Algorithms				
2.	BCA402	Web	3	1	0	4
		Programming				
3.	BCA403	Organizational	3	1	0	4
		Behavior				
4.	BCA404	System analysis	3	1	0	4
		and Design				
5.	BCA405	Object Oriented	3	1	0	4
		Programming				
		using Java				
6.	BCA452	Web	0	0	4	2
		Programming Lab				
7.	BCA455	OOP in Java Lab	0	0	4	2
	Т	otal	15	4	4	24



New Scheme Based on AICTE Flexible Curricula

Semester-IV

Course Content

Course	Subject Title	Subject Code	
BCA	FUNDAMENTALS OF	BCA401	
	COMPUTER ALGORITHMS		

Unit – I

Introduction:

What is an algorithm? Design and performance analysis of algorithms, space and time trade-offs. Analysis of selection sort and insertion sort. Asymptotic notations (O, è, $_{\dot{c}}, \omega o$) to measure complexity of algorithms.

Unit – II

Recursion:

Basic concept. Analysis of recursive algorithms, Master's theorem. Divide & Conquer: The general method. binary search, finding the maximum and minimum, merge sort, quick sort, Best and worst case analysis for the mentioned algorithms.

Unit – III

The Greedy Method:

The general method. Applications to Knapsack problem, minimum weight spanning trees: Prim's & Kruskal's algorithms. Dijkstra's algorithm for finding single source shortest paths problem.

Unit – IV

Algorithms on Graphs:

Breadth First Search, Depth First Search, Biconnectivity, Depth First Search of a Directed Graph, Topological Sorting.

Unit – V

Basic concepts of Backtracking:

8-queen problem, Branch and Bound: 0/1 Knapsack problem, assignment problem.

Text Books:

- 1. CormenThomas H., LeisersonCharles E., & Rivest.Ronald L., "Introduction to Algorithms PHI publication.
- 2. Horowitz Ellis, Sahni Sartaj and Rajasekaran S., "Fundamentals of Computer Algorithms" Galgotia publications.

Reference Books:

- 1. Aho Alfred V., Hopcroft John E. & Ullman Jeffrey D., "The Design & Analysis of Computer Algorithms", Addison Wesley Publications.
- 2. Kleinberg Jon & Tardos Eva, "Algorithm Design", Pearson Education Publications.
- 3. Brassard Gilles & Bratley Paul, "Fundamentals of Algorithms", PHI Publications.



New Scheme Based on AICTE Flexible Curricula

Semester- IV

Course Content

Course	Subject Title	Subject Code		
BCA	Web Programming	BCA402		

Unit – I

Introduction to Internet and HTML: Introduction to Internet, Internet Services, Web Server, Web Client, Domain Registration, Internet Security. HTML Tags, HTML Documents, Header Section, Body Section, Headings, Link Documents using Anchor Tag, Formatting Characters, Font tag, Images and Pictures, Listing, Tables in HTML.

Unit – II

Java Script:Data Types, Variables, Operators, Conditional Statements, Array Objects, Date Objects, String Objects, Use of Java Script in Web Pages, Advantages of Java Script, Type Casting, Array, Operators and Expression, Conditional Checking, Function, User Defined Function.

Unit – III

Understanding XML: Overview of XML, XML Families of Technology, Creating XML Documents, Rules for Well-Formed XML, Discerning Structure, Working with Mixed content, Adding Comments, CDATA Sections, Creating a DTD-The Concept of a Valid XML Document, Creating a DTD for an existing XML File.

Unit – IV

ASP .NET: Building Web Forms Using ASP .NET, Exploring ASP .NET Server Controls, Using ASP.NET Server Controls to Create Web Forms, Understanding the Code behind the Page. Working with User Controls, Exposing User Control Properties and Methods, Using ASP .NET Server Controls in User Controls, Using Validation Controls to Improve Web Forms, Uploading Files to a Web Server.

Unit – V

PHP: Preparing the Use PHP, Exploring PHP for the First Time, Understanding PHP Basics, Displaying PHP Output, Managing PHP Program Flow. Planning a PHP Web Application, Creating and Using a Logon Window, Managing System Data, Updating a PHP Web Application.

TEXT BOOKS

- 1. XavierC., "Web Technology & Design", New Age International Publishers, 1st Edn, New Delhi, 2004.
- 2. BaiXue, Ekedahl Michael, FarrellJoyce, GosselinDon, ZakDiane, KaparthiShashi, MacintyrePeter, Morrissey Bill, "The Web Warrior Guide to Web Programming", India Edition, Thomson Education.

REFERENCE BOOK

1. RossIvan Bay, "Web Enable Commercial Application Using HTML, DHTML", BPB Publication.



New Scheme Based on AICTE Flexible Curricula

Semester- IV

Course Content

Course	Subject Title	Subject Code	
BCA	Organizational Behavior	BCA403	

Unit – I

What is Psychology? Whom does the Psychologist observe? What does Psychologist observe? Where does the Psychologist observe?

Unit – II

Sensation & Perception, Feelings and Emotions, Learning and Thinking.(in so far as they are applicable to Industry), Personality, Definition & Theories, Assessing Personality.

Unit – III

An Overview of Transactional Analysis as a Tool for Measuring One's Own Awareness and of helping Interpersonal Relationship in an Organisation. Theories of Organisation, Contingency Model and other Models of Organisation, Theories of Motivation. – Abraham Maslow, Herzerberg Mecleland.

Unit – IV

Group Dynamics, Structure, Process, Values of Groups, Role and Stature. Theories of Leadership, Identifying Leadership Potential.

Unit – V

Communication: Process, Methods, Barriers and Usefulness.

TEXT & REFERENCE BOOKS:

- 1. Organizational Behavior by Robbins.
- 2. Organizational Behavior by Luthans.
- 3. Organizational Behavior by Sashi Gupta & Rozy Joshi.



New Scheme Based on AICTE Flexible Curricula

Semester- IV

Course Content

Course	Subject Title	Subject Code		
BCA	System analysis and Design	BCA404		

Unit – I

Overview of System Analysis & Design Definition, Characteristics, System Concepts, Elements and Types. System Development Life Cycle Impetus for change, Steps involved in SDLC, People involved SDLC. Initial Investigation Background Analysis, Fact finding techniques, tools for Information gathering, types of interviews and questionnaires.

Unit – II

Structured Analysis Definition, tools for structured analysis. Feasibilit Study Definition, Considerations Technical, Economic, Behavioral & Political, Steps in Feasibility Study, Feasibility Report. Cost Benefit Analysis (CBA) Categories Hardware, Personnel, Facility, Operating and Supply Costs, Proce dure for CBA Determination.

Unit – III

System Design-Definition, Process of Design, Structured Design, Elements of Functional Decomposition – Module, Connection and Coupling, HIPO and IPO Charts, Major development activities of Design stage Data Validation, Audit Trial. System Testing – Why Testing ? Factors considered for testing, Test Data & Test Plan, Phases of Testing, Types of system tests.

