Osmania University

Faculty of Informatics

Bachelor of Computer Applications (BCA)
Semester I and II
2022 – 2023

Scheme of Instruction
and
Syllabi

Osmania University
Hyderabad

PROPOSED SCHEME OF INSTRUCTION
BACHELOR OF COMPUTER APPLICATIONS (BCA)
SEMESTER- I

SNo	Course Code	Course Title	Cate-gory	Hours/Week		No of Credits	Scheme of Examination			
							Max Marks		Duration (hrs)	
				L/T	P		SEE	CIE	SEE	CIE
		THEORY								
1	BCA101BS	Mathematical Foundations of Computer Science	**BSC**	4	-	4	70	30	3	1
2	BCA102PC	Digital Principles	**PCC**	4	-	4	70	30	3	1
3	BCA103PC	Programming in C	**PCC**	4	-	4	70	30	3	1
4	BCA104PC	Introduction to Web Technology	**PCC**	4	-	4	70	30	3	1
5	BCA105HS	Effective Communication	**HSC**	4	-	4	70	30	3	1
		PRACTICAL								
6	BCA151LC	Programming in C Lab	**LCC**	-	4	2	50	25	3	2
7	BCA152LC	Web Technology Lab	**LCC**	-	4	2	50	25	3	2
8	BCA153LC	IT Workshop	**LCC**	-	4	2	50	25	3	2
			Total	20	12	26	500	225	-	-

Category

BSC	Basic Science Course
PCC	Professional Core Course
ETC	Emerging Technological Course
HSC	Humanities and Social Science Course
MGC	Management Course
PEC	Professional Elective Course
LCC	Laboratory Core Course
LTC	Laboratory Technological Course
LPC	Laboratory Professional Course
LHC	Laboratory Humanities Course

Examinations
        CIE – Continuous Internal Evaluation
        SEE – Semester End Evaluation

L/T: Lecture/Tutorial
P: Practical

BCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA101BS	Mathematical Foundations of Computer Science	BSC	4	-	4	70	30	3	1

UNIT- I

Fundamentals of Logic: Basic Connectives and Truth Tables, Logical Equivalence, Logical Implication, Use of Quantifiers, Definitions and the Proof of Theorems.
Set Theory and Properties of the Integers: Set and Subsets, Set Operations, and the Laws of Set theory, Counting and Venn Diagrams. The well – ordering principle, Recursive Definitions, Division Algorithm, Fundamental theorem of Arithmetic.

UNIT-II

Relations and Functions: Cartesian Product, Functions onto Functions, Special Functions, Pigeonhole Principle, Composition and Inverse Functions.
properties of relations, Partial Orders, Equivalence Relations and Partitions, Principle of Inclusion and Exclusion, Generalization of principle.

UNIT–III

Generating Functions: Introductory Examples, Definition And Examples, Partitions of Integers. *Recurrence Relations:* First – order linear recurrence relation, second – order linear homogenous recurrence relation with constant coefficients.

UNIT-IV

Algebraic Structures: Algebraic System – General Properties, Semi Groups, Monoids, Homomorphism, *Groups:* Definition, Examples and Elementary properties, Residue Arithmetic.

UNIT -V

Graph Theory: Definitions and examples, sub graphs, complements and graph Isomorphism, Vertex degree, Planar graphs, Hamiltonian paths and Cycles.
Trees: Definitions, properties and Examples, Rooted Trees, Spanning Trees and Minimum Spanning Trees.

Reference Book: Mott Joe L Mott, Abraham Kandel, and Theodore P Baker, Discrete Mathematics for Computer Scientists& Mathematicians, Prentice Hall NJ, 2nd Edition, 2015.

Suggested Reading:
    1)   Ralph P. Grimaldi , B.V Ramana ., Discrete and Combinatorial Mathematics, 5th Edition,
  Pearson, 2004. (An Applied Introduction)
    2)   Jr. P. Tremblay and R Manohar Discrete Mathematical Structures with Applications to Computer
  Science, McGraw Hill, 1987.
3)R.K.Bisht and H.S.Dhami, Discrete Mathematics Oxford Higher Education, 2015
4)BhavanariSatyanarayana, TumurukotaVenkata Pradeep Kumar and ShaikMohiddin Shaw,
Mathematical Foundation of Computer Science, BSP, 2016

BCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA102PC	Digital Principles	PCC	4	-	4	70	30	3	1

UNIT I
Binary Systems: Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.
Boolean Algebra and Logic Gates: Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates.

