Bhavan's Vivekananda College

Department of Computer Science
Sainikpuri, Secunderabad
Autonomous College – Affiliated to Osmania University
BCA I Year

<u>CBCS (Choice Based Credit System) w.e.f. 2020-2021</u>

Scheme of Instruction and Examination

SEMESTER – I

Sl.No.	Code	Paper Title	Course Type	PPW TH	PPW PR	Max. Marks TH	Max. Marks TH-CIA	Max. Marks PR	Max. Marks PR-CIA	Credits
1	BCA141	Mathematical Foundations of Computer Science	BSC	4		70	30			4
2	BCA142	Digital Principles	PCC	4		70	30			4
3	BCA143	Programming in C	PCC	4		70	30			4
4	BCA144	Introduction to Web Technology	PCC	4		70	30			4
5	BCA145	Effective Communication	HSC	4		70	30			4
6	BCA143P	Programming in C Lab	LCC		4			50	25	2
7	BCA144P	Web Technology Lab	LCC		4			50	25	2
8	BCA146P	IT Workshop	LCC		4			50	25	2
		Total		**20**	**12**	**350**	**150**	**150**	**75**	**26**

BSC : Basic Science Course

PCC : Professional Core Course

HSC : Humanities and Social Science Course

LCC : Laboratory Core Course

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Scheme of Instruction and Examination

SEMESTER – II

Sl.No.	Code	Paper Title	Course Type	PPW TH	PR	Max. Marks TH	Max. Marks TH-CIA	Max. Marks PR	Max. Marks PR-CIA	Credits
1	BCA241	Fundamentals of Probability and Statistics	BSC	4		70	30			4
2	BCA242	Object Oriented Programming using CPP	PCC	4		70	30			4
3	BCA243	Computer Architecture	PCC	4		70	30			4
4	BCA244	Data Structures	PCC	4		70	30			4
5	BCA245	Data Communications	PCC	4		70	30			4
6	BCA242P	Object Oriented Programming using CPP Lab	LCC		4			50	25	2
7	BCA244P	Data Structures Lab	LCC		4			50	25	2
8	BCA246P	Communication Skills Lab	LHC		4			50	25	2
		Total		20	12	350	150	150	75	26

BSC : Basic Science Course

PCC : Professional Core Course

LHC : Laboratory Humanities Course

LCC : Laboratory Core Course

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BCA III SEMESTER

CBCS (Choice Based Credit System) w.e.f. 2021-2022

Scheme of Instruction and Examination

Sl.No.	Code	Paper Title	Course Type	PPW TH	PPW PR	Max. Marks TH	Max. Marks TH-CIA	Max. Marks PR	Max. Marks PR-CIA	Credits
1	BCA341	Applied Mathematics	BSC	4		70	30			4
2	BCA342	Java Programming	PCC	4		70	30			4
3	BCA343	Environmental Science	MC	4		70	30			4
4	BCA344	Operating System Concepts	PCC	4		70	30			4
5	BCA345	Database Design	PCC	4		70	30			4
6	BCA342P	Java Programming Lab	LCC		4			50	25	2
7	BCA344P	Operating System Concepts Lab	LCC		4			50	25	2
8	BCA345P	Database Design Lab	LCC		4			50	25	2
9	BCA346	MOOCs Course(NPTEL)		2		75	25			2
		Total		22	12	425	175	150	75	28

BSC : Basic Science Course

PCC : Professional Core Course

LCC : Laboratory Core Course

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BCA IV SEMESTER

CBCS (Choice Based Credit System) w.e.f. 2021-2022

Scheme of Instruction and Examination

Sl. No.	Code	Paper Title	Course Type	PPW		Max. Marks		Max. Marks		Credits
				TH	PR	TH	TH-CIA	PR	PR-CIA	
1	BCA441	Distributed and Cloud Computing	ETC	4		70	30			4
2	BCA442	Computer Networks	PCC	4		70	30			4
3	BCA443	Software Engineering	PCC	4		70	30			4
4	BCA444	Data Science using Python	ETC	4		70	30			4
5	BCA445	Artificial Intelligence	ETC	4		70	30			4
6	BCA442P	Computer Networks Lab	LCC		4			50	25	2
7	BCA443P	Software Engineering Lab	LCC		4			50	25	2
8	BCA444P	Data Science using Python Lab	LTC		4			50	25	2
		Total		20	12	350	150	150	75	26

ETC: Emering Technological Course

PCC: Professional Core Course

LCC : Laboratory Core Course

LTC : Laboratory Technological Course

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BCA V SEMESTER
CBCS (Choice Based Credit System) w.e.f. 2022-2023

Scheme of Instruction and Examination

Sl.No.	Code	Paper Title	Course Type	PPW		Max. Marks		Max. Marks		Credits
				TH	PR	TH	TH-CIA	PR	PR-CIA	
1	BCA541	Programming using ASP.NET	ETC	4		70	30			4
2	BCA542	Unix Programming	ETC	4		70	30			4
3	BCA543	Object Oriented System Development	ETC	4		70	30			4
4	BCA544	Software Quality Testing	ETC	4		70	30			4
5		**Elective-I (Any one of the following including respective lab)**	PEC	4		70	30			4
	BCA545a	Mobile Computing								
	BCA545b	Internet of Things (IoT)								
	BCA545c	Data Mining								
6	BCA541P	DOTNET Lab	LCC		4			50	25	2
7	BCA542P	Unix Programming Lab	LPC		4			50	25	2
8	BCA543P	OOSD Lab	LTC		4			50	25	2
		Total		20	12	350	150	150	75	26

ETC: Emering Technological Course   **PEC: Professional Elective Course**   **LCC: Laboratory Core Course**   **LTC: Laboratory Technological Course**
LPC: Laboratory Professional Course

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BCA VI SEMESTER
CBCS (Choice Based Credit System) w.e.f. 2022-2023

Scheme of Instruction and Examination

Sl.No.	Code	Paper Title	Course Type	PPW		Max. Marks		Max. Marks		Cre dits
				TH	PR	TH	TH-CIA	PR	PR-CIA	
1	BCA641	Information Security	ETC	4		70	30			4
2	BCA642	Advanced Java Programming	ETC	4		70	30			4
3		**Elective-II (Any one of the following)**	PEC	4		70	30			4
	BCA643a	Bigdata Analytics								
	BCA643b	Blockchain Technology								
	BCA643c	Multimedia								
4	BCA642P	Advanced Java Programming Lab	LTC		4			50	25	2
5	BCA644	Project Work	PC		14			100	50	7
		Total		12	18	210	90	150	75	21

ETC: Emering Technological Course
PEC: Professional Elective Course
LTC : Laboratory Technological Course
PC: Practical Course

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BCA OVERALL 3 YEARS CREDITS (2020-21 to 2022-23)

CBCS (Choice Based Credit System

Sl.No.	Course Type	No. of Papers	Credits
1	BSC	3	12
2	PCC	12	48
3	HSC	1	04
4	ETC	9	36
5	PEC	2	08
6	MC	1	04
7	LCC	11	22
8	LTC	3	06
9	LHC	1	02
10	LPC	1	02
11	Project Work	1	07
12	MOOCs (NPTEL	1	02
	Total		153

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SYLLABUS

OF

BACHELOR OF

COMPUTER

APPLICATIONS

I YEAR

(U.G)

CBCS

(2020-21)

BHAVAN'S VIVEKANANDA COLLEGE
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PROGRAM NAME: BCA (w.e.f 2020-21)
COURSE NAME: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

PAPER CODE: BCA141 **PPW: 4**
YEAR/SEMESTER: I/I **NO. OF CREDITS: 4**

COURSE OBJECTIVE: Students acquire knowledge on basic mathematics to their computer related applications.

UNIT-WISE COURSE OBJECTIVES:

COb1: To familiarize the students with concepts of propositions, logic, truth tables and set theory.

COb2: To familiarize the students with concepts of relations and functions.

COb3: To familiarize the students with concepts of generating functions and recurrence relations.

COb4: To familiarize the students with concepts of algebraic structures.

COb5: To familiarize the students with graph theory.

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: Set and Subsets, Set Operations, and the Laws of Set theory, Counting and Venn Diagrams. Properties of the Integers: The well – ordering principle, Recursive Definitions, Division Algorithms, Fundamental theorem of Arithmetic.

UNIT-II
Relations and Functions: Cartesian Product, Functions onto Functions, Special Functions, Pigeonhole Principle, Composition and Inverse Functions. Relations: Partial Orders, Equivalence Relations and Partitions. Principle of Inclusion and Exclusion: Principles 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.

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UNIT-IV
Algebraic Structures: Algebraic System – General Properties, Semi Groups, Monoids, Homomorphism, Groups, 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.

Suggested Reading:

1. Mott Joe L Mott, Abraham Kandel, and Theodore P Baker, Discrete Mathematics for Computer Scientists & Mathematicians, Prentice Hall NJ, 2nd Edition, 2015.
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. Bhavanari Satyanarayana, Tumurukota Venkata Pradeep Kumar and Shaik Mohiddin Shaw, Mathematical Foundation of Computer Science, BSP, 2016.
5. Ralph P. Grimaldi Discrete and Combinatorial Mathematics, 5th Edition, Pearson, 2004.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA141 CO1: Learn the concepts of logics and be familiarized with set theory.

BCA141 CO2: Learn the concepts of logics and laws of Boolean Algebra.

BCA141 CO3: Learn the concepts of generating functions and recurrence relations.

BCA141 CO4: Understand the concepts of groups.

BCA141 CO5: Understand graph theory which is of great use in computers.

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PROGRAM NAME: BCA (w.e.f 2020-21)
COURSE NAME: DIGITAL PRINCIPLES

PAPER CODE: BCA142

YEAR/SEMESTER: I/I

PPW: 4

NO. OF CREDITS: 4

COURSE OBJECTIVE: This course is intended to teach the basics involved in data representation, digital logic circuits, combinational and sequential logic circuit design used in the computer system.

UNIT-WISE COURSE OBJECTIVES:

COb1: To understand the digital representation of data in a computer system and logic gates

COb2: To explain logic elements and their use in combinational circuit design

COb3: To explain logic elements and their use in sequential logic circuit design.

COb4: To understand the general concepts in registers and counters.

COb5: To explain asynchronous sequential circuits, analysis and design procedures

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, Digital Logic Gates.
(Book 1: ch-1, ch-2:2.4, 2.5, 2.8)

UNIT-II
Minimization: K-Map Method –POS - SOP, Don't care conditions, NAND, NOR Implementation.
Combinational Logic: Combinational Circuits, Analysis and Design Procedure, Binary Adder, Binary Subtractor, Decimal Adder, Decoders, Encoders, Multiplexers.
(Book 1:Ch-3:3.1, 3.2, 3.3, 3.5, 3.6, 3.7, ch-4:4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.9,4.10,4.11)

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UNIT-III
Synchronous Sequential Logic: Sequential Circuits - Latches, Flip-Flops: (D, SR, JK, T flip flop), Analysis of Clocked Sequential Circuits (state table, state diagram, flip flop input equations, analysis with Flip Flops), Design Procedure.
(Book 1:Ch-5:5.2, 5.3, 5.4, 5.5, 5.8)

UNIT-IV
Registers and Counters: Registers (Register with parallel load), Shift Registers (Serial Transfer, Serial Addition, Universal shift register), Ripple Counters (Binary, BCD), Synchronous Counters (Binary, Up-Down, BCD, Binary Counter with Parallel Load), Other Counters (Ring Counters, Johnson Counter).
(Book 1:Ch-6.1, 6.2, 6.3, 6.4, 6.5)

UNIT-V
Asynchronous Sequential Circuit: Introduction- block diagram, Analysis Procedure (transition table, flow table, race conditions), Circuits with Latches (SR latch, Analysis Example, Implementation Example), Design Procedure(Design Example, Primitive Flow Table).
(Book 1:Ch-9: 9.1, 9.2, 9.3, 9.4)

Suggested Reading:

1 M.Morris Mano, "Digital Design", 4th edition, Pearson Education, Delhi, 2007.
2 Donald P Leech, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications", Tata Mc Graw Hill, 2007.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA142 CO1: Acquire knowledge on digital representation of data in a computer system

BCA142 CO2: Analyze the general concepts in combinational circuit design

BCA142 CO3: Explain logic elements and their sequential logic circuit design.

BCA142 CO4: Analyze the general concepts in registers and counters.

BCA142 CO5: Work on asynchronous sequential circuits, analysis and design procedure.

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PROGRAM NAME: BCA (w.e.f 2020-21)
COURSE NAME: PROGRAMMING IN C

PAPER CODE: BCA143   **PPW: 4**
YEAR/SEMESTER: I/I   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of C programming to develop simple applications.

UNIT-WISE COURSE OBJECTIVES:

COb1: To introduce C Language, Data Types, and Variables & Operators.

COb2: To illustrate different Conditional Control Statements and explanation of Functions and storage classes.

COb3: To explain the usage of arrays and Preprocessor Commands.

COb4: To understand the concepts of pointers and strings.

COb5: To discuss the concepts of Structures, unions, Input and Output using files.

UNIT – I
Introduction to Computers: Computer Languages, Creating and Running Programs, Software Development, Flow charts.
Introduction to C Language - Background, C Programs, Structure of a 'C' program, Comments, Identifiers, Data Types, Variables, Constants, Input / Output Statements.
Operators and Expressions: Operators, Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.
(Book 1- Ch: 1,Appendix A, Ch:2,3 , Book 2 - Ch:2)

UNIT-II
Conditional Control Statements: If, If-Else, Switch-Statement and Examples.
Loop Control Statements: For, While, Do-While and Examples. Continue, Break .
Functions: Function Basics, User-defined Functions, Standard Functions(math functions), Methods of Parameter Passing.
Recursion: Iterative definition, Recursive Definition, Recursive Functions.
Storage Classes: Auto, Register, Static, Extern, Scope Rules.
(Book 1 - Ch 5,6,4,Appendix C)

UNIT – III

Arrays - Concepts, Using Arrays in C, Declarations and definitions ,Accessing elements in arrays, Storing values in arrays , Two- Dimensional Arrays ,Declaration, Linear search and Binary Search, Selection Sort and Bubble Sort.