Unit – IV

Quality Assurance – Definition, Goals in System Life Cycle, Levels of Quality Assurance, Tresting. Implementation – Conversion, Stages of Conversion, Combating resistance to change,

Post Implementation Review, Review Plan. Software Maintenance – Maintenance/Enhancement, Activities of a Maintenance procedure, reducing maintenance costs

Unit – V

System Security – Data Security, Threats to System Security, Risk Analysis, Control Measures, System Audit, Protection Againts VIRUS. Hardware and Software Selection – Hardware/Software Suppliers, Procedure for Hardware/Software Selection, Major Phases in Selection. Types of Software, Attributes of Software, Criteria for Software Selection, Evaluation Process. Financial Consideration in Selection – Rental, Lease, Purchase Options.

TEXT BOOKS:

1. System Analysis and Design - by Elias M Awad.

2. System Analysis & Design – by V K Jain, Dreamtech Press.

3. System Analysis & Design – by Theoroff.

REFERENCE BOOKS:

1. Computers Today – by Suresh K Basandra.

2. Modern System Analysis & Design by A Hoffer, F George, S Valaciah, Low price Edn. Pearson Education.

3. Information Technology & Computer Applications – by V.K. Kapoor, Sultan Chand & Sons, New Delhi.

4. Introduction to Systems Analysis and Design – by Lee.



New Scheme Based on AICTE Flexible Curricula

Semester- IV

Course Content

Course	Subject Title	Subject Code
BCA	OBJECT ORIENTED PROGRAMMING USING JAVA	BCA405

Unit - I

Procedure-Oriented Programming, Object-Oriented programming, Benefits of OOP, Applications of OOP, Basics, Evolution of Java, Structure of JAVA Program, Simple Java Program, Tokens, Comments, Identifiers, Operators, Literals, Control Structures. Java Environment Setup, Compiling a Java Program, Java Virtual Machine, Philosophy of Java and Benefits.

Unit - II

Data types and program statements: Primitive and reference data types, variables and constants, enumerated constants, labelled statement, expression and null statements, compound statement, control statement – decision and loops, jump statement, declaration statement, try-throw-catch-finally statement, declaring and creating arrays, accessing array elements, assigning values to array elements, multidimensional arrays.

Unit - III

Functions, Data Abstraction and classes: Declaration, definition and call, main method arguments, reference variables, method overloading, parameter passing by value for primitive types, object references and arrays, scope of variables, return from methods.

Class and object, class members and initialization, access rights of members – public, private and protected access modifiers, constructor and copy constructor, mutability, finalization, dynamic memory management, garbage collection, this keyword, static members, scope of variables, interface – declaration, implementation and extending, package and package visibility.

Unit – IV

Inheritance and Collection classes: multi-level and single inheritance, multiple inheritance of interfaces, Object class, access rights in subclasses and packages, constructor calling sequence, super keyword, dynamic binding of methods, abstract class, overriding, shadowing and hiding, finalize, association, aggregation and composition.

String, StringBuffer, Date, Calendar, Math, Object, Class, Exception class

Module – V

Input/Output and JAVA Applets: Stream clases – InputStream, OutputStream, Buffered Stream, file classes and handling, pushback streams, reader and writer classes, file reader and writer, serialization.

Applet code example, HTML tags for applet, applet life cycle, color, font andbasic GUI handling, basic graphics, and animation.

Text Books:

1. Balagurusamy E., "Programming in Java", 2nd Edition, Tata McGraw Hill Publication, New Delhi.

Reference Books:

- 1. Naghton Patrick & Schildt H., "The Complete Reference Java 2", Tata McGraw Hill Publication, New Delhi.
- 2. Dietel Harvey M & Dietel Paul J., "Java How to program", 7th edition, Pearson Education, New Delhi.

Web Programming Lab

SYLLABUS

- 1. India is a large country. Different regions observe variations in climate. The spoken language of one state is quite different from that of another. They wear different types of garments. They celebrate different festivals and perform varied religious rites. People belonging to diverse cultures belong to different religious faiths. In spite of these diversities, Indians feel a sense of unity and oneness among them. Thus, we conclude that India is a land of Unity in Diversity.
 - a) All the headings should be H2 and green colour.
 - b) Main heading should be H1 and centre aligned.
 - c) The background should be yellow colour.
 - d) There are 10 paragraphs so each of them should be made using P tag.
 - e) The Introduction and Conclusion paragraphs should have "Times New Roman" font, the size should be 12 and colour should be blue.
 - f) All the remaining paragraphs text should be pink and magenta coloured in an alternate way.
 - g) There should be one meaningful picture in the web page with specific dimension.
- 2. Create a webpage having a list as shown below:
 - Food
 - a. Fruit
 - Apple
 - Mango
 - Pear
 - b. Vegetable
 - Potato
 - Tomato
 - Carrot
 - Dress
 - a. Ethnic wear
 - Kurta
 - Sherwani
 - b. Western wear
 - suit
 - jeans
 - Sports
 - a. Indoor sports
 - carom
 - table tennis
 - b. Outdoor sports
 - Cricket
 - Hockey
- 3. Create a webpage with the following:

- a) A superscript and subscript tag
- b) Pre tag
- c) Paragraph tag
- d) Anchor tag
- e) Image tag
- f) Definition list tag
- g) Marquee tag
- h) Horizontal line tag
- i) Break tag
- j) Heading tag
- 4. Create a webpage having 10 divisions each having separate background color and text color using

<DIV> tag. At the top right corner there should be an image hyperlink opening in a new webpage.

5. Create a webpage with a form loaded into it and take input of three strings through three textboxes and then concatenate them without using any built-in function.

6. Create a webpage with two tables. First one should have 1 row and 5 columns and the second one with 3 rows and 4 columns. The contents of the first table should be center aligned and contents of the second table should be right aligned. Each column of the first table should have separate

colors and each row of the second table should have separate colors.

7. Write a JavaScript program to calculate and display the aggregate and percentage of three subjects' (Physics, Chemistry and Mathematics) marks along with the name of a student. The name and individual marks input shall be taken by textbox in the webpage.

8. Write a JavaScript program to search the element 4 in the array [2, 6, 4, 10, 4, 0, -2] using any method.

9. Create a framed webpage with different frames as below:



Contents of 1st, 3rd, 5th, 7th frame should be same again 2nd, 4th, 6th and 8th should be same.

10. Create a webpage to take input of a string and check whether it is a palindrome or not.11. Write a program using JavaScript to display a structure as given below:

- * * * * * * * * * *
- 12. Write a program using JavaScript to take input of an array of numbers like [-4, 5, 6, -1, 10] and then sort it in descending order.
- 13. Create a webpage to take input of a string and reverse that without using any user defined function.
- 14. Write a JavaScript program to search 10 in the array [2, 6, -5, 10, 11, 0, -2] using a binary search method.
- 15. Write a JavaScript program to take two arrays like [3, 7, 1, 6, 2, 3] and [5, 6, 0, -3] and merge them into third array along with that remove the repetitive elements.
- 16. Write a JavaScript program to calculate the percentage of three subjects' (English, Mathematics, and Science) marks along with the name of a student. The name and individual marks input shall be taken by form in the webpage.
- 17. Create a webpage to take input of a string and count the number of vowels in it.
- 18. Create a webpage to take input of two strings and concatenate them without using any built-in function.
- 19. Create a webpage to take input of a string and then slice it into three separate strings and display that.
- 20. Write a JavaScript program to take two arrays like [1, 3, 8, 1, 6, 2, 3] and [2, 1, 5, 6, 0, -3] and merge them into third array along with that remove the repetitive elements.
- 21. Write a JavaScript program to calculate and display the aggregate and percentage of three subjects' (Physics, Chemistry and Mathematics) marks along with the name of a student. The name and individual marks input shall be taken by textbox in the webpage.
- 22. Create a webpage to take input of a string and check whether it is a palindrome or not.