UNIT II
Minimization: K-Map Method – Table Method, POS - SOP, Don't Care Conditions, NAND, NOR Implementation.
Combinational Logic: Combinational Circuits, Analysis and Design Procedure, Binary Adder, Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers.

UNIT III
Synchronous Sequential Logic: Sequential Circuits - Latches, Flip-Flops, An analysis of Clocked Sequential Circuits, State Reduction and Assignment Design Procedure.

UNIT IV
Registers and Counters: Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counters-Johnson Counter.

UNIT V
Asynchronous Sequential Circuit : Introduction, Analysis Procedure, Circuits with Latches, Design Procedure.

Suggested Reading:
1 M.Morris Mano, "Digital Design", 3rd edition, Pearson Education, Delhi, 2007.
2 Donald P Leech, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications", Tata Mc Graw Hill, 2007.

BCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA103PC	Programming in C	PCC	4	-	4	70	30	3	1

UNIT – I
Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts.
Number Systems: Binary, Octal, Decimal, Hexadecimal
Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements
Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

UNIT-II
Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do-While and Examples. Continue, Break and Goto statements
Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. **Recursion-** Recursive Functions.
Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.

UNIT – III
Preprocessors: Preprocessor Commands. **Arrays** - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

UNIT - IV
Pointers - Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, L-value and R-value, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments.
Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.

UNIT - V
Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions, Type Definition (typedef), Enumerated Types.
Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Suggested Reading:
1. B.A. Forouzan and R.F. Gilberg, "*A Structured Programming Approach in C*" , Cengage Learning, 2007
2. Kernighan BW and Ritchie DM, "*The C Programming Language*", 2nd Edition, Prentice Hall of India, 2006.
3. Rajaraman V, "*The Fundamentals of Computer*", 4th Edition, Prentice-Hall of India, 2006.

BCA SEM I – THEORY		Hours /week			Scheme of Examination			
					MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA104PC	Introduction to Web Technology	PCC	4	-	4	70	30	3	1

UNIT-I
Introduction to World WideWeb,WebBrowsers,WebServers,BOM, DOM, HTTP.
HTML5:Introduction,HTML5 Tags, Links, Input, Images, Lists, Tables, CreatingForms, Styling Forms, Placeholder, Inline and Block elements, Id vs Class elements.

UNIT-II
CSS3– Basics: Need and Benefit of CSS3, CSS3 Syntax, Comments, Including CSS3 in HTML Documents(Inline, Embedded and External Style Sheets).CSS3- Selectors: Universal Selector, Element Type Selector, Id Selectors, Class Selectors, Group Selectors.
CSS3-Styles: CSS Color, CSS Background, CSS Fonts, CSS Text, CSS Links, CSS Lists, CSS Tables.CSS3-Box Model: Margin, Padding, Border, Outline, Visibility, Display, Multiple Columns.

UNIT –III
Responsive Web Design(RWD)- Introduction, Viewport, Creating Responsive Websites, Responsive Images, Responsive Texts.
RWD**-**Media Queries: Introduction, Media Types, Device Breakpoints.
RWD**-**Grid View: Introduction, grid-row, grid-column.

UNIT-IV
IntroductiontoJavascript,JavaScriptandFormsVariables,Functions,Operators,Conditional Statements and Loops, Arrays, DOM Methods, Strings, Java ScriptClosures, JSON. Events Handling(Mouse Events, Keyboard Events).

UNIT-V
 Introduction to TypeScript-Overview of Typescript, Interface, classed, Functions, Generices, Enums, Adv Types, Modules, JSX overview.

Suggested Reading:
1. RobertW.Sebesta,ProgrammingtheWorldWideWeb,8thEdition,PearsonEducation,2006.
2. Internet & World Wide Web-HOW TO PROGRAM-5th Edition, Deitel. Published by Pearson (July 14th 2021) - Copyright © 2012.
3. Yakov Fain, Anton Moiseev, TypeScript Quickly, 1st Edition, Manning Publications,2020.

BCA SEM I – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA105HS	Effective Communication	HSC	4	-	4	70	30	3	1

UNIT – I
Effective Communication: Role and importance of communication; Features of human communication; Process of communication; Barriers to communication; Oral and Written Communication; Importance of listening, speaking, reading, and writing;
Types of communication: Verbal – formal versus informal communication, one-way versus two-way communication, Non-verbal communication.