Preprocessor: Preprocessor Commands.(#include, #define).
(Book 1 – Ch 8, Appendix E)

UNIT - IV

Pointers – Introduction, pointer constants, pointer values, pointer variables, Accessing variables through pointers, pointer declaration and definition, initialization of pointer variables.

Pointer Arithmetic and Arrays: Pointer and one dimensional arrays(simple program), arithmetic operations on pointer(simple program) **Note: Only Theory Concepts in Pointers**

Strings – Concepts, fixed length strings ,variable length strings, C Strings, storing strings, string delimiter, string literals, string and characters ,declaring strings, initializing strings, string and assignment operators, reading and writing strings, String Input/Output Functions, Formatted String input/output, String Manipulation (using built-in Functions).
(Book 1-Ch:9,10,11)

UNIT - V

Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Unions: referencing unions, initializers, unions and structures. Type Definition (typedef), Enumerated Types.

Text Input/Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/output Functions: File open and Closes, Character Input/Output Functions. **Note: Only Theory Concepts in Files**
(Book 1 – Ch:12,7)

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.

COURSE OUTCOMES: At the end of the course students will be able to:

BCA143 CO1: Develop simple 'C' programs.

BCA143 CO2: Implement different control statements and functions.

BCA143 CO3: Program the concepts of arrays and Preprocessor Commands.

BCA143 CO4: Apply the concepts of Pointers and Strings.

BCA143 CO5: Implement Structures, Unions and Input and Output using files.

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PROGRAM NAME: BCA (w.e.f 2020-2021)
COURSE NAME: PROGRAMMING IN C LAB

PAPER CODE: BCA143P   **YEAR/SEMESTER: I/I**

1. (a) Computer Systems, Computing Environments(seminar).
   (b) Conversion of Binary to Decimal, Octal, Hexa and Vice-Versa
2. Write programs using arithmetic, logical, bitwise and ternary operators.
3. Write a program to find Roots of a Quadratic Equation.
4. Write a program to demonstrate Type Qualifiers and goto statements.
5. (a)Write program for extracting digits of integers.
   (b) Write program for reversing digits.
   (c) Write program to find sum of digits.
6. Write program for printing multiplication table of given number.
7. Write program for finding Armstrong number.
8. Write program for finding Prime number .
9. Write a program to demonstrate Inter Function Communication.
10. Recursion: Factorial, Fibonacci, GCD.
11. Write a program to demonstrate Inter-Function Communication(Array variables as parameters to function).
12. Write a program to demonstrate Array applications(random number –magic number).
13. Write a program to demonstrate Multidimensional Arrays.
14. Matrix addition, multiplication and transpose of a square matrix using functions.
15. Functions of string manipulation: inputting and outputting string, using string functions such as strlen( ),strcat( ),strcpy( )………etc.
16. Finding the No. of characters, words and lines of given text file.
17. Write a program to demonstrate the following
    a. Pointers for Inter-Function Communication (pointer as parameters to function)
    b. Pointers to Pointers
    c. Compatibility, L-value and R-value.
18. Write a program to demonstrate Passing an Array to a Function
19. Write a program to demonstrate Memory Allocation Functions
20. Write a program to demonstrate Command-line Arguments and Arrays of Strings.
21. Write a program to demonstrate Array of Pointers, Pointers to void.
22. Write a program to demonstrate Pointers to Functions.
23. Write a program to demonstrate Structures and Functions, Pointers to Structures and Self Referential Structures.
24. Write a program to demonstrate File handling.

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PROGRAM NAME: BCA (w.e.f 2020-21)
COURSE NAME: INTRODUCTION TO WEB TECHNOLOGY

PAPER CODE: BCA144
YEAR/SEMESTER: I/I

PPW: 4
NO. OF CREDITS: 4

COURSE OBJECTIVE: To enable students with the concepts of Web Programming, Python and XML to develop simple applications.

UNIT-WISE COURSE OBJECTIVES:

COb1: To discuss the basic concepts like Internet, WWW, web browser, web servers, URL, HTTP and HTML5.

COb2: To explain the usage of Cascading Style Sheets and basics of JavaScript.

COb3: To discuss the concepts of JavaScript with XHTML documents.

COb4: To explain the usage of Python language.

COb5: To discuss the basic concepts of XML, XML DTD, XML Schema, XSLT and XML processor.

UNIT-I: Fundamentals, HTML5
Fundamentals: A Brief introduction to Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators, MIME, HTTP. (Definitions Only)
HTML5: Introduction(Getting Started), Basic page structure, Color, Working with Text(Physical Formatting tag, Logical Formatting tag, Font tag, Heading Tag, Div tag, P tag, HR tag, BR tag, Pre Formatted Tag), Working with Links(Text Link, Image Link, Intra-document Link), Working with Images (Img tag), creating Lists (Ordered, Unordered, Definition), Using Tables (Table, Caption, TR, TH and TD), Creating Forms (Input, TextArea, Select).
(Book 1 –Chapter - 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7 , Book 2 - Chapters- 1, 2, 3, 4, 5, 6, 8, 9, 11)

UNIT-II: Cascading Style Sheets, JavaScript
Cascading Style Sheets: Introduction, Levels of Style Sheets (Inline Style, Embedded Style and External Style), Selector Forms (Class Selectors and ID selectors), Alignment of Text, Box Model.

JavaScript: Introduction to JavaScript, Placing JavaScript in an HTML file, Using Variables, JavaScript Operators (Assignment, Arithmetic, Comparison, Logical, Increment / Decrement, Special) , Conditional Statements(if, if..else, nested if..else and switch) and Loops(while, do..while and for).
(Book 1 - Chapter- 3.1, 3.2, 3.4, 3.9, 3.10, Book 4 - Chapters – 1, 2, 3, 5, 6)

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UNIT-III: JavaScript and XHTML Documents

JavaScript: Using Functions (Introduction, Declaring, Naming, Adding Arguments and Return Statement), JavaScript Arrays (Introduction, Defining and Accessing, Accessing an Array elements, Array Properties and Methods(push(), pop(), join(), shift() and sort()).

XHTML Documents (JavaScript): The Document Object Model (Document Object Properties and Methods), Navigator Object, Event and Event Handling (onclick, onload, onmousemove, onmouseover, onmouseout, onfocus, onblur, onsubmit).

(Book 4 - Chapters- 4, 7, 9, 8, 10)

UNIT-IV: Introduction to Python

Introduction to Python: Introduction, Features of Python, Data Types in Python (Comments, Identifiers, Reserved Words, Variables, Built-in Data types), Operators (Arithmetic, Relational, Logical, Boolean, Membership (in and not in), Identity (is and is not), Input (input()) / Output (print()) Statements, Control Statements (if, if..else, if..elif..else, while, for, break and continue), Execution of Simple Python Programs.

(Book 3 - Chapters-1, 3, 4, 5, 6, 2)

UNIT-V: XML

XML: Introduction, The syntax of XML, XML Document Structure, Document Type Definition (Declaring Elements, Declaring Attributes, Declaring Entities, Internal and External), Namespaces, XML Schemas (Schema Fundamentals, Defining a Schema, Simple Type and Complex Type), XSLT Style Sheets (Definitions Only), XML Processors (Purpose of XML Processor).

(Book 1 - Chapters-8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.9, 8.10)

Suggested Reading:

1. Robert W. Sebesta, Programming the World Wide Web, 3rd Edition , Pearson Education, 2006.
2. Wendy Willard, HTML5, McGraw Hill Education (India) Edition, 2013.
3. R. Nageswara Rao, Core Python Programming, 1st Edition, Dreamtech Press, 2001
4. John Pollock, JavaScript, 4th Edition, McGraw Hill Education (India) Edition, 2013.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA144 CO1: Develop simple programs using HTML5.

BCA144 CO2: Implement different types of Cascading Style Sheets and develop simple JavaScript programs.

BCA144 CO3: Apply the concepts of JavaScript with XHTML documents.

BCA144 CO4: Develop simple programs using Python.

BCA144 CO5: Apply the concepts of XML, XML DTD, XML Schema, XSLT and XML processor.

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Autonomous College – Affiliated to Osmania University
Department of Computer Science

PROGRAM NAME: BCA (w.e.f 2020-21)
COURSE NAME: WEB TECHNOLOGY LAB

PAPER CODE: BCA144P   **YEAR/SEMESTER: I/I**

1.Creating HTML Pages to test different tags
   a. Headers
   b. Linking Images
   c. Images as Anchors Text Formatting
   d. HTML Table Formatting
   e. Ordered and Unordered Lists
   f. Creations of Frames

2. Develop HTML5 form with client validations using JavaScript.

3. Methods of date and time objects

4. Using CSS perform the following
   a. Aligning Text
   b. Setting box dimensions
   c. Floating alerts

5. Demonstrating object hierarchy using collection

6. Using HTML events

7. Develop College Website using HTML5 and CSS

8. Develop Time Table Website using HTML5 and CSS

9. Write basic Python programs

10. Write basic XML programs

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PROGRAM NAME: BCA (w.e.f 2020-21)
COURSE NAME: EFFECTIVE COMMUNICATION

PAPER CODE: BCA145 **PPW: 4**
YEAR/SEMESTER: I/I **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To impart skills for effective communication for personal and professional enhancement.

UNIT-WISE COURSE OBJECTIVES:

COb1: To promote effective communication by making students aware of the role and importance of communication; the features, process and types of communication; and the barriers to communication.

COb2: To develop awareness of personality and interpersonal communication.

COb3: To study the appropriate usage of English language.

COb4: To build vocabulary and written communication skills.

COb5: To comprehend unseen passages.

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)

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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 Reading:

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.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA145 CO1: Value and demonstrate effective communication.

BCA145 CO2: Develop enhanced interpersonal communication through understanding of personality and relational development

BCA145 CO3: Demonstrate appropriate usage of English language.

BCA145 CO4: Apply appropriate vocabulary and to compose paragraphs, precis, essays, official letters and technical reports.

BCA145 CO5: Understand and analyse the content of unseen passages.

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PROGRAM NAME: BCA (w.e.f 2020-21)
COURSE NAME: IT WORKSHOP

PAPER CODE: BCA146P   **YEAR/SEMESTER: I/I**

1. **IT Hardware:** Identification of Parts / Peripherals and System Assembling , Disassembling
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 & 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.

<u>**Suggested Reading:**</u>

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.

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PROGRAM NAME: BCA (w.e.f 2020-21)
COURSE NAME: FUNDAMENTALS OF PROBABILITY AND STATISTICS

PAPER CODE: BCA241   **PPW: 4**
YEAR/SEMESTER: I/II   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: Students will gain the knowledge in basic statistics and learn to apply for real life data analysis. They will also acquire the knowledge to give the proper inference about the data.

UNIT-WISE COURSE OBJECTIVES:

COb1: To perceive the basic concepts in Statistics.

COb2: Calculate and interpret the various descriptive measures of centrality and dispersion.

COb3: Basic concepts of probability theory and apply concepts of various discrete and continuous probability distributions to various problems.

COb4: The concept of association between two variables and forecast future values by regression equations.

COb5: Acquire knowledge on Basic Statistical Inference and its applications.

UNIT-I
Data Validation and Information Abstraction: Importance of statistics, Methods of collecting Primary and Secondary data, Gathering information from data charting. (Diagrams and Graphs).

UNIT-II
Descriptive Statistics: Measures of central tendency (mean, median, mode) with simple applications. Absolute and relative measures of dispersion (range, quartile deviation, mean deviation and standard deviation) with simple applications. Moments, Skewness and Kurtosis. (Problems only on ungrouped data).

UNIT-III
Probability: Laws of Probability (Addition, multiplication, Conditional and Bay's Theorem) only statements with simple problem; Probability distributions: Binomial, Poisson, Continuous: Normal (only statements of properties, applications with simple problems)

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UNIT-IV

Correlation analysis- Scatter diagram, positive, negative correlation, Karl Pearson's coefficient of correlation, spearman's rank correlation(with problem), concepts of multiple and partial correlation(only conceptual frame work no numerical problems)

Regression analysis- concept, least square fit of linear regression, two lines regression, properties of regression coefficients (statements only).

UNIT-V

Hypothesis Testing: Introduction to tests of Significance, F, t, χ^2 tests.
t- test for single, two mean, χ^2- test for Independent of attributes and F-test for difference of variances(simple problems).

Suggested Reading:

1. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics" , 1989.
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.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA241 CO1: Develop skills in presenting quantitative and qualitative data using appropriate diagrams, tabulations and construction of frequency distributions.

BCA241 CO2: Acquire knowledge of various types of data, their organisation and evaluation of summary measures such as measures of central tendency and dispersion.

BCA241 CO3: Calculate probabilities by applying probability laws and theoretical results, knowledge of important discrete and continuous distributions, their interrelations with real time applications.

BCA241 CO4: Compute and interpret Correlation Analysis, regression lines and multiple regression analysis with applications.

BCA241 CO5: Become proficient in inferential statistics.

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PROGRAM NAME: BCA (w.e.f 2020-21)
COURSE NAME: OBJECT ORIENTED PROGRAMMING USING CPP

PAPER CODE: BCA242 **PPW: 4**
YEAR/SEMESTER: I/II **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of object oriented programming and develop simple applications.