New Scheme Based on AICTE Flexible Curricula

S.N	Subject	Subject Nan	ne Marks Distribution					
•	Code			Internal Marks	External Marks		ernal urks To Ma	
				Max	Max	Min	Max	Min
1.	BCA501	Computer Graph Multimedia	ics and a	30	70	21	100	35
2.	BCA502	Management Information Systems		30	70	21	100	35
3.	BCA503	 Program Elective –I Cloud Computing Android Programming Python Programming 		30	70	21	100	35
4.	BCA504	 Program Elective –II Soft Computing and Applications Data Analytics 		30	70	21	100	35
			P	ractical				
				Max			Ν	lin
1.	BCA551	Computer Graphics Lab		50 25				
2.	BCA553	PE-I Lab		50			25	
		Android Program ming						

SCHEME Fifth Semester

		Lab • Python Program ming Lab		
3.	BCA554	 PE-II Lab Soft Computing Lab Data Analytics Lab using R Language 	50	25



New Scheme Based on AICTE Flexible Curricula

S.N.	Subject	Subject Name	L	Т	Р	Credit
	Code					
1.	BCA501	Computer	3	1	0	4
		Graphics and				
		Multimedia				
2.	BCA502	Management	3	1	0	4
		Information				
		Systems				
3.	BCA503	Program Elective -	3	1	0	4
		Ι				
4.	BCA504	Program Elective -	3	1	0	4
		II				
5.	BCA551	Computer	0	0	4	2
		Graphics Lab				
6.	BCA553	PE-I Lab	0	0	4	2
7.	BCA554	PE-II Lab			4	2
	Т	otal	15	4	4	22

SCHEME Fifth Semester Choice Based Credit System


New Scheme Based on AICTE Flexible Curricula

Semester- V

Course Content

Course	Subject Title	Subject Code
BCA	Computer Graphics and Multimedia	BCA501

Unit – I

Introduction to Graphics Systems: Video Display Devices, Raster Scan Systems, Random Scan Systems, Graphics Monitors and Workstations, Input Devices, Hard Copy Devices, Graphics Software. Three-Dimensional Viewing Devices, Stereoscopic & Virtual Reality Systems

Unit – II

Output Primitives: Points and Lines, Line Drawing Algorithms (DDA and Bresenham's Algorithms), Loading the Frame Buffer, Circle Generating Algorithm, Filled Area Primitives – Scan-line Polygon Fill Algorithm, Boundary-Fill Algorithm, Flood-Fill Algorithm, Color Tables.

Unit – III

2D Transformation and Viewing: Basic Transformations, Matrix Representations and Homogeneous Coordinates, Composite Transformations (Translations, Rotations, Scalings), Other Transformations (Reflection and Shear), The Viewing Pipeline, Viewing Coordinate Reference Frame, Window-to- Viewport Coordinate Transformation, Clipping- Point, Cohen-Sutherland Line Clipping and Sutherland-Hodgeman Polygon Clipping.

Unit – IV

Three-Dimensional Geometric Transformations: Translation, Rotation, Scaling.

Unit – V

Introduction to Multimedia Systems and Multimedia Components: Multimedia Systems, Multimedia Presentation and Production, Characteristics of Multimedia Presentation, Uses of Multimedia. CD Formats, DVD, DVD Formats. Text and its File Formats, Image Types and File Formats, Fundamental Characteristics of Sound, Audio File Formats, Video, Transmission of Video Signals, Video File Formats.

TEXT BOOKS

- 1. HearnD. and BakerM. P., "Computer Graphics: C Version", 2nd Edition, Pearson Education, 2007.
- 2. BufordJ. F. K., "Multimedia Systems", 1st Edition, Pearson Education, 2005.

REFERENCE BOOKS

- 1. FoleyJ. D., DamA. Van, Feiner S. K. and HughesJ. F., "Computer Graphics: Principles and Practice in C", 2nd Edition, Pearson Education, 2000.
- 2. ParekhR., "Principles of Multimedia", 2nd Edition, Tata McGraw Hill, 2012.



New Scheme Based on AICTE Flexible Curricula

Semester- V

Course Content

Course	Subject Title	Subject Code
BCA	Management Information Systems	BCA502

Unit – I

Information Systems in Global Business Today:

The role of Information System in Business Today, How Information Systems Are Transforming Business, What's New in Management Information Systems?, Globalization Challenges and Opportunities: A Flatted World, The Emerging Digital Firm, Strategic Business Objectives of Information Systems, Perspectives on Information Systems, What is an Information System?, Dimensions of Information Systems, It Isn't Just Technology: A Business Perspective on Information Systems.

Unit – II

E-Business: How Businesses Use Information Systems:

Business Processes and Information Systems, Business Processes, How Information Technology Enhances Business Processes, Types of Information Systems, Transaction Processing Systems, Management Information Systems and Decision-Support Systems, Systems That Span the Enterprise, Enterprise Applications, Intranets and Extranets, Collaboration and Communication Systems: "Interaction" Jobs in a Global Economy, E-Business, The Information Systems Function in Business.

Unit – III

Information Systems, Organizations, and Strategy:

Organizations and Information Systems, What Is an Organization?, Features of Organizations, How Information Systems Impact Organizations and Business Firms, Economic Impacts, Organizational and Behavioural Impacts, The Internet and Organizations, Implications for the Design and Understanding of Information Systems, Using Information Systems to Achieve Competitive Advantage, Porter's Competitive Forces Model.

Unit – IV

IT Infrastructure and Emerging Technologies:

IT Infrastructure, Defining IT Infrastructure, Evolution of IT Infrastructure, Technology Drivers of Infrastructure Evolution, Infrastructure Components, Computer Hardware Platforms, Operating System Platforms, Enterprise Software Applications, Data Management and Storage, Networking/ Telecommunication Platforms, Internet Platforms, Consulting and System Integration Services, Contemporary Hardware Platform Trends, The Emerging Mobile Digital Platform, Grid Computing, Cloud Computing and the Computing Utility, Autonomic Computing.

Unit – V

Enhancing Decision Making:

Decision Making and Information Systems, Business Value of Improved Decision Making, Types of Decisions, The Decision Making process, Managers and Decision Making in The Real World, Systems for Decision Support, Management Information System(MIS), Decision-Support Systems(DSS), Web- Based Customer Decision-Support Systems, Group Decision-Support Systems(GDSS), Executive Support Systems(ESS).

Case Studies: Two Recent Case Studies to be Discussed Fully Covering the Whole Syllabus.

TEXT BOOK

1. Laudon K. and Laudon J., "Management Information Systems", Prentice Hall Publication.

REFERENCE BOOKS

- 1. Murdick, Ross and Claggett, "Information Systems for Modern Management", PHI Publication.
- 2. Jawadekar W. S., "Management Information Systems", Tata McGraw Hill Publication.
- 3. GoyalD. P., "Management Information Systems Managerial Perspectives", Macmillan India Ltd.