UNIT – II
Personality Development and Interpersonal Communication: Models of interpersonal development, Johari window, Knapp's model, Styles of communication, Time management, Emotional Quotient, Teamwork, Persuasion techniques.

UNIT – III
Remedial English: Tenses, Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés.
(Note: The focus is on appropriate usage)

UNIT – IV
Vocabulary Building and Written Communication: Roots and affixes;
Words often confused: Homonyms, Homophones, Homographs; One-word substitutes;
Idiomatic usage: Idioms, Phrases, Phrasal Verbs; Synonyms; Antonyms; Paragraph writing; Précis writing; Essay writing; Official letters; E-mail etiquette;
Technical report writing: Feasibility and Progress reports.

UNIT – V
Reading Comprehension: Unseen Passages, A.P.J. Abdul Kalam, Azim Premji, Sachin Tendulkar, Sathya Nadella, Sam Pitroda
(Note: No descriptive questions to be set from this unit and only Reading Comprehension/s from unseen passages should be set in the Examination Question Papers)

Suggested Readings:
1. E. Suresh Kumar, *Engineering English*, Orient BlackSwan, 2014
2. *Language and Life A Skills Approach*, Orient Black Swan, 2018
3. Michael Swan, *Practical English Usage*. OUP, 1995
4. Ashraf Rizvi, M, *Effective Technical Communication*, Tata McGraw Hill, 2009.
5. Meenakshi Raman and Sangeeta Sharma. *Technical Communication: Principles and Practice*. OUP, 2011.

BCA SEM I – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA151LC	Programming in C Lab	LCC	-	4	2	50	25	3	2

1. Write programs using arithmetic, logical, bitwise and ternary operators.
2. Write programs simple control statements : Roots of a Quadratic Equation, extracting digits of integers, reversing digits ,finding sum of digit ,printing multiplication tables, Armstrong numbers, checking for prime, magic number,
3. Sin x and Cos x values using series expansion
4. Conversion of Binary to Decimal, Octal, Hexa and Vice versa
5. Generating a Pascal triangle and Pyramid of numbers
6. Recursion: Factorial, Fibonacci, GCD
7. Finding the maximum, minimum, average and standard deviation of given set of numbers using arrays
8. Reversing an array ,removal of duplicates from array
9. Matrix addition , multiplication and transpose of a square matrix .using functions
10. Functions of string manipulation**:** inputting and outputting string , using string functions such as strlen( ),strcat( ),strcpy( )………etc
11. Writing simple programs for strings without using string functions.
12. Finding the No. of characters, words and lines of given text file
13. File handling programs : student memo printing

BCA SEM I – Laboratory		Hours /week			Scheme of Examination			
					MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA152LC	Web Technology Lab	LCC	-	4	2	50	25	3	2

1. Visual Studio Code Installation, TypeScript Extension Installation in Visual Studio Code.

2. Create a Webpage Layout using Semantic elements.

3. Add Audio and Video element to a Webpage.

4. Drawing 2D graphics using Canvas.

5. Program to Find current location using Geolocation.

6. Example for localStorage and sessionStorage.

7. Styling text and fonts using CSS3 properties.

8. Styling Lists and Links using CSS3 properties.

9. Styling tables using CSS3 properties.

10. Styling Webpage backgrounds using CSS3 properties.

11. Demonstrate Form validation.

12. Demonstrate DOM methods.

13. Demonstrate HTML events.

14. Write TypeScript code to perform arithmetic operations.

15. Demonstrate functions inTypeScript.

BCA SEM I – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA153LC	IT Workshop	LCC	-	4	2	50	25	3	2

1. System Assembling , Disassembling and identification of Parts / Peripherals
2. Operating System Installation – Install Operating Systems like Windows, Linux along with necessary Device Drivers.
3. Introducing to programming Environment(Linux commands, editing tools such as vi editor, sample program entry, compilation and execution)

4. MS-Office / Open Office
    a. Word – Formatting Page Borders, Reviewing Equations, symbols
    b. Spread Sheet – organize data, usage of formula graphs charts
    c. Power point – features of power point, guidelines for preparing an effective presentation
    d. Access – creation of database, validate data
5. Network Configuration & Software Installation: Configuring TCP/IP, proxy and firewall settings. Installing application software system software & tools.
6. Internet and World Wide Web-Search Engines. Types of search engines, netiquette, Cyber hygiene.
7. Trouble Shooting – Hardware trouble shooting, Software trouble shooting.