UNIT-WISE COURSE OBJECTIVES:

COb1: To discuss the benefits and applications of object oriented approach, and explain basic concepts like Constants, Variables, Data types, Operators.

COb2: To illustrate different control statements and looping statements with real-time examples and explain about functions.

COb3: To explain the usage of member functions and constructors.

COb4: To construct class programs with inheritance, pointers.

COb5: To explore the concepts of polymorphism, templates and exception handling.

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.
(Book 1- Chapters 1,2,3)

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.
(Book 1- Chapters 3,5)

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UNIT-III

Functions in C++: Main function, function prototyping, call by reference, return by reference, inline functions, default arguments, Function overloading, friend function.

Constructors & Destructors: Constructors, parameterized constructors, multiple constructors in a class, copy constructors, destructors.

(Book 1- Chapters 4,5,6)

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, 'this' pointer.

(Book 1- Chapters 8,7,9)

UNIT-V

Polymorphism and Virtual Functions: Compile-time polymorphism vs runtime polymorphism, virtual functions.

Templates: Introduction, function templates, class templates.

Exception Handling: Introduction, exception handling mechanism, throwing mechanism, catching mechanism.

(Book 1- Chapters 9,12,13)

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.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA242 CO1: Develop simple programs.

BCA242 CO2: Implement different control statements.

BCA242 CO3: Program the concepts of classes and member functions.

BCA242 CO4: Apply the concepts of Inheritance

BCA242 CO5: Implement polymorphism, templates and exception handling

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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 a given matrix of m x n size.
4. Write a program to add corresponding elements of two 2-D matrices using friend function.
5. Demonstrate friend functions with two classes
6. Write a program to demonstrate objects as function arguments.
7. Write a program for finding area of different geometric shapes (Circle, Rectangle and Cube) using function overloading.
8. Write a Program to generate Fibonacci Series by using Constructor.
9. Demonstrate Dynamic Constructors.
10. Write a Program to demonstrate constructors with default arguments.
11. Write a Program to demonstrate pointers with arrays.
12. Write a program to demonstrate arrays of pointers.
13. Write a program to demonstrate pointers to objects.
14. Write a program to demonstrate single inheritance distinguishing public and private derivation.
15. Write a program to illustrate the implementation of both Multilevel and Multiple (Hybrid) inheritance.
16. Demonstrate binary operator overloading for addition.
17. Write a program to demonstrate the usage of virtual functions.
18. Write a program to sort a given set of elements using function template.
19. 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.

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PROGRAM NAME: BCA (w.e.f 2020-21)
COURSE NAME: COMPUTER ARCHITECTURE

PAPER CODE: BCA243   **PPW: 4**
YEAR/SEMESTER: I/II   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: This course will expose students to the basic architecture of processing, memory and I/O organization in a computer system

UNIT-WISE COURSE OBJECTIVES:

COb1: To discuss the basic concepts of functional units, bus structures, software performance, memory locations, addressing modes & basic I/O operations

COb2: To illustrate different arithmetic operations like addition, subtractions, multiplication, integer division and operations.

COb3: To explain the fundamental concepts of processing unit, hardwired, micro programmed control, pipeline and data path control consideration.

COb4: To explain about memory systems ROM, RAM, speed, size and cost, cache memory, virtual memory and secondary storage

COb5: To explain about I/O Devices, interrupts, DMA, BUSES, I/O interface and standard circuits

UNIT-I
Basic Structure of Computers:
Functional units, Basic operational concepts, Bus structures, Software, performance.
Machine Instructions and Programs:
Memory locations and addresses, Memory operations, Instruction and instruction sequencing, Addressing modes, Assembly language, Basic I/O operations.
(Book 1 - Ch-1:1.2, 1.3, 1.4, 1.5,1.6, Ch-2:2.2, 2.3, 2.4, 2.5, 2.6, 2.7)

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.
(Book 1 - Ch-6:6.1,6.2, 6.3, 6.4, 6.5, 6.6)

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UNIT-III
Basic Processing Unit:
Fundamental concepts, Execution of a complete instruction, Hardwired control, Micro programmed control,
Pipelining:
Pipelining, Basic concepts, Data hazards, Instruction hazards, Influence on Instruction sets, Data path and control consideration.
(Book 1 - Ch-7:7.1, 7.2, 7.4, 7.5, Ch-8:8.1, 8.2, 8.3, 8.4,8.5)

UNIT-IV
Memory System:
Basic concepts, Semiconductor RAMs, ROMs, Speed, size and cost, Cache memories, Performance consideration, Virtual memory, Memory Management requirements, Secondary storage.
(Book 1 - Ch-5:5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9)

UNIT-V
Accessing I/O devices, Interrupts-interrupt hardware, enabling and disabling, handling multiple devices, controlling device requests, Direct Memory Access-bus arbitration, Buses –synchronous, asynchronous, Interface circuits-parallel port, serial port, Standard I/O Interfaces (PCI, SCSI, USB).
(Book 1 - Ch-4:4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7)

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.

COURSE OUTCOMES:
At the end of the course students will be able to:

BCA243 CO1: Acquire knowledge on concepts such as functional units, bus structures, software performance, memory locations, addressing modes & basic I/O operations

BCA243 CO2: Perform different arithmetic operations, integer division and operations.

BCA243 CO3: Acquire knowledge of fundamental concepts, hardwired, micro programmed control, pipeline and data path control consideration.

BCA243 CO4: Understood About memory systems, cache memory, virtual memory and secondary storage

BCA243 CO5: Acquire knowledge on I/O Devices, Interrupts, Direct Memory Access, Buses, Interface circuits, Standard I/O Interfaces (PCI, SCSI, USB).

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PROGRAM NAME: BCA (w.e.f 2020-2021)
COURSE NAME: DATA STRUCTURES

PAPER CODE: BCA244
YEAR/SEMESTER: I/II

PPW: 4
NO. OF CREDITS: 4

COURSE OBJECTIVE: To train the students with the concepts of Arrays, Stacks, Queues, Linked Lists, Hashing, Trees, Graphs, Sorting and Searching techniques.

UNIT-WISE COURSE OBJECTIVES:

COb1: To explain the Array as an abstract data type and String Pattern Matching.

COb2: To acquire knowledge on Stacks and Queues.

COb3: To learn Singly Linked list, Doubly Linked List, Circular List and Hashing.

COb4: To enlighten the importance of Trees and Graphs.

COb5: To determine the best Sorting and Searching techniques.

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, Strings—String Pattern Matching (A Simple Algorithm).
(Book 1 - Chapter: 2.1,2.2,2.5,2.6.1)
<u>Note:</u> Theory & Algorithm/ Pseudocode only for all concepts

UNIT-II
Stacks and Queues: The Stack Abstract Data type- Representation of Stacks, Operations on Stacks, The Queue Abstract Datatype- Representation of Queues, Operations on Queues, Types of Queues-Circular Queue, Operations on Circular Queue.
(Book 1 - Chapter: 3.2, 3.3)
<u>Note:</u> Theory & Algorithm/ Pseudocode only for all concepts

UNIT-III
Linked Lists: Singly Linked Lists-Defining a Node in C++,Insert and Delete operations on Singly Linked List, Doubly Linked Lists-Insert and Delete operations on Doubly Linked List, Circular Lists-Insert and Delete operations on Circular List.
Hashing: Static Hashing: Hash Tables, Hash Functions-Division, Mid-Square, Overflow Handling-Linear probing(Linear open addressing) **(Book 1- Chapter: 4.1, 4.2, 4.10,4.4, Chapter:8.2.1,8.2.2.1,8.2.2.2,8.2.4.1)**
<u>Note:</u> Theory & Algorithm/ Pseudocode only for all concepts

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UNIT-IV

Trees: Introduction, Binary Trees, Representation of Binary Tree, Binary Tree Traversal-Inorder, Preorder and Postorder Traversals, Binary Search Tree, Operations on Binary Search Tree- Searching, Insertion, Deletion operations on Binary Search Tree.

Graphs: Terminology, Types, Representation of Graph, Elementary Graph operations- DFS and BFS.
(Book 1 - Chapter: 5.1, 5.2,5.3.1,5.3.2,5.3.3,5.3.4,5.7.1,5.7.2,5.7.3,5.7.4, Chapter:6.1, 6.2.1, 6.2.2)
<u>Note</u>: **Theory & Algorithm/ Pseudocode only for all concepts**

UNIT-V

Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort-Merging, Heap Sort.
Searching Techniques: Linear Search, Binary Search
(Book 1 - Chapter: 7.9, Chapter:1.5.1, Chapter:7.2,7.3,7.5.1,7.6,7.1, Chapter:1.5.1)
<u>Note</u>: **Theory & Algorithm/ Pseudocode only for all concepts**

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 Education2006.
3. Michael T. Goodrich, Roberto Tamassia, David Mount, Data Structures and Algorithms in C++, Wiley India Pvt. Ltd,2004.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA244 CO1: Summarize the concepts of Array as an abstract data type and String Pattern Matching.

BCA244 CO2: Review the various operations of Stacks and Queues.

BCA244 CO3: Govern the operations of Single Linked List, Doubly Linked List, Circular List and Hashing.

BCA244 CO4: Deliberate the logic of binary search tree operations and traversing a graph.

BCA244 CO5: Summarize the concepts of searching and sorting techniques.

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PROGRAM NAME: BCA (w.e.f 2020-2021)
COURSE NAME: DATA STRUCTURES LAB

PAPER CODE: BCA244P   **YEAR/SEMESTER: I/II**

1. Write a C++ program for the implementation of Array.
2. Write a C++ program to implement the operations of Sparse Matrices.
3. Write a C++ program for the implementation of String.
4. Write a C++ program to implement the following using array
   a. Stack
   b. Queue
5. Write a C++ program to implement the following using
   a. Singly linkedlist
   b. Doubly linkedlist
   c. Circular linkedlist
6. Write a C++ program to implement stack using linkedlist.
7. Write a C++ program to implement queue using linkedlist.
8. Write a C++ program to implement Heap Tree.
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
11. Write C++ program for implementing the following sorting methods
    a. Insertion sort
    b. Quick sort
12. Write C++ program for implementing the shell sorting method.
13. Write C++ program for implementing the following sorting methods
    a. Merge sort
    b. Heap sort
14. Programs on Linear Search and Binary Search.

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PROGRAM NAME: BCA (w.e.f 2020-2021)
COURSE NAME: DATA COMMUNICATIONS

PAPER CODE: BCA245   **PPW: 4**
YEAR/SEMESTER: I/II   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: Enables the student to identify how the data moves across different systems in the network.

UNIT-WISE COURSE OBJECTIVES:

COb1: To impart knowledge of layers in networking.

COb2: To impart knowledge about Analog and Digital data transmission and Transmission media.

COb3: To impart knowledge about the coding of data into signals.

COb4: To impart knowledge about errors and their types along with Data Link Control Protocols.

COb5: To impart knowledge about different types of multiplexing.

UNIT-I: Data communication, Data networking and the Internet, Protocol Architecture
Data communication, Data networking and the Internet: A communication model, Data communications-A Data Communication Model Networks-Wide Area Networks, Local Area Networks, Wireless Networks, The Internet-Origins of the Internet, Key Elements, Internet Architecture.
Protocol Architecture: Need for protocol Architecture, TCP/IP Protocol Architecture-The TCP/IP Layers, Operation of TCP and IP, TCP/IP Applications, The OSI model, TCP/IP Vs OSI model.
(Book 1 - Chapters 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3)

UNIT-II: Data Transmission, Transmission Media
Data transmission: Concepts and terminology – Transmission Terminology, Frequency, Spectrum, and Bandwidth, Analog and Digital Data Transmission-Analog and Digital Data, Analog and Digital Signals, Data and Signals, Analog and Digital Transmission, Transmission impairments-Attenuation , Delay Distortion, Noise.
Transmission Media: Guided Transmission Media–Twisted Pair, Coaxial cable, Optical fiber and unguided/ Wireless Transmission Media-Antennas, Terrestrial Microwave, Satellite Microwave, Broadcast Radio.
(Book 1 - Chapters 3.1, 3.2, 3.3, 4.1, 4.2)

UNIT-III: Signal Encoding Techniques
Signal Encoding Techniques:
Digital data to Digital signals – Nonreturn-to-Zero (NRZ), Multilevel Binary, Biphase.
Digital data to Analog signals - Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying.

Analog data to digital signals - Pulse Code Modulation, Delta Modulation (DM),
Analog data to Analog signals - Amplitude Modulation, Angle Modulation (FM, PM).
(Book 1 - Chapter 5.1, 5.2, 5.3, 5.4)

UNIT-IV: Digital Data Communication Techniques, Data Link Control Protocols

Digital Data Communication Techniques: Asynchronous and Synchronous transmission – Asynchronous Transmission, Synchronous Transmission, Types of errors, Error Detection techniques- Parity Check, Cyclic Redundancy Check (Modulo 2 Arithmetic).

Data link control protocols: Flow control-Stop-and-Wait Flow Control , Sliding-Window Flow Control, Error control-Stop-and-Wait ARQ, Go-Back-N ARQ , Selective-Reject ARQ, High level data link control (HDLC) protocol-Basic Characteristics, Frame Structure, Operation.
(Book 1 - Chapters 6.1, 6.2, 6.3, 7.1, 7.2, 7.3)

UNIT-V: Multiplexing

Multiplexing: Frequency division multiplexing - characteristics, Synchronous time division multiplexing - characteristics, Statistical time division multiplexing - characteristics.
(Book 1 - Chapter 8.1, 8.2, 8.3)

Suggested Reading:

1. William Stallings, Data and Computer Communications, 8/e, Pearson Education., 2013.
2. S.S. Shinde, Computer Networks
3. Behrouz A Forouzan, Data Communications and Networking, 4/e, McGraw Hill, 2012.
4. Andrew S. Tanenbaum, David J Wetherall, Computer Networks
5. Behrouz A Forouzan, Firouz Mosharraf, Computer Networks A Top-Down Approach
6. James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet
7. Fred Harshall, Data Communications, Computer Networks and Open systems, 4/e, Pearson Education, 2005.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA245 CO1: Acquire knowledge on the fundamental concepts and terminologies in networking and seven layers of OSI network model and four layers of TCP/IP model.