New Scheme Based on AICTE Flexible Curricula

Semester- V

Course Content

Course	Subject Title	Subject Code
BCA	PE-I(Cloud Computing)	BCA503

Unit – I

Cloud Computing at a glance, Distributed Systems, Virtualization, Web 2.0,

Unit – II

Eras of Computing, Elements of Distributed Computing, Concepts of Virtualization and its characteristics, Virtualization and cloud computing, cloud reference model, types of clouds, economics of the cloud.

Unit – III

Cloud Interoperability and standards:

Amazon Web Services: Compute Services, Storage Services, Communication Services. Google AppEngine: Architectural and Core Concepts, Application Life-Cycle, Cost Model.

Microsoft Azure: Azure Core Concepts, SQL Azure.

Unit – IV

Energy-Efficiency in clouds, Energy-Efficient and Green Cloud Computing Architecture, Market- Oriented Cloud Computing, Federated clouds: characterization and definition, cloud federation stack.

Cloud Security and Trust Management: Cloud Security Defense Strategies

Unit – V

Application of clouds in: Health care, Biology, CRM, ERP, Social Networking, Productivity and Geoscience. Cloudlets for Mobile Cloud Computing.

TEXT BOOK

1. BuyyaRajkumar, Charles, VecchiolaChristian amd SelviS. Thamarai "Mastering Cloud Computing", McGraw Hill Education(India) Private Limited, 2013.

REFERENCE BOOK

1. HwangKai, FoxGeoffrey C., DongarraJack J., "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufmann - India Edition, 2012.



New Scheme Based on AICTE Flexible Curricula

Semester- V

Course Content

Course	Subject Title	Subject Code
BCA	PE-I(Android Programming)	BCA503

Unit – I

What is Android? Android EcoSystem, Features of Android, Architecture of Android, Android Verson, Android SDK, Android Development tools, Anatomy of an Android Application.

Unit – II

Android User Interface: Linear Layout, Absolute Layout, Frame Layout, Relative Layout, Table Layout.

Unit – III

Designing User Interface with View: Text View, Push Button, Image Button, Edit Text, Checkbox, ToggleButton, Radio Button, ProgressBar, Spinner, List View, Gridview, Time and Date Picker.

Unit – IV

Displaying Pictures and Menus with Views: Gallery Views, ImageSwitcher, GridView, Options Menu, Context Menu, DigitalClock View, Webview.

SMS Messaging: Sending SMS Messages Programmatically

Unit – V

SQLITE Database in Android: SQLite Database, Creation and connection of the database, extracting values from a cursor.

TEXT BOOK

1. DixitPrashant Kumar, "Android", Vikas Publishing House Pvt. Ltd, 1stEdition, 2014.

REFERENCE BOOK

LeeWei-Meng, "Beginning Android for Application Development", Wiley, Indian Edition.

Android Programming Lab(BCA553)

SYLLABUS

List of Programs as Assignments:

- 1. Write a program using Android Developer Studio/Eclipse to generate Frame Layout.
- 2. Write a program using Android Developer Studio/Eclipse to generate button with content "My Button".
- **3.** Write a program using Android Developer Studio/Eclipse to generate three buttons with content "First", "Second", "Third" and then orient them along row wise.
- **4.** Write a program using Android Developer Studio/Eclipse to generate three buttons with content "First", "Second", "Third" and then orient them along column wise.
- **5.** Write a program using Android Developer Studio/Eclipse to create Text-View to accept user name.
- 6. Write a program using Android Developer Studio/Eclipse to generate the following Table Layout

Roll Number	
Name	

7. Write a program using Android Developer Studio/Eclipse to generate the following Table Layout

Login Id	
Password	

Submit

- 8. Write a program using Android Developer Studio/Eclipse to implement Check box.
- 9. Write a program using Android Developer Studio/Eclipse to implement Radio Button.
- 10. Write a program using Android Developer Studio/Eclipse to import image to Frame Layout.
- 11. Write a program using Android Developer Studio/Eclipse to display an option Menu.
- 12. Write a program using Android Developer Studio/Eclipse to generate Analog Clock.
- **13.** Write a program using Android Developer Studio/Eclipse to generate Digital Clock
- 14. Write a program using Android Developer Studio/Eclipse to load URL "google.com".
- 15. Write a program using Android Developer Studio/Eclipse to load URL "bitmesra.ac.in"
- **16.** Write a program using Android Developer Studio/Eclipse to accept a mobile number and then send sms "Welcome".
- 17. Write a program using Android Developer Studio/Eclipse to implement Context Menu.
- 18. Write a program using Android Developer Studio/Eclipse to display current date.
- **19.** Create a SQLITE database Employee and Make a form in Android Studio/Eclipse to allow data entry to Employee Form with the following command buttons:

Employee Id		Save
Employee Name		Cancel
Address		
Date of Joining		

1. Create a SQLITE database Student and Make a form in Android Studio/Eclipse to allow data entry to Student Form with the following command buttons:

Roll No		Submit	
Name		Cancel	

Text Books:

1. DixitPrashant Kumar, "Android", Vikas Publishing House Pvt. Ltd, 1 st Edition, 2014.

Reference Books:

Programming Android, 2nd Edition, <u>Zigurd Mednieks</u>, <u>Blake Meike</u>, <u>Laird Dornin</u>, <u>Masumi</u> <u>Nakamura</u>, <u>O'Reilly Media</u>, October 2012



New Scheme Based on AICTE Flexible Curricula

Semester- V

Course Content

Course	Subject Title	Subject Code
BCA	PE-I(Python Programming)	BCA503

Unit – I

Introduction to Computers, Programs, and Python:Introduction,Programming Languages, Operating Systems, The History of Python, Features of python language, Getting Started with Python, Programming Style and Documentation, Programming Errors.

Elementary Programming:Introduction, Writing a Simple Program, Reading Input from the Console, Identifiers,Variables, Assignment Statements, and Expressions, Simultaneous Assignments, Named Constants, Numeric Data Types and Operators, Evaluating Expressions and Operator Precedence, Augmented Assignment Operators, Type Conversions and Rounding. **Unit – II**

Mathematical Functions, Strings, and Objects: Introduction, Common Python Functions, Strings and Characters, Introduction to Objects and Methods, Formatting Numbers and Strings.

Control Structures: Selections:Introduction, Boolean Types, Values, and Expressions, if Statements, Two-Way if-else Statements, Nested if and Multi-Way if-elif-else Statements, Logical Operators, Conditional Expressions, Loops: Introduction, The while Loop, The for Loop, Nested Loops, Keywords break and continue

Unit – III

Functions: Introduction, Defining a Function, Calling a Function, Functions with/without Return Values, Positional and Keyword Arguments, Passing Arguments by Reference Values, Modularizing code, The Scope of Variables, Default Arguments, Returning Multiple Values.

Lists:Introduction, List Basics, Copying Lists, Passing Lists to Functions, Returning a List from a Function, Searching Lists, Sorting, Processing Two-Dimensional Lists, Passing Two-Dimensional Lists to Functions, Multidimensional Lists.

Unit – IV

Tuples, Sets, and Dictionaries: Introduction, Tuples: Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Tuple methods, Sets: Creating Sets, Manipulating and Accessing Sets, Subset and Superset, Set Operations, Comparing the Performance of Sets and Lists, Dictionaries: Creating a Dictionary, Adding, Modifying, and Retrieving Values, Deleting Items, Looping Items, The Dictionary Methods.