Suggested Reading:
1. K. L. James, Computer Hardware, Installation, Interfacing Troubleshooting and Maintenance,
    Eastern Economy Edition.
2. Gary B.Shelly, Misty E Vermaat and Thomas J. Cashman, Microsoft Office 2007 Introduction
    Concepts and Techniques, Windows XP Edition, 2007, Paperback.
3. Leslie Lam port, LATEX-User□s Guide and Reference manual, Pearson, LPE, 2nd Edition.
4. Rudraprathap, Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, Oxford University Press, 2002.
5. Scott Mueller□s, Upgrading and Repairing PCs, 18th Edition, Scott. Mueller, QUE, Pearson, 2008.
6. Cherry l A Schmidt, The Complete Computer Upgrade and Repair Book, 3rd Edition , Dream tech.
7. Vikas Gupta, Comdex Information Technology Course Tool Kit , WILEY Dream tech.
8. ITL Education Solutions Limited, Introduction to Information Technology, Pearson Education.

PROPOSED SCHEME OF INSTRUCTION
BACHELOR OF COMPUTER APPLICATIONS (BCA)
SEMESTER- II

SNo	Course Code	Course Title	Category	Hours/ Week		No of Credits	Scheme of Examination			
							Max Marks		Duration (hrs)	
				L/T	P		SEE	CIE	SEE	CIE
THEORY										
1	BCA201BS	Fundamentals of Probability and Statistics	**BSC**	4	-	4	70	30	3	1
2	BCA202PC	Object Oriented Programming using CPP	**PCC**	4	-	4	70	30	3	1
3	BCA203PC	Computer Architecture	**PCC**	4	-	4	70	30	3	1
4	BCA204PC	Data Structures	**PCC**	4	-	4	70	30	3	1
5	BCA205PC	Advance Computer Networks	**PCC**	4	-	4	70	30	3	1
PRACTICALS										
6	BCA251LC	Object Oriented Programming using CPP Lab	**LCC**	-	4	2	50	25	3	2
7	BCA252LC	Data Structures Lab	**LCC**	-	4	2	50	25	3	2
8	BCA253LH	Communication Skills Lab	**LHC**	-	4	2	50	25	3	2
			Total	20	12	26	500	225	-	-

Category

L/T: Lecture/Tutorial
P: Practical

BSC	Basic Science Course
PCC	Professional Core Course
ETC	Emerging Technological Course
HSC	Humanities and Social Science Course
MGC	Management Course
PEC	Professional Elective Course
LCC	Laboratory Core Course
LTC	Laboratory Technological Course
LPC	Laboratory Professional Course
LHC	Laboratory Humanities Course

BCA SEM II – THEORY		Hours /week			Scheme of Examination			
					MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA201BS	Fundamentals of Probability and Statistics	BSC	4	-	4	70	30	3	1

UNIT-I

Introduction: Importance of Statistics, Concepts of Statistics, population and a sample; quantitative and qualitative data; Collection of Primary and Secondary data; Classification and Tabulation of data. Construction of Univariate and bivariate frequency distribution; Diagrammatic and Graphical representation of data.

UNIT-II

Descriptive Statistics: Measures of central tendency: Arithmetic Mean, Median, Mode, Geometric mean, Harmonic mean; Measures of Dispersion:Range, Quartile deviation, Mean deviation, Standard deviation.
Definition of Moments; Measures of Skewness: Karl pearson's coefficient of skewness, Bowley's coefficient of skewness; Kurtosis.

UNIT-III

*Probability:*Basic terminology, Mathematical probability, Statistical probability, Axiomatic approach to probability, Theorems onprobability.
Conditional Probability, Multiplication theorem of probability, Independent events, Pairwise/mutually independent events, Bayes' Theorem.

UNIT-IV

Random variable: Definition of a random variable, discrete and continuous random variables, functions of random variables, probability mass function and probability density function and mathematical expectation of a random variable and properties of expectation.
*Probability Distributions:*Binomial, Poisson and Normal Distribution.

UNIT-V

*Correlation and Regression analysis:*Definitionof correlation, Scatter Diagram, Karl Pearson's Coefficient of correlation; Partial and Multiple correlation coefficients (for three variables); Definition of Regression, Simple Linear Regression (for 2 variables).
*Small Sample Tests:*Basic Definitions of testing of hypothesis;**t-Test:** t-test for single Mean, t-test for difference of Means, Paired t-test. **F-Test:** F-test for equality of two population variances. **CHI-SQUARE Test:**test for single variance(population variance)and test of independence of attributes.