BCA245 CO2: Acquire knowledge about the characteristics of Digital and Analog Data along with Transmission media.

BCA245 CO3: Identify how exactly the given data in either digital or analog format is converted into either analog or digital signal format.

BCA245 CO4: Acquire knowledge about Asynchronous v/s Synchronous transmission along with the concept of Errors and also learnt about Data Link Control Protocols.

BCA245 CO5: Acquire knowledge about different multiplexing techniques (FDM, TDM).

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PROGRAM NAME: BCA (w.e.f 2020-2021)
COURSE NAME: COMMUNICATION SKILLS LAB

PAPER CODE: BCA246P   **YEAR/SEMESTER: I/II**

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 Reading:

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.

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PROGRAM NAME: BCA (w.e.f 2021-22)
COURSE NAME: APPLIED MATHEMATICS

PAPER CODE: BCA341   **PPW: 4**
YEAR/SEMESTER: II/III   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To familiarize concepts in basic notions of differential calculus and modern mathematical subjects.

UNIT-WISE COURSE OBJECTIVES:

COb1: Apply a range of techniques to solve first & second order partial differentials.

COb2: To construct mathematical expressions involving functions and their derivatives, compute mathematical quantities using differential calculus.

COb3: To learn concepts in Vector Space and Subspace.

COb4: To acquire knowledge about Row space, Column space, Null space and matrix of Linear Transformation.

COb5: To explain the concepts of eigen vectors and eigen values.

UNIT I
Partial Differentiation: Introduction - Functions of two variables - Neighborhood of a Point (a, b) Continuity of a Function of Two Variables, Continuity at a Point - Limit of a Function of Two Variables - Partial Derivatives - Geometrical representation of a Function of Two Variables - Homogeneous Functions.
(Book 1 - Chapter: 11(11.1 to 11.8))

UNIT II
Theorem on Total Differentials, Composite Functions, Differentiation of Composite Functions, Implicit Functions, Equality of $f_{xy}(a, b)$ and $f_{yz}(a, b)$, Taylor's Theorem for a Function of Two Variables, Maxima and Minima of Functions of Two Variables, Lagrange's Method of Undetermined Multipliers.
(Book 1 - Chapters: 9(9.6, 9.7) & 11(11.10, 11.11))

UNIT III

Vector Spaces: Vector Spaces and Subspaces, Linearly Combinations, Linearly Independent and Dependent Sets; Bases, Coordinate Systems, The Dimension of a Vector Space.
(Book 2 - Chapters: 4.1 ,4.3 & 4.5)

UNIT IV

Null Space, Column Space and Row Space of a Matrix, Basis and Dimensions of Null Space, Column Space and Row Space of a Matrix, Rank and Rank Theorem, Linear Transformations, Kernel and Range of Linear Transformations, Matrix of a Linear Transformations.
(Book 2 - Chapter: 4.2, 4.6, 4.7, 5.1 & 5.2)

UNIT - V

Eigen Values , Eigen Vectors, The characteristic Equation, Diagonalization, Complex Eigen values.
(Book 2 - Chapter: 5.3, 5.4, & 5.5)

**NOTE**: No proofs of theorems in all units.

Suggested Readings:

1. Shanti Narayan, P.K. Mittal Differential Calculus, 15th Edition, S.CHAND, NEW DELHI.
2. David C Lay,Linear Algebra and its Applications 4th Edition, Pearson Publications.
3. S Lang, Introduction to Linear Algebra, Springer Publications, 2nd Edition.
4. Gilbert Strang , Linear Algebra and its Applications, Cengage Learning5th Edition
5. Shanti Narayan Integral Calculus, S.CHAND, NEW DELHI, 35th Edition

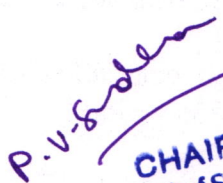**COURSE OUTCOMES:** At the end of the course students will be able to:

BCA341 CO1: Evaluate first & second order partial derivatives.

BCA341 CO2: Compute the Total Differentials, Composite Functions and Maxima and Minima of functions of two variables.

BCA341 CO3: Interpret properties of Vector Space and Subspace.

BCA341 CO4: Compute and calculate Rank and Nullity.

BCA341 CO5: Evaluate eigen vectors and eigen values.

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PROGRAM NAME: BCA (w.e.f 2021-22)
COURSE NAME: JAVA PROGRAMMING

COURSE CODE: BCA342   **PPW: 4**

YEAR/SEMESTER: II/III   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To familiarize the students with Java programming.

UNIT-WISE COURSE OBJECTIVES:

COb1: To discuss Object-Oriented programming concepts in Java.

COb2: To acquire knowledge on Arrays, Strings, Inheritance, Interfaces, Packages and Inner
Classes in Java.

COb3: To illustrate the importance of Exception Handling and Multithreading in Java.

COb4: To demonstrate the concepts of GUI Design & Event Handling.

COb5: To impart knowledge on File Handling and Collections Framework.

UNIT-I
Introduction to Java: Java History – Features of Java, The Birth of Modern Programming:
C, C++: The Next Step, The Creation of Java, Java Primitive Types, Basic Operators,
Control Statements.
Defining Classes: Adding Instance Fields and Methods, Constructors, Access Modifiers
(Visibility Modes), Object Creation Examples, Method Overloading and Constructor
Overloading, Use of Static and Final Keywords, Objects as Parameters, The Scope and
Life Time of Variables, Introduction to Object Class, How to Read User Input(from
Keyboard).
(Book 1 – Chapters: 1, 3, 4, 5, 6, 7, 8, 9, 13)

UNIT-II
Arrays, Strings in Java: How to Create and Define Arrays, Introduction to Java.util.Array
Class, Difference between String & Stringbuffer Classes, StringTokenizer Class, Wrapper
Classes and Conversion between Objects & Primitives.
Inheritance, Interfaces and Packages in Java: Defining Super/Sub Classes, Abstract
Classes, Method Overriding, Interfaces, Creating and Defining Packages.
Inner Classes in Java: Types of Inner Classes.
(Book 1 – Chapters: 3, 17, 15, 18, 16, 8, 9)

UNIT-III

Exception Handling in Java: What are Exceptions, Writing your own Exception Classes, Try, Catch, Throw, Throws Clauses, Difference between Checked Vs Unchecked Exceptions, Errors Vs Exception.

Multithreading in Java: Thread and its Life Cycle, How to Create Threads, Thread Class in Java, Use of Synchronized Keyword, How to Avoid Deadlock.

(Book 1 – Chapters: 10, 11)

UNIT-IV

GUI Design & Event Handling: Component, Container, Color, GUI Controls, Layout Managers, Introduction to Swings, Events, Listeners, Writing GUI Based Applications, Applets, Running Applets.

(Book 1 - Chapters : 24, 25, 30, 23, 22)

UNIT-V

File Handling: Stream Classes, Reader and Writer Classes, File and Directory Class.
Generics and Frameworks: Generics, Collections Framework, Collection Interfaces and Classes, ArrayList, LinkedList, Vector.

(Book 1 – Chapters: 19, 20, 17)

Suggested Readings:

1. Herbert Schildt : "Java : The Complete Reference Java", Eighth Edition,Tata McGraw Hill Publications, 2011, ISBN: 9781259002465.
2. E.Balaguruswamy, Programming with Java, A primer 5th edition, Tata McGraw-Hill,2014
3. John R. Hubbard, Programming with Java, Second Edition, Schaum's outline Series, Tata McGraw-Hill, 2007.
4. Timothy Budd, Understanding Object Oriented Programming with Java, Pearson Education, 2007.

COURSE OUTCOMES: At the end of the course students will be able to:

BCA342 CO1: Comprehend Object-Oriented programming concepts in Java.

BCA342 CO2: Implement the concepts of Arrays, Strings, Inheritance, Interfaces, Packages and Inner Classes in Java.

BCA342 CO3: Employ the concepts of Exception Handling and Multithreading in Java.

BCA342 CO4: Apply the concepts of GUI Design & Event Handling.

BCA342 CO5: Develop applications using File Handling and Collections Framework.

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PROGRAM NAME: BCA (w.e.f 2021-2022)
COURSE NAME: JAVA PROGRAMMING LAB

PAPER CODE: BCA342P   **YEAR/SEMESTER: II/III**

COURSE OBJECTIVE: Enable students to apply Object-Oriented Concepts and GUI Programming.

Cob1: To demonstrate the concepts of Control statements, Object-Oriented Concepts, packages, Exception Handling and Multithreading using Java Programming.

Cob2: To illustrate the concepts of AWT, Applets, GUI Design and Event Handling.

1. Programs on if-else, if-else-if.
2. Program on switch.
3. Program on while.
4. Program on for loop.
5. Program on do-while.
6. Program to demonstrate class concept.
7. Program to demonstrate methods.
8. Program to demonstrate method overloading.
9. Program to demonstrate constructors.
10. Program to demonstrate constructor overloading.
11. Program to demonstrate an Array.
12. Program to demonstrate multidimensional array.
13. Program to demonstrate Strings.
14. Program to demonstrate inheritance.
15. Program to demonstrate method overriding.
16. Program to demonstrate abstract class.
17. Program to demonstrate reading console input.
18. Program to demonstrate interfaces.
19. Program to demonstrate packages.
20. Program to demonstrate exceptional handling.
21. Program to demonstrate creating a thread by extending Thread class.
22. Program to demonstrate creating a thread by implementing Runnable interface.
23. Program to demonstrate AWT controls.

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24. Program to demonstrate Layout Manager.
25. Program to demonstrate Events.
26. Program to demonstrate applets.

COURSE OUTCOMES: At the end of the course students will be able to:

BCA342P CO1: Apply Control Statements, Object-Oriented Programming concepts, Packages, Exception Handling and Multithreading.

BCA342P CO2: Implement AWT, Applets, GUI design and Event Handling.

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PROGRAM NAME: BCA (w.e.f 2021-22)
COURSE NAME: ENVIRONMENTAL SCIENCE

PAPER CODE: BCA343   **PPW: 4**

YEAR/SEMESTER: II/III   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To instill social responsibility among students to protect the environment and to promote judicious use of natural resources.

UNIT-WISE COURSE OBJECTIVES:

COb1: To introduce students to the scope and importance of environmental studies; to senstise students about the misuse of water resources and ill effects of modern agricultural practices.

COb2: To gain knowledge about the various ecosystems, and to promote optimal use of land and energy resources.

COb3: To appreciate the need to protect the endangered species and to conserve the rich biodiversity on earth.

COb4: To understand the harmful effects of all kinds of pollution and to study their control measures and environmental legislation.

COb5: To sensitise the students about the major environmental challenges like climate change , global warming, ozone depletion and the steps to be taken towards effective disaster management.
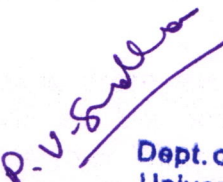
UNIT I
Environmental Studies: Definition, Scope and Importance, Need for Public Awareness. **Natural Resources:** Water Resources; Use and Over-Utilization of Surface and Ground Water, Floods, Drought, Conflicts Over Water, Dams: Benefits and Problems. Effects of Modern Agriculture, Fertilizer- Pesticide Problems, Water Logging and Salinity.

UNIT- II
Ecosystems: Concept of an Ecosystem, Structure and Function of an Ecosystem, Producers, Consumers and Decomposers, Energy Flow in Ecosystem, Food Chains, Ecological Pyramids, Aquatic Ecosystem (Ponds, Streams, Lakes, Rivers, Oceans, Estuaries).

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Energy Resources: Growing Energy Needs, Renewable And Non-Renewable Energy Sources. Land Resources, Land as a Resource, Land Degradation, Soil Erosion and Desertification.

UNIT- III

Biodiversity: Genetic Species and Ecosystem Diversity, Bio-Geographical Classification of India. Value of Biodiversity, Threats to Biodiversity, Endangered and Endemic Species of India, Conservation of Biodiversity.

UNIT IV

Environmental Pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution; solid and liquid waste management.

Environment Protection Act: Air, water, forest and wild life Acts, enforcement of environmental legislation.

UNIT V

Social Issues and the Environment: Water Conservation, Watershed Management, and Environmental Ethics. Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion. **Environmental Disaster Management:** Types of Disasters, Impact of Disasters on Environment, Infrastructure, and Development. Basic Principles of Disaster Mitigation, Disaster Management, and Methodology. Disaster Management Cycle, and Disaster Management in India.

Suggested Readings:

1. A.K. De, Environmental Chemistry, Wiley Eastern Ltd.
2. E.P. Odum, Fundamentals of Ecology, W.B. Sunders Co., USA.
3. M.N. Rao and A.K. Datta , Waste Water Treatment, Oxford and IBK Publications.
4. Benny Joseph, Environmental Studies, Tata McGraw Hill, 2005.
5. V.K. Sharma, Disaster Management, National Centre for Disaster Management, IIPE,1999.
6. Green Building Council of India, Teri Document.

COURSE OUTCOMES: At the end of the course, the student will be able:

BCA343 CO1: Assess the importance of environmental studies and develop sustainable practices for water management and agriculture.