Unit – V

Objects and Classes: Introduction, Defining Classes for Objects, Immutable Objects vs. Mutable Objects, Hiding Data Fields, Class Abstraction and Encapsulation, Object-Oriented Thinking.Inheritance and Polymorphism: Introduction, Superclasses and Subclasses, Overriding Methods, The **object** Class, Polymorphism and Dynamic Binding, The **isinstance**Function. Class Relationships: Association, Aggregation, composition.

Files and Exception Handling:Introduction, text input and ouput: opening a file, Writing Data, Testing a File's Existence, Reading All Data from a File, Writing and Reading Numeric Data, Binary IO Using Pickling, Exception Handling, Raising Exceptions.

TEXT BOOK

1. Y. Daniel Liang, "Introduction to programming using python", Pearson Education; First edition (2017).

REFERENCE BOOK

- 1. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education; Forth edition (2018)
- 2. Mark Lutz, "Learning Python" O'Reilly Fifth edition (2013)
- 3. Mark Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language" Pearson Education; Second edition (2018)

Python Programming Lab(BCA553)

SYLLABUS

List of Programs as Assignments:

- 1. Write a program that displays "Hello to Python programming".
- 2. Write a program to read two integers and perform arithmetic operations on them (addition, subtraction, multiplication and division).
- 3. Write a program to read the marks of three subjects and find the average of them.
- 4. Surface area of a prism can be calculated if the lengths of the three sides are known. Write a program that takes the sides as input (read it as integer) and prints the surface area of the prism (Surface Area = 2ab + 2bc + 2ca)

- 5. A plane travels 395,000 meters in 9000 seconds. Write a program to find the speed of the plane (Speed = Distance / Time).
- 6. You need to empty out the rectangular swimming pool which is 12 meters long, 7 meters wide and 2 meter depth. You have a pump which can move 17 cubic meters of water in an hour. Write a program to find how long it will take to empty your pool? (Volume = 1 * w * h, and flow = volume/time).
- 7. Write a program to convert temperature from centigrade (read it as float value) to Fahrenheit.
- 8. A car starts from a stoplight and is traveling with a velocity of 10 m/sec east in 20 seconds. Write a program to find the acceleration of the car. [acc = $(V_{\text{final}} V_{\text{initial}})/$ Time].
- 9. Write a Program to Prompt for a Score between 0.0 and 1.0. If the Score Is Out of Range, Print an Error. If the Score Is between 0.0 and 1.0, Print a Grade Using the Following Table

Score	Grade	
>= 0.9	А	
>= 0.8	В	
>= 0.7	С	
>= 0.6	D	
< 0.6	F	
20	1	

- 10. Write a Program to find the maximum of three numbers.
- 11. Suppose you want to develop a program to play a lottery. The program randomly generates a two-digit number, prompts the user to enter a two-digit number, and determines whether the user wins according to the following rules:
 - a) If the user's input matches the lottery in the exact order, the award is \$10,000.
 - b) If all the digits in the user's input match all the digits in the lottery number, the award is \$3,000.
 - c) If one digit in the user's input matches a digit in the lottery number, the award is \$1,000.
- 12. Write a Program to Check If a Given Year Is a Leap Year.
- 13. Program to Find the GCD of Two Positive Numbers.
- 14. Write a program that prompts the user to enter a four-digit integer and displays the number in reverse order.
- 15. Write Python Program to Find the Sum of Digits in a Number

- 16. Write a program to print the sum of the following series.
 - a) $1 + 1/2 + 1/3 + \ldots + 1/n$
 - b) $1/1 + 2^2/2 + 3^3/3 + \dots + n^n/n$
- 17. Write a Program to Display the Fibonacci Sequences up to nth Term Where n is Provided by the User.
- 18. Write a Program to Find the Sum of All Odd and Even Numbers up to a Number Specified by the User.
- 19. Write a Program to Check Whether a Number Is Prime or Not.
- 20. Write a Program to Find the Factorial of a Number.
- 21. Write a Program to Demonstrate the Return of Multiple Values from a Function Definition.
- 22. Program to Demonstrate the Use of Default Parameters
- 23. Write Program to Demonstrate the Scope of Variables.
- 24. Program to Print the Characters Which Are Common in Two Strings.
- 25. Write a program to check whether a given String is palindrome or not.
- 26. Write Python Program to Count the Number of Times an Item appears in the List.
- 27. Write a program to create a list of integer numbers. Sort the elements using any sorting method.
- 28. Write a program to create a lists of integer numbers and perform the linear and binary search.
- 29. Write a program to create a lists of cities names and perform the sort the cities name in alphabetical order.
- 30. Find Mean, Variance and Standard Deviation of List Numbers
- 31. Write a Program to Find the Transpose of a Matrix.
- 32. Write a program to perform the matrices multiplication.

- 33. Write a program to create a dictionary for countries name as key and currency as value. Traversve the dictionary with key:value Pairs in using for Loop.
- 34. Write a program to create tuples, and perform the following operations: Merging of tuples, Spliting of a tuple, comparison of two tuples.
- 35. Write a program to create an intersection, union, set difference, and symmetric difference of sets.
- 36. Write a program with "MyRectangle" class aving the dimensions as data members and area() as a method member. Calculate the area of each rectangle object created by user.
- 37. Design a class with name "MyComplex" to represent the complex number including the constructor overloading, methods to perform the arithmetic operation over the two complex numbers. Write the complete python program for the above design.
- 38. Design a class with name "Distance" to represent the distance in feet and inch. Include the method to calculate the addition of two distances. Write the complete python program for the above design.
- 39. Write a complete program to implement the Employee and its subclasses (Salarayed Employee, DailyWaged Employee, Commission based employee) given in Hierarchical and multilevel manner. The program should exhibit the use of super key word to invoke the super class constructor.
- 40. Write a program to open a file and perform the reading and writing operation with the file.
- 41. Write a program to count the number of line in a file.
- 42. Write a program to count the frequencies of each word from a file.
- 43. Write a program to copy the text of a file to another file.
- 44. Write a program to append a file with the content of another file.
- 45. Write a program to compare two file.
- 46. Write a program to delete and insert a sentence at specified position in a file.
- 47. Write a program to delete a sentence from a file if the file contains a specific word.
- 48. Write program to delete comment lines from a file.
- 49. Write a program to capitalize each word of the file.

- 50. Write a program to handle an exception using exception handling mechanism of the python.
- 51. Write a program to raise an exception explicitly using raise keyword.

Text Books:

1. <u>Y. Daniel</u> Liang, "Introduction to programming using python", Pearson Education; First edition (2017).

Reference Books :

- 1. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education; Forth edition (2018)
- 2. Mark Lutz, "Learning Python" O'Reilly Fifth edition (2013)
- 3. Mark Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language" Pearson Education; Second edition (2018)



New Scheme Based on AICTE Flexible Curricula

Semester- V

Course Content

Course	Subject Title	Subject Code
BCA	PE-II(Soft Computing	BCA504
	and Applications)	

Unit – I

Fuzzy Set Theory: Basic Definition and Terminology, Set Theoretic Operations, Fuzzy types and levels, MF Formulation and Parameterization, MF of two dimensions, Fuzzy Union, Intersection and Complement, Fuzzy Number, Fuzzy measure.