Reference Book: S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Sons,Twelfth Edition.
Suggested reading:
1. A.M. Gun, M.K. Gupta, B.Dasgupta, "Fundamentals of Statistics", Vol-1, the world press Pvt.Ltd.,Kolakota.
2. William Mendenhall, Robert J. Beaver, Barbara M.. Beaver, "Introduction to Probability and Statistics", Thomson Brooks / Cole, Eleventh Edition, 2003.
3. Richard A. Johnson, "Probability and Statistics for Engineers", Prentice Hall of India, Seventh Edition 2005.

BCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA202PC	Object oriented Programming using CPP	PCC	4	-	4	70	30	3	1

UNIT I
Introduction to OOP: Procedure oriented programming, object oriented programming, basic concepts of OOP, benefits and applications of OOP, simple C++ program, namespace scope, structure of C++ Program, creating, compiling and linking a file.
Tokens : Keywords, identifiers, constants, basic data types, user defined data types, storage classes, derived data types, dynamic initialization of variables, reference variables, operators in C++, scope resolution operator, member dereferencing operators, memory management operators.

UNIT II
Control Structures: if, if..else, elseif ladder, nested if, switch, for, while, do..while, break, continue, exit, goto.
Classes and Objects: Specifying a class, defining member functions, C++ program with class, private member functions, arrays within class, memory allocation for objects, static data members, static member functions, arrays of objects, returning objects.
Functions in C++: Main function, function prototyping, call by reference, return by reference, inline functions, default arguments.

UNIT III
More about Functions: Function overloading, friend function, a function friendly to two classes, objects as function arguments.
Constructors & Destructors: Constructors, parameterized constructors, multiple constructors in a class, constructors with default arguments, copy constructors, dynamic constructors, destructors.

UNIT IV
Inheritance: Introduction to inheritance, single inheritance, multi-level inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance.
Operator Overloading: Rules for overloading operators, overloading unary operators, overloading binary operators.
Pointers: Introduction to pointers, declaring and initializing pointers, arithmetic operations on pointers, pointers with arrays, arrays of pointers, pointers to objects, 'this' pointer.

UNIT V
Polymorphism and Virtual Functions: Compile-time polymorphism, runtime polymorphism, virtual functions.
Templates: Introduction, function templates, class templates.
Exception Handling: Introduction, exception handling mechanism, throwing mechanism, catching mechanism.
 Suggested Reading:
1. E. Balagurusamy, Object Oriented Programming with C++, 6/e, McGraw Hill, 2013.

2. Behrouz A. Forouzan and Richard F. Gilberg, Computer Science : A Structured Approach Using C++, 2/e, Cengage Learning, 2003.
3. Ashok N. Kamthane, Object Oriented Programming with ANSI and Turbo C++, 1/e, Pearson Education, 2006.

BCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Category	L/T	P	Credits	SEE	CIE	SEE	CIE
BCA203PC	Computer Architecture	PCC	4	-	4	70	30	3	1

UNIT I
Basic Structure of Computers
Functional units, Basic operational concepts, Bus structures, Software performance, Memory locations and addresses, Memory operations, Instruction and instruction sequencing, Addressing modes, Assembly language, Basic I/O operations.

UNIT II
Arithmetic Unit
Addition and subtraction of signed numbers, Design of fast adders, Multiplication of positive Numbers, Signed operand multiplication and fast multiplication, Integer division , Floating point numbers and operations.

UNIT III
Basic Processing Unit
Fundamental concepts, Execution of a complete instruction,
Hardwired control, Microprogrammed control, Pipelining, Basic concepts, Data hazards, Instruction hazards, Influence on Instruction sets, Data path and control consideration.

UNIT IV
Memory System
Basic concepts, Semiconductor RAMs, ROMs, Speed, size and cost, Cache memories, Performance consideration, Virtual memory, Memory Management requirements, Secondary storage.

UNIT V
I/O Organization
Accessing I/O devices, Interrupts, Direct Memory Access , Buses, Interface circuits, Standard I/O Interfaces (PCI, SCSI, USB).