BCA343 CO2: Examine the function of ecosystems and integrate them with judicious use of land and energy resources.

BCA343 CO3: Demonstrate appreciation for biodiversity and express concern for endangered species.

BCA343 CO4: Discuss the different types of pollution and relate them to the control measures in the light of environmental legislation.

BCA343 CO5: Evaluate the role of social and environmental ethics to overcome environmental challenges and to apply them in the area of disaster management.

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PROGRAM NAME: BCA (w.e.f 2021-22)
COURSE NAME: OPERATING SYSTEM CONCEPTS

PAPER CODE: BCA344	**PPW: 4**
YEAR/SEMESTER: II/III	**NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students, acquire knowledge on Operating System Services and Functions, Processes, Memory Management, Disk Management, Security and Protective Measures.

UNIT-WISE COURSE OBJECTIVES:

COb1: To impart the basic concepts of Operating System Services.

COb2: To explain Process Synchronization Methods and Deadlocks.

COb3: To describe the Main Memory Management.

COb4: To outline File System Interface Concepts.

COb5: To comprehend the concepts of Protection and Security.

UNIT I
Introduction: Definition of Operating System, Computer System Architecture- Single Processor System, Multi-Processor System, Clustered System, Operating-System Structure- Operating System Services, System Calls, **Operating System Structures:** Operating System Services, System Calls.
Process: Process Concept-The Process, Process State, Process Control Block, Thread; Process Scheduling- Scheduling Queues, Schedulers, Context Switch; Inter process Communication(Only Definition) **Threads:** Overview- Motivation, Benefits.
CPU Scheduling: Basic Concepts:CPU-I/O Burst Cycle, CPU Scheduler, Preemptive Scheduling, Scheduling Criteria , Scheduling Algorithms - FCFS , SJF, Priority Scheduling, Round Robin Scheduling.
(Book 1 - Chapters: 1, 2, 3, 6)

UNIT II
Process Synchronization: Background, The Critical-Section Problem, Peterson's Solutions, Semaphores- Semaphore Usage, Classic Problems of Synchronization- The Bounded-Buffer Problem, The Reader's Writer's problem, The Dining Philosophers' Problem, Monitors- Monitor Usage.

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance (Introduction), Deadlock Detection(Introduction), Recovery from Deadlock- Process Termination, Process Preemption.
(Book 1 - Chapters: 5,7)

UNIT III

Main Memory: Swapping- Standard Swapping, Swapping on Mobile Systems, Contiguous Memory Allocation- Memory Protection, Memory allocation, Fragmentation; Segmentation- Basic Method, Segmentation hardware, Paging- Basic Method, Structure of the Page Table- Hierarchical.

Virtual Memory: Background, Demand Paging - Basic Concepts, Page Replacement- Basic Page Replacement, FIFO Page Replacement, Optimal Page Replacement, LRU page Replacement, Thrashing-Cause of Thrashing.

Mass-Storage Structure: Overview of Mass Storage Structure - Magnetic Disks, Solid State Disk, Magnetic Tapes. Disk Structure, Disk Scheduling – FCFS Scheduling, SSTF Scheduling, SCAN Scheduling, C-SCAN Scheduling. Disk Management, RAID Structure (level 0, level 1, level 1+0).
(Book 1 - Chapters: 8,9,10)

UNIT IV

File-System Interface: File Concept - File Attributes, File Operations. Access Methods, Directory and Disk Structure- Storage Structure, Directory Overview, Single Level Directory, Two-level Directory, Protection.

File-System Implementation: File-System Structure, Directory Implementation- Linear Lists, Hash Table. Allocation Methods - Contiguous Allocation, Linked Allocation, Indexed Allocation, Performance. Efficiency and Performance- Efficiency, Performance.

I/O Systems: Overview, Kernel I/O Subsystem- I/O Scheduling, Buffering, Caching. Transforming I/O Requests to Hardware Operations.
(Book 1 - Chapters: 11, 12, 13)

UNIT V

Protection: Goals of Protection, Principles of Protection, Domain of Protection-Domain Structure. Access Matrix, Access Control, Revocation of Access Rights.

Security: The Security Problem, Program Threats-Trojan, Horse, Trap Door, Logic Bomb, Stack and Buffer Overflow, Viruses. System and Network Threats-Worms, Port Scanning, Denial of Service. User Authentication-Passwords, Password Vulnerabilities, Securing Passwords, One Time Password, Biometrics.
(Book 1 - Chapters: 14, 15)

Suggested Readings :

1. Abraham Silberschatz, Peter Galvin, Greg Gagne, "Operating System Concepts", Ninth Edition, John wiley and sons publication, 2013.
2. A.Tanenbaum,"Modern Operation Systems", Third Edition, Pearson Education, 2008.

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3. William Stallings, "Operating Systems", Fifth Edition, Pearson Education, 2005.
4. Ida M.Flynn, "Understanding Operating Systems", Sixth Edition, Cengage, 2011.
5. D.M.Dhamdhere,"Operating systems a concept based approach", Second Edition, McGraw-Hill, 2007

COURSE OUTCOMES: At the end of the course, the student will be able:

BCA344 CO1: To paraphrase operating system services and how these services are implemented.

BCA344 CO2: To summarize how a process is synchronized and scheduled.

BCA344 CO3: To infer different approaches of memory management.

BCA344 CO4: To illustrate the structure and organization of file system.

BCA344 CO5: To correlate the different Security and Protection measures of a system.

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PROGRAM NAME: BCA (w.e.f 2021-2022)
COURSE NAME: OPERATING SYSTEM CONCEPTS LAB

COURSE CODE: BCA344P   **YEAR/SEMESTER:II/III**

COURSE OBJECTIVE: To enable students with knowledge in selecting CPU scheduling and page replacement algorithms.

COb1: To familiarize the Unix shell commands.

COb2: To demonstrate the implementation of CPU Scheduling and Page Replacement Algorithms.

I: Unix Shell Commands- mkdir, cfinger,d, ls, cat, touch, rmdir, man, pwd, mv, cp, rm, cut, cal, date, factor, who, who am i, finger, wc, sort, grep, head, tail , ps, more, banner, mail, write, wall, ps, kill, nice.
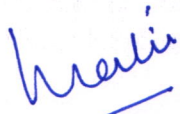
II: System Calls, CPU Scheduling and Page Replacement Algorithms:
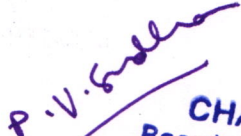1. Process System Calls
2. IO System Calls
3. IPC using Pipe Processing
4. First Come First Serve Scheduling
5. Shortest job first Scheduling
6. Priority Scheduling
7. Round Robin Scheduling
8. Simulate Page Replacement Algorithms FIFO
9. Simulate Page Replacement Algorithms LRU
10. Simulate Page Replacement Algorithms OPTIMAL

COURSE OUTCOMES: At the end of the course, the student will be able to:

BCA344P CO1: Apply the Unix shell commands.

BCA344P CO2: Implement the CPU Scheduling and Page Replacement algorithms

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PROGRAM NAME: BCA (w.e.f 2021-22)
COURSE NAME: DATABASE DESIGN

PAPER CODE: BCA345   **PPW: 4**

YEAR/SEMESTER: II/III   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: Enable students to acquire knowledge on Database Models, Normalization, File Organization, Transaction Management and Concurrency Control.

UNIT-WISE COURSE OBJECTIVES:

COb1: To impart knowledge on the basic concepts of database.

COb2: To explain Entity-Relation approach of data modeling.

COb3: To describe the relational model and Normalization.

COb4: To outline Transaction Management concepts.

COb5: To comprehend the concepts of recovery and security in databases.

UNIT I
Introduction to Databases: Database Environment – Concepts And Definitions, Traditional File Processing Systems, Database Approach, Range of Database Applications, Advantages, Costs and Risks, Components, SDLC, Three Schema Architecture.
(Book 1 - Chapters: 1, 2)

UNIT- II
Database Analysis - E-R Model – Entities, Attributes, Relationships, Degree and Cardinality - Case Studies.
Enhanced E-R Model - Super Type, Sub Type, Specialization and Generalization, Constraints, Disjointness, Subtype Discriminator, Super Type /Subtype Hierarchies.
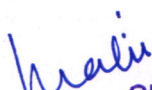**(Book 1 - Chapter: 7)**

UNIT- III
Relational Model – Definitions, Integrity Constraints, Transforming EER Diagrams into Relations, Normalization - Normal Forms, Merging Relations, Case Study.
Overview of Storage and Indexing: File Organizations and Indexing- Clustered Indexes Primary and Secondary Indexes, Index Data Structures, RAID- Level 1, Level 0, Level 1+0.
(Book 1 - Chapter: 7, Book 2 - Chapter: -8)

UNIT IV

Tree-Structured Indexing: Indexed Sequential Access Method (ISAM)- Overflow Pages, Locking Considerations, B+ Trees: A Dynamic Index Structure - Format of a Node. Search, Insert, Delete, Construction of B+ Tree.

Hash-Based Indexing: Static Hashing – Notation and Conventions, Extendible Hashing, Linear Hashing, Extendible Vs Linear Hashing.

(Book 2 - Chapters: 10, 11)

UNIT V

Transaction Management: ACID Properties- Consistency and Isolation, Atomicity and Durability, Transactions and Schedules. Concurrent Execution of Transactions- Motivation for Concurrent Execution, Serializability. Lock-Based Concurrency Control- Strict 2-Phase Locking, Deadlocks.

Concurrency Control: 2PL, Serializability and Recoverability- View Serializability. Introduction to Lock Management- Implementing Lock and Unlock Requests- Atomicity of Locking and Unlocking. Dealing with Deadlock – Deadlock Prevention.

(Book 2 - Chapters: 16, 17)

Suggested Readings:

1. Fred R Me Fadden. Jeffrey A Hoffer, Mary B Prescott - Modern Database Management, Fifth edition. Addition Wesly 2016.
2. Raghu Ramakrishnan, Johannes Gehrke, "*Database Management Systems*", Third Edition, McGraw Hill, 2014.
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, "*Database System Concepts*", Sixth Edition, McGraw-Hill International Edition, 2011

COURSE OUTCOMES: At the end of the course, the student will be able to:

BCA345 CO1: Acquire knowledge on the basic concepts of Database.

BCA345 CO2: Familiarize the Entity-Relation approach of Data Modeling.

BCA345 CO3: Paraphrase the Relational Model and Normalization.

BCA345 CO4: Summarize Transaction Management concepts.

BCA345 CO5: Acquire knowledge on the concepts of recovery and security in databases.

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PROGRAM NAME: BCA (w.e.f 2021-22)
COURSE NAME: DATABASE DESIGN LAB

PAPER CODE: BCA345P   **YEAR/SEMESTER: II/III**

COURSE OBJECTIVE: Enable students to acquire knowledge on SQL Commands, Clauses, Stored Procedures and Triggers.

COb1: To impart the basic concepts of SQL commands and Clauses.

COb2: To program the SQL commands through Stored Procedures and Triggers.

1. Create command for creating a table using primary key
2. Alter command for altering the column name and datatype of a column in the table
3. Alter command to add new column to the existing table
4. Alter command to modify the existing name of the column in the table
5. Drop command of the table
6. Truncate command for the table
7. Insert command for storing the records in the database table
8. Update command for updating a particular record by using where clause
9. Delete command for removing a particular record from the table
10. Select command for selecting data from the table
11. Select command for selecting the specific data from the data by using where clause and select distinct statement
12. Select command for selecting the records by using ORDER BY clause ASC
13. Select command for selecting the records by using ORDER BY clause DESC
14. SQL Built in functions (MIN. MAX, COUNT, AVG, SUM)
15. SQL Query to perform AND Operator and OR Operator
16. SQL Query to perform GROUPBY Clause
17. SQL Query to perform HAVING Clause
18. SQL l Queries to perform integrity constraints
19. SQL Query to perform SQL BETWEEN Operator
20. Joins – Equi Join, Non-Equi Join, Outer Join and Self Join
21. Stored Procedures
22. Triggers

COURSE OUTCOMES: At the end of the course, the student will be able to:

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BCA345P CO1: Query the database with appropriate commands and clauses

BCA345P CO2: Apply stored procedures and triggers on the database.

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PROGRAM NAME: BCA (w.e.f 2020-21)
COURSE NAME: DISTRIBUTED AND CLOUD COMPUTING

PAPER CODE: BCA441   **PPW: 4**
YEAR/SEMESTER: II/IV   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To impart knowledge in students with the concepts of Distributed Systems and Cloud Computing

UNIT-WISE COURSE OBJECTIVES:

COb1: To introduce Distributed Systems and Inter process Communication.

COb2: To impart knowledge on Remote Method Invocation and Publish-Subscribe systems.

COb3: To explain the concepts of cloud computing, system models, types of clouds, features, principles of cloud computing and its challenges and risks.

COb4: To discuss the concepts of Virtual Machines and Virtualization Clusters and Data Centers.

COb5: To describe the concepts of Cloud computing architectures over Virtualized Data Centers.

UNIT I
Examples of Distributed Systems, Trends in Distributed Systems: Pervasive Networking and The Modern Internet, Mobile and Ubiquitous Computing, Distributed Multimedia Systems, Distributed Computing as a Utility. Focus on Resource Sharing.
Challenges: Heterogeneity, Openness, Security, Scalability, Failure Handling, Concurrency, Transparency, Quality of Service.
System Model: Physical Models, Architectural Models-Architectural Elements, Fundamental Models - Interaction Models, Failure Models.
Inter Process Communication: Introduction, The API for Internet Protocols-The Characteristics of Inter Process Communication.
(Book 1 - Chapters: 1.2, 1.3, 1.4, 1.5, 2.2, 2.3, 2.4, 4.1, 4.2)

UNIT II
Network virtualization: Overlay Networks, Case Study-MPI Remote Method Invocation and Objects.
Remote Invocation – Introduction, The Request-Reply Protocols.
Remote Procedure Call- Design Issues for RPC, Implementation of RPC.