Unit – II

Fuzzy Logic: Fuzzy Rules and Fuzzy Reasoning: Extension Principles and Fuzzy Relations, Fuzzy IF THEN Rules, Defuzzification, Fuzzy Reasoning. Fuzzy Inference System: Introduction, Mamdani Fuzzy Models, Other Variants, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models.

Unit – III

Fundamentals of Genetic Algorithms: Basic Concepts, Creation of Offsprings, Encoding, Fitness Functions, Reproduction, Genetic Modelling: Inheritance Operators, Cross over, Inversion and detection, Mutation operator, Bitwise operators.

Unit – IV

Introduction to Artificial Neural Networks: What is a Neural Network? Human Brain, Models of Neuron, Neural Network viewed as Directed Graphs, Feedback, Network Architecture, Knowledge Representation, Learning processes:(Error correction, Memory-Based, Hebbian, Competitive, Boltzman, Supervised, Unsupervised), Memory, Adaptation.

Unit – V

Perceptrons, Adaline, Back Propagation Algorithm, Methods of Speeding, Convolution Networks, Radical Basis Function Networks, Covers Theorem, Interpolation Learning, The Hopfield Network.

Text Books:

- 1. Jang J.S.R., Sun C.T. and Mizutani E., "Neuro-Fuzzy and Soft Computing" PHI/Pearson Education, New Delhi, 2004.
- 2. Rajasekaran S. & Vijayalakshmi, G.A. Pai, "Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications", PHI, New Delhi, 2003.
- 3. Ross T. J., "Fuzzy Logic with Engineering Applications", TMH, New York, 1997.
- 4. Haykins Simon, "Neural Networks: A Comprehensive Foundation", Pearson Education, 2002.

Reference Books:

- 1. Ray K.S., "Soft Computing and Its application", Vol 1, Apple Academic Press.2015.
- 2. Lee K.H., "First Course on Fuzzy Theory and App.", Adv in Soft Computing Spinger.2005.
- 3. Zimmermann H.Z., "Fuzzy Set Theory and its App", 4thEdition, Spinger Science, 2001.

Soft Computing LAB(BCA554)

Implementation of Fuzzy Operations.
Implementation of Fuzzy Relations (Max-min Composition).
To implement De-Morgan's Law.
To plot various membership functions.
To implement FIS Editor.
Implementation of Fuzzy Controller (Washing Machine).
Implementation of Perceptron Learning Algorithm.
Implementation of Unsupervised Learning Algorithm.
Implementation of Simple Genetic Application.

Text Books:

- 1. Jang J.S.R., Sun C.T. and Mizutani E., "Neuro-Fuzzy and Soft Computing" PHI/Pearson Education, New Delhi, 2004.
- 2. Rajasekaran S. & Vijayalakshmi, G.A. Pai, "Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications", PHI, New Delhi, 2003.
- 3. Ross T. J., "Fuzzy Logic with Engineering Applications", TMH, New York, 1997.

4. Haykins Simon, "Neural Networks: A Comprehensive Foundation", Pearson Education, 2002.

Reference Books:

- Ray K.S., "Soft Computing and Its application", Vol 1, Apple Academic Press.2015.
 Lee K.H., "First Course on Fuzzy Theory and App.", Adv in Soft Computing Spinger.2005.
 Zimmermann H.Z., "Fuzzy Set Theory and its App", 4thEdition, Spinger Science,2001.



New Scheme Based on AICTE Flexible Curricula

Semester- V

Course Content

Course	Subject Title	Subject Code
BCA	PE-II(Data Analytics)	BCA504

Unit – I

Analysis using Descriptive and Pictorial Statistics: mean, median, mode, harmonic mean, geometric mean, variance and standard deviation, quantiles, skewness, moments and kurtosis. Data Visualization: Summery table, Contingency table, Bar plot, Pie chart, Frequency distribution, Relative frequency distribution, Cumulative frequency distribution, Histogram, Frequency polygon, Cumulative frequency graphs, Box plot, Time series plot, Scatter diagram.

Unit – II

Data Relationships, Transformation, and Data Cleaning: Relationships between different types of data: Relationship between two categorical data, Relationship between categorical and quantitative data, Relationship between two quantitative data Transformation: The logarithm transformation, Root and

square root transformation Standardization (Z-transformation), Min-max normalization. Data cleaning: missing values, noisy data.

Unit – III

Analysis using Inferential Statistics: Sampling, Sampling Distribution, and Estimation of Parameters, Sampling distribution of: means, proportions, difference of means, difference of proportions. Hypothesis testing about: population mean, the difference between two means, about a population proportion, difference between two proportions.

Unit – IV

Social Network and Text Data Analysis: What is a social network? Characteristics of social network. Link mining: Tasks and challenges. Mining on social networks. Text data analysis and informational retrieval. Dimensional reduction for text.

Unit – V

Outlier Analysis: Outlier detection based on: statistical distribution, distance based, deviation based.

Text Books:

- 1. Gupta and Gupta, "Business Statistics", Sultan Chand and Sons, 2014.
- 2. Bishnu and Bhattacherjee, Data Analysis: Using Statistics and Probability with R Language, PHI Learning, 2019.
- 3. Han J and Kamber M, "Data Mining: Concepts and techniques", Morgan Kaufmann Publishers.

Reference Books:

- 1. Maheshwari Anil, "Data Analytics", Mc Graw hill publication, 2017.
- 2. TanPang-Ning, SteinbachMichael, and KumarVipin, "Introduction to Data Mining, Pearson Education", New Delhi.Dunham
- 3. H.M. & Sridhar S., "Data Mining", Pearson Education, New Delhi, 2006.

Data analytics using R Language Lab(BCA554)

Unit – I

Mean, median, mode. 2. Harmonic mean, geometric mean. 3. Variance and standard deviation.
 Quantiles, Percentile. 5. Skewness. 6. Moments. 7. kurtosis.

Unit – II

8. Summery table, contingency table. 9. Frequency distribution, relative frequency distribution, cumulative frequency distribution. 10 Histogram, frequency polygon, cumulative frequency graphs, 11 Satter diagram. 12. Pie chart (2 D and 3 D) and bar plot (stacked and side by side). 13. Time series plot.

Unit – III

14. Relationships between different types of data: Relationship between two categorical data. 15. Relationship between categorical and quantitative data. 16. Relationship between two quantitative data Transformation. 17. Logarithm transformation, Root and square root transformation. 18. Z-transformation 19. Min-max normalization.

Unit – IV

20. Sampling distribution of: means. 21. Sampling distribution of: proportions. 22. Sampling distribution of: difference of means. 23. Sampling distribution of: difference of proportions.

Unit – V

24. Hypothesis testing about: population mean. 25. Hypothesis testing about: the difference between two means. 26. Hypothesis testing about: a population proportion. 27. Hypothesis testing about: difference between two proportions. 28. Identification of outlier data using scatter plot and regression line. 29. Identification of outlier data using quartiles. 30. Identification of outlier data using box plot.

Text Books:

- 1. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, Addison-Wesley Professional, 2017.
- 2. Bishnu, Partha Sarathi, Bhattacherjee, Vandana, Data Analysis : Using Statistics and Probability with R Language, PHI Learning, 2019.