Suggested Reading:
1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, 5th Edition "Computer Organization", McGraw-Hill, 2002.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", 6th Edition, Pearson Education, 2003.
3. David A.Patterson and John L.Hennessy, "Computer Organization and Design: The hardware / software interface", 2nd Edition, Morgan Kaufmann, 2002.
4. John P.Hayes, "Computer Architecture and Organization", 3rd Edition, McGraw Hill, 1998.

BCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA204PC	Data Structures	**PCC**	4	-	4	70	30	3	1

UNIT-I
Introduction to Data Structures: Definition, Uses, Types.
Arrays: Abstract Data Types and the C++ Class, Array as an Abstract Data Type, Representation of Arrays, Matrices, Special Matrices Sparse Matrices, Strings.

UNIT-II
Stacks and Queues: Representation of Stacks, Representation of Queue, Operations on Stacks, Operations on Queues, Types of Queues.

UNIT-III
Linked Lists: Singly Linked Lists, Doubly Linked Lists, Circular Lists.
Hashing: Static Hashing, Hash Tables, Hash Functions, Overflow Handling.

UNIT-IV
Trees: Introduction, Binary Trees, Representation of Binary Tree, Binary Tree Traversal, Binary Search Tree, Operations on Binary Search Tree, Heap tree, B-tree.
Graphs: Terminology, Types, Representation of Graph, Elementary Graph operations- DFS and BFS.

UNIT-V
Sorting: Bubble, Selection, Insertion sort, Quick sort, Merge sort, Heap sort, shell sort.
Searching Techniques: Linear Search, Binary Search

Suggested Reading:
1. Ellis Horowitz, Dinesh Mehta, S. Sahani. Fundamentals of Data Structures in C++, Universities Press. 2007.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education 2006.
3. Michael T. Goodrich, Roberto Tamassia, David Mount, Data Structures and Algorithms in C++, Wiley India Pvt. Ltd, 2004.

BCA SEM II – THEORY			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Category	L/T	P	Credits	SEE	CIE	SEE	CIE
BCA205PC	Advanced Computer Networks	PCC	4	-	4	70	30	3	1

Unit - I

Network Architecture, Performance: Bandwidth and Latency, High Speed Networks, Network-Centric View, Error Detection, Reliable Transmission, Ethernet and Multiple Access Networks, Overlay Networks: Routing Overlays, Peer-to-Peer Networks and Content Distribution Networks, Client-Server Networks, Delay-Tolerant Networks

Unit - II
Switching: Circuit-Switched Networks, Datagram Networks, Virtual-Circuit Networks, Message-Switched Networks, Asynchronous Transfer Mode: Evolution, Benefits, Concepts, Exploring Broadband Integrated Services Digital Network, Layer and Adaptation Layer

Unit - III
IPv4: Address Space, Notations, Classful, Classless, Network Address Translation, Datagram, Fragmentation and Checksum IPv6 Addresses: Structure, Address Space, Packet Format and Extension Headers, ICMP, IGMP, ARP, RARP, Congestion Control and Resource Allocation: Problem, Issues, Queuing, TCP

Unit - IV
Congestion Control, Congestion-Avoidance Mechanisms and Quality of Service, Internetworking: Intra-Domain and Inter-Domain Routings, Unicast Routing Protocols: RIP, OSPF and BGP, Multicast Routing Protocols: DVMRP, PIM-DM, PIM-SM, CBT, MSDP and MOSPF, Spanning Tree Algorithm

Unit - V

Optical Networking: SONET/SDH Standards, Traffic Engineering: Requirement, Traffic Sizing, Characteristics, Protocols, Time and Delay Considerations, Connectivity, Availability, Reliability and Maintainability and Throughput, Multimedia Over Internet: Transmission, IP Multicasting and VoIP, Domain Name System: Name Space, Domain Name Space, Distribution, Domains, Resolutions and Dynamic Domain Name System, SNMP, Security: IPSec, SSL/TLS, PGP and Firewalls, Datacenter Design and Interconnection Networks.

Text Books/Reference Books/Online Resources:

1. Larry L. Peterson and Bruce S. Davie, Computer Networks: A System Approach, Fifth Edition, Morgan Kaufmann, Elsevier, 2012.
2. Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, Fifth Edition, 2017.
3. Chwan-Hwa (John) Wu, J. David Irwin, Introduction to Computer Networks and Cyber Security, CRC press, Taylor & Francis Group,2014
4. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Pearson, 5th Edition, 2014. 5. G. Wright and W. Stevens, TCP/IP Illustrated, Volume 1 and Volume 2, Addison-Wesley, 1996.
6. Dayanand Ambawade, Deven Shah, Mahendra Mehra and Mayank Agarwal, Advanced Computer Network, Dreamtech Press, 2016. 7. R. Srikant, The Mathematics of Internet Congestion Control, Springer, 2004. 8. J. L. Boudec and P. Thiran, Network Calculus, Springer, 2011.