Remote Method Invocation: Introduction.

Group Communication: The Programming Model, Process Groups and Object Groups, Implementation Issues, Group Membership Management.

Publish-Subscribe Systems: Applications of Publish-Subscribe Systems, Characteristics of Publish-Subscribe Systems.

Message Queues: The Programming Model.

Shared Memory Approaches: Distributed Shared Memory, Tuple Space Communication, Implementation Issues.

Distributed Objects and Components-Distributed Objects.

(Book 1 - Chapters: 4.5, 4.6, 5.1, 5.2, 5.3, 5.4, 6.2, 6.3, 6.4, 6.5, 8.2)

UNIT III

Introduction to Cloud Computing: Cloud Computing in a Nutshell.

Roots Of Cloud Computing: From Mainframes to Clouds, SOA, Web Services, Web 2.0, and Mashups, Grid Computing, Utility Computing, Hardware Virtualization, Virtual Appliances and The Open Virtualization Format, Autonomic Computing.

Layers and Types of Clouds: Infrastructure as a Service, Platform as a Service, Software as a Service.

Deployment Models: Public, Private, Community, Hybrid Clouds. Desired Features of a Cloud.

Challenges and Risks: Security, Privacy, and Trust, Data Lock-In and Standardization, Availability, Fault-Tolerance, and Disaster Recovery, Resource Management and Energy-Efficiency.

(Book 2 - Chapters: 1.1, 1.2, 1.3, 1.4, 1.8)

UNIT IV

Virtual Machines and Virtualization of Clusters and Data Centers: Implementation level of Virtualization-Levels of Virtualization implementation, Virtualization Support at the OS Level.

Virtualization Structures Tools and Mechanisms: Hypervisor, Full Virtualization, Para-Virtualization.

Virtualization of CPU, Memory and I/O Devices-Hardware Support for Virtualization, CPU Virtualization, Memory Virtualization, I/O Virtualization.

Virtual Clusters and Resource Management - Physical versus Virtual Clusters.

Migration of Memory, Files and Network Resources: Memory Migration, File System Migration, Network Migration.

Virtualization Data-Center Automation: Server Consolidation in Data Centers, Virtual Storage Management, Cloud OS for Virtualization Data Centers.

(Book 3- Chapters: 3-3.1, 3.2, 3.3, 3.4, 3.5)

UNIT V

Cloud Computing Architectures over Virtualized Data Centers: Data-Center Design and Interconnection Networks-Warehouse-Scale Data-Center Design,

Data-Center Interconnection Networks, Modular Data – Center in Shipping Containers, Interconnection of Modular Data Centers, Data-Center Management Issues.

Architectural Design Of Compute And Storage Clouds: A Generic Cloud Architecture Design-Cloud Platform Design Goals, Enabling Technologies for Clouds, A Generic Cloud Architecture.

Public Cloud Platforms, GAE, AWS, Azure: Public Clouds and Services Offerings, Google App Engine, Amazon Web Services, Microsoft Windows Azure.

Inter-Cloud Resource Management: Extended Cloud Computing Services.
(Book 3– Chapters: 4-4.2, 4.3, 4.4, 4.5.1)

<u>**Suggested Readings:**</u>

1. Distributed System Concepts & Design   - George Colouries ,Jean Dollimore, Tim Kindberg, Gordon Blair ,5th Edition- Pearson Education
2. RajkumarBuyya, James Broberg and Andrzej M. Goscinski," Cloud Computing:Principles and Paradigms (Wiley Series on Parallel and Distributed Computing), WileyPublishing ©2011
3. Kai Hwang. Geoffrey C.Fox, Jack J. Dongarra, "Distributed and Cloud Computing FromParallelProcessing to the Internet of Things", Elsevier, 2012.
4. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hallof India, 2007.
5. Tanenbaum A.S., Van Steen M., "Distributed Systems: Principles and Paradigms",PearsonEducation, 2007.
6. John W. Rittinghouse, "Cloud Computing: Implementation, Management, and Security ".JamesF.Ransome, CRC Press 2009.

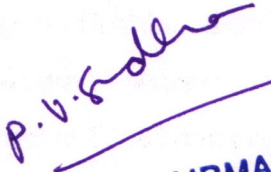**COURSE OUTCOMES:** At the end of the course students will be able to:

BCA441 CO1: Outline Distributed Systems and Inter-Process Communication.

BCA441 CO2: Comprehend Remote Method Invocation and Publish- Subscribe Systems.

BCA441 CO3: Acquire Knowledge on Distributed and Cloud Computing

BCA441 CO4: Paraphrase Virtualization Concepts.

BCA441 CO5: Interpret the concepts of Cloud computing architectures over Virtualized Data Centers.

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PROGRAM NAME: BCA (w.e.f 2021-22)
COURSE NAME: COMPUTER NETWORKS

PAPER CODE: BCA442　　　　　　　　　　　**PPW: 4**
YEAR/SEMESTER: II/IV　　　　　　　　　　**NO. OF CREDITS: 4**

COURSE OBJECTIVE: Enable students to acquire knowledge on protocols, operations of different layers and Socket Programming.

UNIT-WISE COURSE OBJECTIVES:

COb1: To introduce wired networks, wireless network standards, multi-access and address mapping protocols.

COb2: To comprehend IPV4, IPV6 address format, optimizing IPV4 address space, network management and routing protocols.

COb3: To explain reliable and best effort transport layer protocols, flow and congestion control in transport layer.

COb4: To describe the concepts of socket introduction, different socket options and I/O operations (Multiplexing, Asynchronous).

COb5: To outline the concepts of application layer protocols DNS, SMTP, FTP and HTTP.

UNIT – I
Wired LANs-Ethernet: IEEE standards (IEEE802.3LAN), **Standard Ethernet**-CSMA/CD Protocol. Changes in the Standard -Switched Ethernet, Fast Ethernet, Gigabit Ethernet.
Wireless LAN- IEEE 802.11-Architecture, MAC Sub Layer- CSMA/CA Protocol, Connecting Devices-Bridges and Types of Bridges. Address Mapping- ARP and RARP.
(Book 1 - Chapters: 13, 14.1, 15.1, 21.1)

UNIT-II
NetworkLayer: Logical Addressing-IPv4 Addresses, Classful Addressing, Classless Addressing-Subnetting,andSupernetting,CIDR, IPV6 Addresses- Introduction to IPv6, Structure .
ICMP- Types of Messages, Message Format, Error Reporting, **IGMP-** Group management, IGMP Messages, Message Format.
Unicast Routing Protocols-DistanceVector Routing-RIP, Link State Routing-OSPF.
(Book 1 - Chapters: 19, 21.2, 21.3, 22.3)

UNIT – III
Transport Layer: TCP State Diagram(TCP Features, Segments, A TCP Connection), Window Management(Flow Control),Congestion Control, Timer Management (Re-Transmission Timer Round Trip- RTT and Re -Transmission Timer Out- RTO) and UDP Protocol.
(Book 1 - Chapters: 23.3, 24.3, 23.2)

UNIT - IV
SocketProgramming: Socket Introduction-Socket Address Structure(Generic Socket Address Structure), Elementary TCP Sockets (socket(),connect(),bind(),listen(),accept(), close()), Elementary UDP Sockets (recvfrom(),sendto()).
Socket options- Introduction, IPV4 Socket Options, TCP Socket Options.
I/O Models-I/O Multiplexing, Asynchronous I/O.
(Book 3 - Chapters: 3.1, 3.2, 4, 8.1, 7.1, 7.5, 7.9, 6.2)

UNIT - V
ApplicationLayer: Domain Name System, Electronic Mail-Simple Mail Transfer Protocol(SMTP), FileTransfer Protocol(FTP), Hyper Text Transfer Protocol (HTTP).
(Book 1 - Chapters: 25, 26.2, 26.3, 27.3)

Suggested Readings:

1. Data Communications and Networking- Behrouz A.Fourouzan, Fourth Edition TMH.
2. Computer Networks--Andrew S Tanenbaum, 4th Edition, Pearson Education.
3. UNIX Network Programming, The Sockets Networking API- W.RichardStevens, BillFenner, Andrew M. Rudoff ,Volume 1, Third Edition.

COURSE OUTCOMES: At the end of the course students will be able to:

BCA442 CO1: Acquire knowledge on Ethernet Standards.

BCA442 CO2: Compare IPV4 and IPV6 address space by using different routing protocols.

BCA442 CO3: Interpret how data transportation is handled by Flow and Congestion Control in TCP and UDP.

BCA442 CO4: Determine Client Server communication by using different socket options and I/O communication.

BCA442 CO5: Acquire knowledge on various application layer protocols such as DNS, SMTP, FTP, HTTP.

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**PROGRAM NAME: BCA (w.e.f 2021-2022)
COURSE NAME: COMPUTER NETWORKS LAB**

PAPER CODE: BCA442P   **YEAR/SEMESTER: II/IV**

COURSE OBJECTIVE: To enable student with network programming knowledge for the Client Server communication.

COb1: To introduce planning and implementation of LAN with IP address on Ethernet ports,testing the network connectivity using commands and interconnecting multiple LAN by using routers.

COb2: To illustrate the network programming for the Client-Server communication over TCP & UDP protocols with different system calls and file transfer.

Networking Concepts Demonstration:
1. Demonstrations of IP address and ports in computer system.
2. Explanation of settings in network connections.
3. Testing of networking connectivity using ping,tracepath
4. Checking network statistics with netstat
5. Demonstration of static and dynamic IP address settings
6. Understanding ethernet cabling and switched networks
7. Comprehension of routers and firewalls
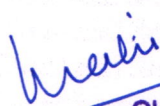8. Significance of DNS

Network Programming:
1. Implement IPC using a) Pipes b) FIFO.
2. Implement file transfer using Message Queue form of IPC.
3. Design TCP Iterative Client and Server application to reverse the given input sentence.
4. Design TCP Concurrent Client and Server application to reverse the given input sentence.
5. Design TCP Client and Server application to transfer file.
6. Design UDP Client and Server application to reverse the given input sentence.
7. Design UDP Client and Server application to reverse the given input sentence.
8. Design UDP Client Server to transfer a file.

COURSE OUTCOMES: At the end of the course students will be able to:

BCA442P CO1: Design, implement and test LAN with IP addressing and inter-connect multiple LAN connections by using routers .

BCA442P CO2: Implement Client-Server communication over TCP & UDP protocols with different system calls and file transfer.

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PROGRAM NAME: BCA (w.e.f 2021-22)
COURSE NAME: SOFTWARE ENGINEERING

PAPER CODE: BCA443   **PPW: 4**
YEAR/SEMESTER: II/IV   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students improve logical thinking and systematic approach in Software Engineering.

UNIT WISE OBJECTIVES:

COb1: To impart knowledge of generic process models in software engineering.

COb2: To analyze requirement engineering principles and requirement specifications.

COb3: To discuss about architectural styles.

COb4: To inculcate knowledge in building UML models.

COb5: To infer about Software Testing techniques.

UNIT I
Software Engineering– Introduction, Program Versus Software (Definition Only), Software Engineering (Definition Only), Software Development Process and its Stages, Generic Software Development Process Models (Waterfall Model, V Model, Iterative Software Process Model, Spiral Model), Code of Ethics and Professional Practice, Software Development and Maintenance Cost Breakup.
Requirement Engineering Processes– Requirement Engineering Process, Feasibility Study, Cost and Benefit Analysis.
(Book 1 - Chapters: 1, 2)

UNIT II
Requirement Specification (Functional Requirement Specification, Requirement Elicitation Analysis), Characteristics of aGood Requirement and Validation Techniques, Requirements Management Planning (Definition Only), Process of Requirement Change Management.
Software Requirement Specifications– Introduction, Stakeholder Analysis, Software Requirements Document, IEEE Standard of Software Requirement Specifications (Table 3.2), Organizing Functional Requirements (Functional Requirements Shown Class Wise), Traceability and Validation of Specifications.
(Book 1 - Chapters: 2, 3)

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UNIT III

Architectural Styles– Introduction, Architecture Styles (Client-Server Architecture, Layered Architecture), Object Oriented Architecture, Computing Architecture Style, Core, Configurable and Customizable Architecture, Architectural Design Principles.

Object Oriented System Analysis– Introduction, Object Oriented Design, Object Oriented Design Models, Object Oriented Analysis.

(Book 1 - Chapters: 4, 5)

UNIT IV

Object-Oriented Design Using UML– Introduction, Sequence Diagram, State Machine Diagram, Timing Diagram, Decision Tree and Decision Table, Composite Structure Diagram, Generating Test Cases, Structured Methods.

Software Development– Introduction, Good Coding Practices, Code Reuse, Design Pattern, Component Based Software Engineering, Agile Methods (Extreme Programming, XP Programming Practices, Principles of Pair Programming, Prototyping).

(Book 1 - Chapters: 6, 7)

UNIT V

Verification, Validation and Software Testing– Introduction, Software Verification and Validation Process (Definition Only), Software Testing (Unit Testing, White Box Testing, Integration Testing, Regression Testing), Black Box Testing, System Testing, Artof Debugging.

Measurement and Metrics for Assessing Software Quality– Introduction, ISO 9126 Quality Standards, Quality Management Models (ISO 9001, CMM for Process Improvement), Ways to Build Quality in Software, Software Quality Control and Metrics, Class Coupling Metric-Coupling Between Objects (Definitions Only), Monitoring Dynamic Quality Attributes (Visible Externally) of aSoftware.