Reference Books:

- 1. Mark Gardener, Beginning R: The Statistical Programming Language, O'Reilly.
- 2. Hadley Wickham and , R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, O'Reilly.



RKDF UNIVERSITY, RANCHI

Bachelor of Computer Applications (BCA)

Subject Name Marks Distribution S.N Subject Code Internal External . Marks Marks Total Marks Max Max Min Max Min 1. **BCA601** 30 70 21 100 35 Data Mining 2. **BCA602** 30 70 21 100 35 Distributed Computing **BCA603** 70 21 3. 30 Program Elective 100 35 -III Mobile • Application (MA) Cloud Computing Network Security Cyber Forensics 4. **BCA604** 30 70 21 100 35 Program Elective-IV Distributed Database Systems Decision Support System 70 100 5. **BCA605** 30 21 35 Project

SCHEME Sixth Semester



Bachelor of Computer Applications (BCA)(2019-2022)

S.N.	Subject	Subject Name	L	Т	Р	Credit
	Code					
1.	BCA601	Data Mining	3	1	0	4
2.	BCA602	Distributed	3	0	0	3
		Computing				
3.	BCA603	Program Elective - III	3	1	0	4
4.	BCA604	Program Elective- IV	3	1	0	4
5.	BCA605	Project	0	0	0	6
	Т	otal	12	2	0	20

Sixth Semester Choice Based Credit System



New Scheme Based on AICTE Flexible Curricula

Semester- VI

Course Content

Course	Subject Title	Subject Code	
BCA	Data Mining	BCA601	
Unit – I			

Introduction: What is data mining? Motivating challenges. The origins of data mining. Data mining tasks. Data: Types of Data. Attributes and Measurement. Types of Data Sets. Data Quality Measurement and Data Collection Issues.

Unit – II

Measures of Similarity and Dissimilarity: Basics. Similarity and Dissimilarity between Simple Attributes. Dissimilarities between Data Objects. Similarities between Data Objects. Examples of Proximity Measures. Issues in Proximity Calculation. Selecting the Right Proximity Measure.

Unit – III

Association Analysis: Basic Concepts and Algorithms Preliminaries. Frequent Itemset Generation. The Apriori Principle. Frequent Itemset Generation in the Apriori Algorithm. Candidate Generation and Pruning Support Counting. Rule Generation.

Unit – IV

Cluster Analysis: Basic Concepts and Algorithms. What Is Cluster Analysis? Different Types of Clustering. Different Types of Clusters. K-means. Basic K-means Algorithm. Basic Agglomerative Hierarchical Clustering Algorithm. Key Issues in Hierarchical Clustering. The DBSCAN Algorithm.

Unit – V

Classification: Basic Concepts and Techniques. General Framework for Classification. Decision Tree Classifier. A Basic Algorithm to Build a Decision Tree. Methods for Expressing Attribute

Test Conditions. Measures for Selecting an Attribute Test Condition. Algorithm for Decision Tree Induction. Characteristics of Decision Tree Classifiers. Model Evaluation.

TEXT BOOK

1. Tan Pang-Ning, Steinbach Michael, andKumar Vipin, "Introduction to Data Mining", Pearson Education, New Delhi.

REFERENCE BOOKS

- 1. Han Jiawei & Kamber Micheline, "Data Mining Concepts & Techniques", Publisher Harcourt India. Private Limited, Second Edition
- 2. Dunham H.M. & Sridhar S., "Data Mining", Pearson Education, New Delhi, 2006.



New Scheme Based on AICTE Flexible Curricula

Semester- VI

Course Content

Course	Subject Title	Subject Code
BCA	DISTRIBUTED COMPUTING	BCA602

Unit – I

Distributed Computing Concept: Definitions, The history of distributed computing, Different forms of computing, The strengths & weaknesses of distributed computing, Basics of operating systems, Network basics, Software engineering basics. Event synchronization, Timeouts and threading, Deadlocks, Data representation, Data marshalling, Event diagram and sequence diagram, IPv4 & IPv6, Connection – oriented versus connectionless IPC.

Unit – II

Distributed Computing Paradigms: Paradigms and Abstraction, Message Passing, The Client-Server Paradigm, the Message System Paradigm, Remote Procedure Call Model, RMI, The Distributed Objects Paradigm, The Object space, The Mobile Agent Paradigm.

Unit – III

The Socket API: The Socket metaphor in IPC, The Datagram Socket API, The Stream-Mode Socket API, Sockets with nonblocking I/O Operations, Secure Socket API.

The client server paradigm issuers, connection- oriented and connectionless servers, Iterative server and concurrent server, stateful server and stateless server.

Unit – IV

Distributed Objects: Remote Procedure Calls, Distributed Objected Systems, Remote Method Invocation, The Java RMI Architecture, The API for the Java RMI, RMI Security Manager, Comparison of RMI Remote Procedure Calls, Distributed Objected Systems, Remote Method Invocation, The Java RMI Architecture, The API for the Java RMI, RMI Security Manager, Comparison of RMI and Socket APIs.

Unit – V

Group Communication: Unicasting versus Multicasting, Multicast API, Connectionless versus Connection-oriented Multicast, Reliable Multicasting versus Unreliable Multicasting, The Java Basic Multicast API.

TEXT BOOK

1. Liu M. L., "Distributed Computing: Principles and Application", Pearson Education, 2008.

REFERENCE BOOK

1. AltiyaH., WelchJ., "Distributed Computing Fundamentals, Simulations and Advanced Topics", 2nd edition, Wiley – India Edition, 2006.



New Scheme Based on AICTE Flexible Curricula

Semester-VI

Course Content

Course	Subject Title	Subject Code
BCA	PE-III(Mobile Application(MA))	BCA603

Unit – I

Introduction, Developing Mobile Applications, Going Mobile, People Perspective, Mobilizing the Enterprise.

Unit – II

Mobile Application Architectures, Client-Server layers and Tires, Client thin and fat & web page Hosting, Server one, two and three tire architecture, Connection type with always, partially and never connect, Good Architectural Design Tenets

Unit – III

Mobile Infrastructure, Mobile Device Types, Mobile Device Components, Connection Methods

Unit – IV

Mobile Client Applications, Thin Client, Fat Client, Web Page Hosting, Best Practices

Unit – V

Mobilizing existing application architectures. Evolution of Enterprise Architectures, Anatomy of Enterprise Web Architecture, Considerations When Mobilizing Existing Applications, Types of Mobile Applications, Mobile Web Apps Versus Native Applications, Mobile 2.0

Text Books:

1. SchellRobbie, SchneiderHeather, LeeValentino, "Mobile Applications: Architecture, Design, and Development", Prentice Hall 2004.

2. FlingBrian, "Mobile Design and Development", O'Reilly Media, 2009.

Reference Books:

1. McWherterJeff, GowellScott, "Professional Mobile Application Development", John Wiley & Sons 2012.



RKDF UNIVERSITY, RANCHI

Bachelor of Computer Applications (BCA) New Scheme Based on AICTE Flexible Curricula Semester- VI Course Content

Course	Subject Title	Subject Code
BCA	PE-III (Cloud Computing)	BCA603

Unit – I

Cloud Computing at a glance, Distributed Systems, Virtualization, Web 2.0,

Unit – II

Eras of Computing, Elements of Distributed Computing, Concepts of Virtualization and its characteristics, Virtualization and cloud computing, cloud reference model, types of clouds, economics of the cloud.