BCA SEM II – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA251LC	Object oriented Programming using CPP Lab	LCC	-	4	2	50	25	3	2

1. Write a program that contains a function to exchange (swap) values of two arguments by using pointers and References parameters.
2. Write a program to check the given string is palindrome or not using a private member function.
3. Write a program to find transpose of 2-D matrix by allocating memory dynamically to the matrix. Initialize and display contents of the matrix and deallocate memory.
4. Write a program to add corresponding elements of two 2-D matrices using friend function. Create two classes each capable of storing one 2-D matrix. Declare the matrices under private access specifier and access them outside the class.
5. Write a program for finding area of different geometric shapes (Circle, Rectangle and Cube) using function overloading.
6. Write a Program to generate Fibonacci Series by using Constructor to initialize the Data Members.
7. Write a program to add two matrices of same copy. Create two objects of the class and each of which refers to one 2-D matrix. Use constructor to allocate memory dynamically and use copy constructor to allocate memory when one array object is used to initialize another.
8. Write a program to demonstrate single inheritance distinguishing public and private derivation.
9. Write a program to illustrate the implementation of both Multilevel and Multiple (Hybrid) inheritance.
10. Write a program to find transpose of a given matrix of mxn size using unary operator overloading.
11. Write a program to add two matrices of mxn size using binary operator overloading.
12. Write a program to demonstrate the usage of virtual functions.
13. Write a program to sort a given set of elements using function template.
14. Write a program to search a key element in a given set of elements using class template.
15. Write a program to find average marks of the subjects of a student. Throw multiple exceptions and define multiple catch statements to handle division by zero as well as array index out of bounds exceptions.

BCA SEM II – Laboratory			Hours /week			Scheme of Examination			
						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA252LC	Data Structures Lab	LCC	-	4	2	50	25	3	2

Experiments:
1. Write a C++ program for the implementation of Array.
2. Write a C++ program for the implementation of Special Matrices.
3. Write a C++ program for the implementation of Sparse Matrices
4. Write a C++ program for the implementation of String
5. Write a C++ program to implement the following using array
   a) Stack
   b) Queue
6. Write a C++ program to implement the following using a) single linked list b) Doubly linked list c)Circular linked list
7. Write a C++ program to implement stack using linked list.
8. Write a C++ program to implement queue using linked list.
9. Write a C++ program to implement binary tree.
10. Write C++ program for implementing the following sorting methods
    a) Bubble sort
    b) Selection sort
    c) Insertion sort
    d) Quick sort
    e) shell sort
    f) Merge sort
    g) g) Heap sort
11. Programs on Linear Search and Binary Search using recursion and iteration

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						MaxMarks		Duration(hrs)	
Course Code	Course Title	Cate-gory	L/T	P	Cre-dits	SEE	CIE	SEE	CIE
BCA253LH	Communication Skills Lab	LHC	-	4	2	50	25	3	2

1. **Introduction to English Phonetics**: Organs of Speech: respiratory, articulatory and phonatory systems; Sounds of English: Introduction to International Phonetic Alphabet; Minimal pairs; Syllable; Word Stress; Introduction of rhythm and intonation; Difficulties of Indians speakers with stress and intonation.
2. **Speaking Activities**: Self Introduction, Picture perception, JAM.
3. Group discussion, Debate, Presentation skills
4. **Listening Activities**: Listening to different types of materials for effective comprehension
5. **Role play:** Use of dialogues in a variety of situations and settings

Suggested Readings:
1. E. Suresh Kumar. *A Handbook for English Language Laboratories (with CD).*
Revised edition, Cambridge University Press India Pvt. Ltd. 2014
2. T. Balasubramanian. *A Textbook of English Phonetics for Indian Students.*
Macmillan, 2008.
3. J. Sethi et al., *A Practical Course in English Pronunciation (with CD).* Prentice
Hall of India, 2005.
4. Hari Mohan Prasad. *How to Prepare for Group Discussions and Interviews.* Tata McGraw
Hill, 2006.