(Book 1 - Chapters: 8, 9)

Suggested Readings:

1. Rajesh Narang, Software Engineering: Principles and Practices 1st edition 2015
2. Ian Sommerville, Software Engineering 9 edition 2011.
3. R. Mall, Fundamentals of Software Engineering, 2018.
4. PankajJalote, An Integrated Approach to Software Engineering, 3rd Edition 2005.
5. Frank Tsui, Orlando Karam, Barbara Bernal, Essentials of Software Engineering,4th Edition 2016.
6. Roger S Pressman, B R Maxim, Software Engineering – A Practitioner's Approach,8th Edition 2015.
7. Grady Booch, The Unified Modeling Language User Guide,2nd Edition 2005.

COURSE OUTCOMES: At the end of the course students will be able to:

BCA443 CO1: Use generic process models in software engineering.

BCA443 CO2: Comprehend Requirement Engineering principles and requirement specifications.

BCA443 CO3: Acquire knowledge about architectural styles which can be implemented in present scenario.

BCA443 CO4: Design UML Models.

BCA443 CO5: Acquire knowledge on Software Testing techniques.

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PROGRAM NAME: BCA (w.e.f 2021-22)
COURSE NAME: SOFTWARE ENGINEERING LAB

PAPER CODE: BCA443P   **YEAR/SEMESTER: II/IV**

COURSE OBJECTIVE: To enable students with the concepts of design in Software Development Life Cycle.

COb1: To inculcate knowledge in defining problem statement and its specifications.

COb2: To demonstrate various UML models.

Case Studies:

1.   Banking System.
2.   Hotel management system.
3.   Inventory Control System.
4.   Library management system.
5.   Railway Reservation System.

Choose any two of above case studies and do the following exercises for that case studies:

1.   Write the complete problem statement.
2.   Write the software requirements specification document.
3.   Draw the entity relationship diagram.
4.   Draw the data flow diagrams.
5.   Draw use case diagrams.
6.   Draw activity diagrams for all use cases.
7.   Draw sequence diagrams for all use cases.
8.   Draw collaboration diagram.
9.   Assign objects in sequence diagrams to classes and make class diagram.

Note:
To draw dataflow diagrams using Microsoft Visio Software, SmartDraw, etc…
To draw UML diagrams using Rational Rose Software, StarUML, etc…

COURSE OUTCOMES: At the end of the course students will be able to:

BCA443P CO1: Write problem statement.

BCA443P CO2: Use tools to draw various UML models.

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PROGRAM NAME: BCA (w.e.f 2021-22)
COURSE NAME: DATA SCIENCE USING PYTHON

PAPER CODE: BCA444	**PPW: 4**
YEAR/SEMESTER: II/IV	**NO. OF CREDITS: 4**

**COURSE OBJECTIVE*:* To inculcate knowledge in students with the concepts of Data Science using Python Programming.

UNIT-WISE COURSE OBJECTIVES:

COb1: To introduce Data Science, Data Analysis and Python Programming.

COb2: To demonstrate the usage of functions and conditional Statements in Python Programming.

COb3: To demonstrate the usage of Strings, Lists, Tuples and Dictionaries.

COb4: To illustrate the concepts of Numpy.

COb5: To exhibit the usage of Pandas for data manipulation.

UNIT I
Introduction To Data Science – Introduction to Data Science, Data Science Components, Data Science Process, Data Science Jobs Roles, Tools for Data Science, Difference Between Data Science With BI (Business Intelligence), Applications of Data Science, Challenges of Data Science Technology.
Data Analysis – Introduction to Data Analysis, Data Analysis Tools, Types of Data Analysis, Techniques and Methods, Data Analysis Process
Introduction to Python, Python Features, Python Interpreter, Modes of Python Interpreter, Values and Data Types, Variables, Keywords, Identifiers, Statements.
(Book 1 - Chapters: 1,2)

UNIT II
Expressions, Input & Output, Comments, Lines & Indentation, Quotations, Tuple Assignment, Operators, Precedence of Operators.
Functions: Definition and Use, Types of Functions, Flow of Execution, Parameters and Arguments, Modules.
Conditionals: Conditional(If), Alternative(If-Else), Chained Conditionals(If-Elif-Else), Nested Conditionals; **Iteration/Control Statements:** while, for, break, continue, pass; Fruitful Function

Vs Void Function, Parameters/Arguments, Return Values, Variables Scope(Local, Global), Function Composition.
(Book 1 - Chapters: 2, 3, 5, 7, Book 3 - Chapters: 4, 6, 7)

UNIT III

Strings: Strings, String Slices, Immutability, String Functions & Methods, String Module; List as Array: Array, Methods of Array. **Lists:** List Operations, List Slices, List Methods, List Loops, Mutability, Aliasing, Cloning List, List Parameters.**Tuple:** Benefit of Tuple, Operations on Tuple, Tuple Methods, Tuple Assignment, Tuple as Return Value, Tuple as Argument.**Dictionaries:** Operations on Dictionary, Methods in Dictionary, Difference between List, Tuple and Dictionary.**Advanced List Processing:** List Comprehension, Nested List
(Book 1 - Chapters: 8, 10, 11, 12)

UNIT IV

Introduction to Numpy – The Basics of Numpy Array, Computation on Numpy Arrays, Aggregations, Computations on Arrays, Comparisons, Masks and Boolean Logic, Fancy Indexing, Sorting Arrays, Structured Data.
(Book 2 - Chapter: 2)

UNIT - V

Data Manipulation with Pandas – Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets, Aggregation and Grouping
(Book 2 - Chapter: 3)

Suggested Readings:

1. Allen B Downey, "Think Python: How to think like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2. Jake VanderPlas, "Python Data Science Handbook – Essential Tools for Working with Data", 1st edition, O'Reilly Publishers, 2017.
3. Guido van Rossum and Fred L.DrakeJr, - An Introduction to Python - Revised and Updated for Python 3.2, Network Theory Ltd 2011.
4. Grus, Joel. Data science from scratch: first principles with python. O'Reilly Media, 2019.

COURSE OUTCOMES: At the end of the course students will be able to:

BCA444 CO1: Acquire knowledge on Data Science, Data Analysis and basics of Python Programming.

BCA444 CO2: Develop applications by implementing functions and conditional statements using Python Programming.

BCA444 CO3: Develop applications using Strings, Lists, Tuples and Dictionaries.

BCA444 CO4: Apply the concepts of Numpy.

BCA444 CO5: Implement the concepts of Pandas for Data Manipulation.

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PROGRAM NAME: BCA (w.e.f 2021-2022)
COURSE NAME: DATA SCIENCE USING PYTHON LAB

PAPER CODE: BCA444P   **YEAR/SEMESTER: II/IV**

COURSE OBJECTIVE: To enable students with the concepts of Python Programming, Numpy and Pandas to develop real-time applications.

COb1: To introduce Conditional Statements, Functions, Lists, Tuples and Dictionaries.

COb2: To illustrate the concepts of Numpy and Pandas.

Note: Datasets from Kaggle, UCI, Google, etc. can be used.

Python:
1. Write a program to demonstrate different numbers data types in python.
2. Write a python program to design simple calculator using functions.
3. Write a python program to check whether a given number is Armstrong number or not.
4. Write a python program to generate prime numbers between different intervals.
5. Write a python program to find factorial of a number using recursion.
6. Write a python program to check whether a string is palindrome or not.
7. Write a python program to count the number of characters present in a word.
8. Write a python program to create, append and remove lists.
9. Write a program to demonstrate working with tuples in python.
10. Write a program to demonstrate dictionaries in python.

Numpy:
11. Write a python program to demonstrate basic array characteristics.
12. Write a python program to demonstrate array creation techniques.
13. Write a python program to demonstrate indexing in numpy.
14. Write a python program to demonstrate basic operations on single array.
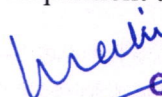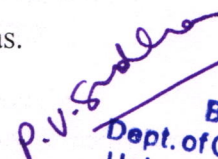15. Write a python program to demonstrate unary operators in numpy.

Pandas:
16. Python code to make a Pandas DataFrame with two-dimensional list.
17. Python code to demonstrate creating DataFrame from dictionary of narray and lists.
18. Python code to demonstrate creating a Pandas Dataframe using list of tuples.
19. Python code to demonstrate how to iterate over rows in Pandas Dataframe.
20. Python code to demonstrate how to get column names in Pandas Dataframe.

COURSE OUTCOMES: At the end of the course students will be able to:

BCA444P CO1: Develop applications using Conditional Statements, Functions, Lists, Tuples and Dictionaries.

BCA444P CO2: Implement the concepts of Numpy and Pandas.

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(Accredited with 'A' Grade by NAAC)
Autonomous College – Affiliated to Osmania University
Department of Computer Science

PROGRAM NAME: BCA (w.e.f 2021-22)
COURSE NAME: ARTIFICIAL INTELLIGENCE

PAPER CODE: BCA445   **PPW: 4**
YEAR/SEMESTER: II/IV   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of Artificial Intelligence.

UNIT-WISE COURSE OBJECTIVES:

COb1: To explain basics of Artificial Intelligence & Heuristic Techniques.

COb2: To inculcate knowledge on knowledge representation issues & game playing.

COb3: To outline uncertainty & reasoning techniques.

COb4: To describe the importance of Learning and Expert Systems.

COb5: To discuss about Natural Language Processing.

UNIT I
What is Artificial Intelligence: AI problems, AI Technique-Introduction-Tic-Tac-Toe, Defining Problem as a State Space Search (A Water Jug Problem), Production Systems - Control Strategies - Breadth First Search Algorithm, Depth First Search Algorithm, Problem Characteristics, Production System Characteristics.
Heuristic Search Techniques: Generate – and – Test, Hill Climbing–Simple Hill Climbing, Steepest-Ascent Hill Climbing, Best – First Search - OR Graphs.
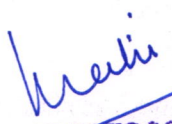**(Book 1 - Chapters: 1, 2, 3)**
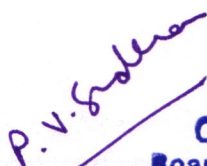
UNIT II
Game Playing: Overview, Min-Max Search Procedure.
Knowledge Representation Issues: Representation and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation – Important Attributes, Relationship among Attributes, Frame Problem.
Using Predicate Logic: Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution- Introduction, Natural Deduction.
(Book 1 - Chapters: 12, 4, 5)

UNIT III

Symbolic Reasoning under Uncertainty: Introduction to Non Monotonic Reasoning, Logics for Non Monotonic Reasoning –Introduction. Implementation issues.
Statistical Reasoning: Probability and Bayes Theorem, Certainty Factors and Rule-Based Systems, Bayesian Networks, Dempster-Shafer Theory.
(Book 1 - Chapters: 7, 8)

UNIT IV

Learning: What is Learning, Rote Learning, Learning by Taking Advice, Learning in Problem Solving - Learning by Parameter Adjustment, Learning from Examples: Induction-Winston's Learning Program, Decision Trees.
Expert Systems: Representing and Using Domain Knowledge, Expert Systems Shells, Explanation, Knowledge Acquisition.
(Book 1 - Chapters: 17, 20)

UNIT V

Perception and Action: Real Time Search, Perception-Vision, Speech Recognition. ACTION-Navigation, Manipulation, Robot Architectures.
Natural Language Processing: Introduction, Syntactic Processing –Grammars and Parsers, Semantic Analysis –Introduction, Semantic Grammars Spell Checking.
(Book 1 - Chapters: 21, 15)

Suggested Readings:

1. Elaine Rich, Kevin Night, Shivashankar B.Nair," Artificial Intelligence ", 3rd Edition.,2008.
2. Russell Norvig, "Artificial Intelligence-Modern Approach", 3 rd edition, 2009.
3. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2012.
4. NelsonM.Mattos, "An Approach to Knowledge Base Management", Springer Berli.

COURSE OUTCOMES: At the end of the course students will be able to:

BCA445 CO1: Acquire Knowledge in Artificial Intelligence and Heuristic Techniques.

BCA445 CO2: Comprehend knowledge representation issues and Game Playing.

BCA445 CO3: Apply uncertainty & reasoning techniques.

BCA445 CO4: Adopt different learning methods and concepts of Expert Systems

BCA445 CO5: Interpret the concepts of Natural Language Processing.

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SYLLABUS

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APPLICATIONS

III YEAR

(U.G)

CBCS

(2022-23)

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PROGRAM NAME: BCA
COURSE NAME: PROGRAMMING USING ASP.NET
(w.e.f 2022-23)

PAPER CODE: BCA541   **PPW: 4**
YEAR/SEMESTER: III/V   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To impart knowledge in students to develop web based applications.

UNIT-WISE COURSE OBJECTIVES:

COb1: To explain ASP.NET Framework and its Controls.

COb2: To paraphrase ASP.NET Validation Controls and Master Pages.

COb3: To design Websites using Themes and use ADO.NET.

COb4: To illustrate concepts of DataBound Controls and List Control.

COb5: To demonstrate GridView Control, DetailsView and FormView Control.