Unit – III

Cloud Interoperability and standards:

Amazon Web Services: Compute Services, Storage Services, Communication Services. Google AppEngine: Architectural and Core Concepts, Application Life-Cycle, Cost Model.

Microsoft Azure: Azure Core Concepts, SQL Azure.

Unit – IV

Energy-Efficiency in clouds, Energy-Efficient and Green Cloud Computing Architecture, Market- Oriented Cloud Computing, Federated clouds: characterization and definition, cloud federation stack.

Cloud Security and Trust Management: Cloud Security Defense Strategies

Unit – V

Application of clouds in: Health care, Biology, CRM, ERP, Social Networking, Productivity and Geoscience. Cloudlets for Mobile Cloud Computing.

TEXT BOOK

1. BuyyaRajkumar, Charles, VecchiolaChristian amd SelviS. Thamarai "Mastering Cloud Computing", McGraw Hill Education(India) Private Limited, 2013.

REFERENCE BOOK

1. HwangKai, FoxGeoffrey C., DongarraJack J., "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufmann - India Edition, 2012.



New Scheme Based on AICTE Flexible Curricula

Semester- VI

Course Content

Course	Subject Title	Subject Code	
BCA PE-III(Network Security)		BCA603	
Unit – I			

Introduction to networking: OSI Reference model, Active vs Passive attacks, Layers and cryptography, Multilevel model of security.

Unit – II

Modes of Operation: encrypting large messages, Generating MAC's, Multiple Encryption DES, Hash and message digest: Using Hash for encrypting, MD2, MD4, MD5, SHA1.

Unit – III

AuthenticationSystems, Password authentication systems, authentication protocols, tructed intermediates, session key establishment.

Security handshake pitfalls: mutual authentication, Integrity / encryption of data, mediated authentication, strong password protocols.

Unit – IV

Real time communication security: Session key establishment, perfect forward secrecy, DOS, clogging protection, Arranging for parallel computation, session resumption, data steam protection, plausible deniability.

Unit – V

E mail security, PEM& S/MIME, PGP, Firewalls.

TEXT BOOK

1. Kaufman Charlie, Perlman Radia and Speciner Mike, "Network Security: Private Communication in a Public World", 2nd Edition, Prentice Hall, 2002.



New Scheme Based on AICTE Flexible Curricula

Semester- VI

Course Content

Course	Subject Title	Subject Code
BCA	PE-III (Cyber Forensics)	BCA603

Unit – I

IPsec protocols - IP Authentication header - IP ESP, Key management protocol for IPsec, Transport layer Security: SSL protocol, Cryptography computations - TLS protocol

Unit – II

PGP - S/ MIME: Internet Firewalls for Trusted System: Roles of Firewalls - firewall related terminology, Types of Firewalls, Firewall design, Honeycomb design: Set for E-Commerce transactions

Unit – III

Introduction to traditional cybercrime, Traditional problems associated with cybercrime, Introduction to Identity Theft & Identity Fraud, Types of Cyber Forensics techniques: incident & incident response

methodology, Forensics duplication & investigations, Preparation of IR: Creating response tool kit & IR team, Forensics Technology & Systems

Unit – IV

Processing Crime & Incident Scenes, Working with windows & DOS systems, Current computer Forensics tools: Software/ hardware tools

Unit – V

Validating Forensics data, Data hiding techniques, Performing Remote Acquisition, Network Forensics, Email investigations, Cell phone & Mobile devices Forensics

Text Books:

1. Albert J. Marcella Jr., & Frederic Guillossou, "Cyber Forensics: From Data to Digital Evidence", John Wiley and Sons, ISBN-13: 978-1118273661, 2012.



RKDF UNIVERSITY, RANCHI

Bachelor of Computer Applications (BCA)

New Scheme Based on AICTE Flexible Curricula Semester- VI Course Content

Course	Subject Title		Subject Code
BCA	PE-IV (Distributed Systems)	Database	BCA604

Unit-I:

Introduction: Distributed Data Processing, What is a Distributed Database System? Promises of DDBSs, Problem Areas.

Unit-II:

Distributed DBMS Architecture: DBMS Standardization, Architectural Models for Distributed DBMSs, Distributed DBMS Architecture.

Distributed Database Design: Alternative Design Strategies, Distribution Design Issues, Fragmentation, Allocation.

Unit-III:

Overview of Query Processing: Query Processing Problem, Objectives of Query Processing, Complexity of Relational Algebra Operations, Layers of Query Processing.

Query Decomposition and Optimization: Query Decomposition, Query Optimization, Centralized Query Optimization, Distributed Query Optimization Algorithms.

Unit -IV:

Transaction Management and Concurrency Control: Definition of a Transaction, properties of Transactions, Serializability Theory, Taxonomy of Concurrency Control Mechanisms, Locking-based Concurrency Control Algorithms, Timestamp-based Concurrency Control Algorithms, Deadlock Management.
Unit -V:

Distributed DBMS Reliability: Reliability Concepts and Measures, Failures and Fault Tolerance in Distributed Systems, Failures in Distributed DBMS, Local Reliability Protocols, Distributed Reliability Protocols.

TEXT BOOK

1. OzsuM. Tamer, ValduriezPatrick, "Distributed Database Systems", 2nd Edition, Pearson, 2011.

REFERENCE BOOKS

- 1. NavatheElmasri, "Fundamental of Database Systems", 5th Edition, Pearson Education, 2008.
- 2. ConnollyThomas, BeggCarolyn, "Database Systems A Practical Approach to Design, implementation and Management", 4th Edition, Pearson Education, 2008.
- **3.** Silberschatz, Korth, &Sudarshan, "Database System Concepts", 4th Edition, McGraw Hill, 2002.



Bachelor of Computer Applications (BCA)

New Scheme Based on AICTE Flexible Curricula Semester- VI Course Content

Course	Subject Title	Subject Code
BCA	PE-IV(Decision Support System)	BCA604

Unit-I

Introduction to DSS:

Definition. Types of DSS. Data and Model Management. DSS Knowledge Base. User interface. The DSS user. Categories and classes of DSS.

Unit -II

Decision and Decision-makers:

Definition. Types of decision. Different levels of Decision makers in the organization and their requirement. Decision effectiveness. Simon's model of decision making. Rational decision making. Bounded rationality. Biases and heuristics in decision making.

Unit -III

Group Decision Support System (GDSS):

Group decision making. GDSS modeling. Brainstorming process. MDM support technologies. Managing MDM activities. System perspective of a DSS: DSS in the context of information system. Information quality issues in DSS design. Role of internet in DSS development.

Unit -IV

Designing and building DSS:

Strategies for DSS analysis and design. The DSS developer. Tools for DSS development. Implementing and Integrating DSS: DSS implementation. System evaluation. The importance of

Unit-V

Intelligent Decision Support system:

The intelligence of Artificial Intelligence. Future of Expert and Artificial Intelligence. Knowledge acquisition for Expert Systems. Future of Intelligent integration. Software Agents and Delegation.

TEXT BOOK

1. Marakas George M., "Decision Support Systems in the 21st century", Pearson education.

REFERENCE BOOKS

1. Turban Efraim, "Decision Support Systems and Intelligent Systems", Pearson Education.