UNIT I
Overview of the ASP.NET Framework: ASP.NET and the .NET Framework, Understanding ASP.NET Controls, Understanding ASP.NET Pages.
Using the Standard Controls: Displaying Information – Using the Label Control. Accepting User Input – Using the TextBox Control, Checkbox Control, RadioButton Control. Submitting Form Data – Using Button Control, LinkButton Control, ImageButton Control, Using Client Scripts with Button Controls, Performing Cross-Page Posts, Specifying a Default Button, Handling the Command Event. Displaying Images – Using the Image Control, Using the ImageMap Control. Using the Panel Control, Using the Hyperlink Control.
(Book 1 - Chapters: 1, 2)

UNIT II
Using the Validation Controls: Overview of the Validation Controls, RequiredFieldValidator Control, RangeValidator Control, CompareValidator Control, RegularExpressionValidator Control, CustomValidator Control, ValidationSummary Control.
Designing Websites with Master Pages: Creating Master Pages – Creating Default Content, Nesting Master Pages, Using Images and Hyperlinks in Master Pages, Registering Master Pages in Web Configuration, Modifying Master Page Content – Using the Title Attribute, Page Header Property, Exposing Master Pages Properties, Using FindControl with Master Pages, Loading Master Pages Dynamically – Loading Master Pages Dynamically for Multiple Content Pages.
(Book 1 - Chapters: 4, 5)

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UNIT III

Designing Websites with Themes: Creating Themes, Adding Skins to Themes – Creating Named Skins, Themes versus StyleSheetThemes, Disabling Themes, Registering Themes in Web Configuration File. Adding Cascading Style Sheets to Themes – Adding Multiple Cascading Style Sheets to a Theme, Changing Page Layouts with Cascading Style Sheets. Creating Global Themes, Applying Themes Dynamically – Applying Skins Dynamically.

Building Data Access Components with ADO.NET: Connected Data Access – Using Connection Object, Command Object, DataReader Object. Disconnected Data Access – Using the DataAdapter Object, DataTable Object, DataView Object, DataSet Object.

(Book 1 - Chapters: 6, 17)

UNIT IV

Overview of Data Access: Using DataBound Controls – Working with List Controls, Working with Tabular DataBound Controls, Working with Hierarchial DataBound Controls, Working with Other Controls. Using DataSource Controls – Using ASP.NET Parameters with DataSource Controls.

Using List Controls: Overview of the List Controls – Declaring List Items, Binding to a Data Source, Determining the Selected List Item, Appending Data Items, Enabling Automatic PostBacks, Using the Items Collection.Working with the DropDownList Control, RadioButtonList Control, ListBox Control, CheckBoxList Control, BulletedList Control.

(Book 1 - Chapters: 8,10)

UNIT V

Using the GridView Control: GridView Control Fundamentals – Displaying Data, Selecting Data, Using Data Keys, Sorting Data, Paging Through Data, Editing Data, Displaying Empty Data, Formatting the GridView Control. Using Fields with the GridView Control – Using BoundFields, CheckBoxFields, CommandFields, ButtonFields, HyperLinkFields, ImageFields. Working with GridView Control Events – Highlighting GridView Rows, Displaying Column Summaries, Displaying Nested Master/Details Forms. Extending the GridView Control – Creating a LongTextField, DeleteButton Field, ValidatedField.

Using the DetailsView and FormView Controls: Using the DetailsView Control – Displaying Data, Using Fields, Displaying Empty Data, Paging Through Data, Updating Data, Inserting Data, Deleting Data, Working with DetailsView Control Events, Formatting the DetailsView Control. Using the FormView Control - Displaying Data, Paging Through Data, Editing Data, Inserting Data, Deleting Data.

(Book 1 - Chapters: 11, 12)

Suggested Readings:

1. Stephen Walther, ASP.NET 3.5 Unleashed, SAMS Publications, 2011.
2. Dino Esposito, Programming ASP.NET Core, Microsoft Press, 2019.
3. Mathew MacDonald, ASP.NET – The Complete Reference, MaGraw Hill Education, Indian Edition, 2017.
4. Imar Spaanjaars, Beginning ASP.NET 4.5.1 in C# and VB, Wiley, 2014.

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COURSE OUTCOMES:

At the end of the course students will be able to:

BCA541 CO1: Develop applications using ASP.NET Controls.

BCA541 CO2: Write applications using ASP.NET Validation Controls and Master Pages.

BCA541 CO3: Apply themes and ADO.NET concepts in developing applications.

BCA541 CO4: Program applications using DataBound Controls and List Control.

BCA541 CO5: Compile applications using GridView, DetailsView and FormView Control.

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PROGRAM NAME: BCA
COURSE NAME: DOTNET LAB
(w.e.f 2022-23)

PAPER CODE: BCA541P **YEAR/SEMESTER: III/V**

COURSE OBJECTIVE: To impart knowledge in students on the execution process of client server applications.

UNIT-WISE COURSE OBJECTIVES:

COb1: To demonstrate Web Form Controls using ASP.NET.

COb2: To illustrate the usage of ADO.NET.

1. Write the procedure to install Visual Studio2013.
2. Hello World in VisualStudio.
3. GUI form Design for student attendance.
4. GUI form to design Form Controls
5. For Loops Execution for DropDownList
6. ASP.Net web design to perform user credentials check.
7. Create Master Page with menu options to invoke the respective web form.
8. Create a web page to print the given number-based multiplication table.
9. ADO.NET connecting to DataSource
10. ADO.NET connectivity for Accessing MSSQL Table to demonstrate select and create queries.
11. ADO.NET to insert and update data using Grid.
12. Design a web page to perform insert, update, list, and delete records for a student based on key attribute.
13. ASP.NET for student marks using HTML along with Form Controls
14. ASP.NET displaying student details with ADO.NET and AJAX Controls
15. Write the procedure to deploy ASP.NET application in IIS server.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA541P CO1: Develop applications using Web Form Controls using ASP.NET.

BCA541P CO2: Implement the concepts of ADO.NET.

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PROGRAM NAME: BCA
COURSE NAME: UNIX PROGRAMMING
(w.e.f 2022-23)

PAPER CODE: BCA542   **PPW: 4**
YEAR/SEMESTER: III/V   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enrich student's with the knowledge of Unix Programming, Working and Processing of UNIX Environment.

UNIT-WISE COURSE OBJECTIVES:

Cob1: To examine the Unix System architecture and standardization of UNIX System with its effect on current systems

COb2: To describe the basic input and output functions provided by the UNIX system and all the attributes of UNIX files and directories.

COb3: To compare the standard I/O Library used by UNIX applications and environment of a C program.

COb4: To associate the various process control functions, Process Relationships and Signals in Unix.

COb5: To explore various features in terminals and methods of Inter Process Communication.

UNIT I
UNIX System Overview: Introduction; UNIX Architecture, Logging in,Files and Directories-File System, Filename, Path name, Working Directory, Home Directory,Input and Output- File Descriptors, Standard Input, Standard Output, and Standard Error, Unbuffered I/O, Standard I/O, Programs and Processes- Program, Processes and Process ID, Process Control, Threads and Thread ID, Error Handling, Signals, System Calls and Library Functions. **(Book 1 - Chapter: 1)**

UNIT II
File IO- Introduction, File Descriptors, open and openat functions, creat function, close function, lseek function, read function and write function.
Files and Directories-Introduction, stat, fstat, fstatat and lstat functions, file types, Set-User-lD and SetGroup-lD, File Access Permissions, Ownership of New Files and Directories, access and faccessat function, umask function, chmod and chown function, File systems, link, unlink, remove and rename functions, mkdir, chdir and rmdir functions.
(Book 1 - Chapters: 3, 4)

UNIT III

Standard IO Library- Introduction, Streams and FILE Objects, Standard Input, Standard Output and Standard Error, Opening a Stream, Reading and Writing a stream.

Process environment- Introduction, Overview of C Language, Main Function, Process Termination, Command-Line Arguments, Memory Allocation, Environment variables.

(Book 1 - Chapters: 5, 7)

UNIT IV

Process Control- Introduction, Process Identifiers, fork Function, exit function, wait and exec Functions, race conditions, changing user IDs and Group IDs, Process Accounting, User Identification

Process relationships -Terminal Logins, Network Logins.

Signals- Signal Concepts, Signal Function, Unreliable Signals.

(Book 1 - Chapters: 8, 9, 10)

UNIT V

Terminal I/O- STTY COMMAND, Baud Rate Functions, Line Control Functions, Canonical Mode, Noncanonical Mode.

Inter process Communication-Pipes, FIFOs, Message Queues, Semaphores, Shared Memory, and Client-Server Properties.

(Book 1 - Chapters: 18, 15)

Suggested Readings:

1. W. Richard Stevens- Advanced Programming in the UNIX environment, 3rd Edition, 2013.
2. Advanced Unix, A Programmers Guide, Prata, Stephen BPB, 2008.
3. Unix: Complete Reference, Rosen, Kenneth Others TMH, 2nd Edition, 2007.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA542 CO1: Recall the architecture and standardization of the Unix System.

BCA542 CO2: Paraphrase the basic input and output functions provided by the UNIX system and attributes associated with its files and directories.

BCA542 CO3: Interpret the standard I/O library of Unix System and its environment in C programs.

BCA542 CO4: Analyze the Process control and Process Relationships.

BCA542 CO5: Summarize the features of Terminals and Inter Process Communication methods.

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PROGRAM NAME: BCA
COURSE NAME: UNIX PROGRAMMING LAB
(w.e.f 2022-23)

PAPER CODE: BCA542P   **YEAR/SEMESTER: III/V**

COURSE OBJECTIVE: To impart knowledge about UNIX system administration commands.

UNIT-WISE COURSE OBJECTIVES:

COb1: To implement the system administrative commands, system calls in Unix.

COb2: To program the implementation of system calls in Unix.

1. Creating users and groups (Execution of various system administration Commands such as useradd, usermod, password, groupmod, uname, permission(r,w,x)(4,2,1), umask, chmod and chown.
2. Write a shell script that takes a command line argument and reports on whether it is directory, a file or something else.
3. Program to search for a given pattern in a file.
4. Write a shells script that accepts one or more file names as arguments and converts all of them into Uppercase, provided they exist in the current directory.
5. Write a shells script to delete all the temporary files.
6. Write a program to create a child process using fork() and exec() system calls.
7. Write a program using open(), read() and write() system calls.
8. Implementation of Signals in UNIX.
9. Write a shells script to check and list attributes of a processes.
10. Write a shells script to display list of users currently logged in
11. Write a C program to illustrate the Race Condition.
12. Write a C Program which demonstrates inter process communication between a reader process and a writer process.
13. Write a C/C++ program for Inter process communication using pipes.

COURSE OUTCOMES:

At the end of the course, students will be able to:

BCA542P CO1: Implement the System administrative commands in Unix.

BCA542P CO2: Program the system calls in Unix.

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PROGRAM NAME: BCA
COURSE NAME: OBJECT ORIENTED SYSTEM DEVELOPMENT
(w.e.f 2022-23)

PAPER CODE: BCA543 **PPW: 4**
YEAR/SEMESTER: III/V **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To impart knowledge in students about structural, behavioral, architectural modeling and unified software development process of Object-Oriented Systems.

UNIT-WISE COURSE OBJECTIVES:

COb1: To illustrate overview & architecture of UML and design the classes and relationships.

COb2: To demonstrate UML features of diagrams, advanced classes, advanced relationships, interfaces and packages.

COb3: To describe the object diagrams, use cases, use case diagrams, interaction diagrams, and activity diagrams.

COb4: To inculcate knowledge on events and signals, state machines, process and threads, time and spaces, state chart diagrams.

COb5: To illustrate components, deployment, collaborations, component diagrams and deployment diagrams.

UNIT I

UML Introduction: Why we Model- importance of modeling, principles of modeling, Object oriented modeling.
Introducing the UML-an overview of UML, A conceptual model of the UML, Architecture of the UML, Software Development Life Cycle.
Classes- Terms and Concepts, Modeling the vocabulary, Modeling the distribution of responsibilities, modeling non structure things, modeling primitive types of systems.
Relationships-Terms and Concepts, modeling single dependency, modeling single inheritance, modeling structural relationship.
(Book1-Chapters: 1, 2, 4, 5)

UNIT II

Common Mechanisms- Terms and Concepts, modeling comments, modeling new building blocks, modeling new properties.

Diagrams- Terms and Concepts, modeling different views of a system.

Advanced Classes- Terms and Concepts.

Advanced Relationships- Terms and Concepts.

Interfaces, Types and Roles-introduction, names, operations, relationships, understanding an interface, types and roles.

Packages-introduction, names, owned elements, visibility, import and exporting, generalization, standard elements.

(Book1-Chapters: 6, 7, 9, 10, 11, 12)

UNIT III

Class and Object Diagrams- Terms and Concepts, Modeling object structures for Class Diagrams.

Interactions-terms and concepts, modeling a flow of control, Use **Cases-**terms and concepts, modeling a behavior of an element.

Use Case Diagrams-terms and concepts, modeling the context of a system, modeling the requirement of a system, forward and reverse engineering.

Interaction Diagrams-terms and concepts, modeling flows of control by time ordering, modeling flows of control by organization.

Activity Diagrams-terms and concepts, modeling a work flow, modeling an operation.

(Book1-Chapters: 14, 15, 16, 17, 18, 19)

UNIT IV

Events and Signals- Terms and Concepts, modeling a family of signals, modeling exceptions, **State Machines-** Terms and Concepts, modeling the life time of an object.

Processes and Threads- Terms and Concepts, modeling multiple flows of control.

Times and Space- Terms and Concepts, modeling time constraints, modeling the distribution of objects.

State Chart Diagrams- Terms and Concepts, modeling reactive objects..

(Book1-Chapters: 20, 21, 22, 23, 24)

UNIT V

Components- Terms and Concepts, modeling executables and libraries, modeling tables, files and documents. Modeling an API.

Deployment- Terms and Concepts, modeling processors and devices, modeling the distribution of components.

Collaborations- Terms and Concepts, modeling the realization of a use case.

Component Diagrams- Terms and Concepts, modeling source code, modeling an executable release, modeling a physical database diagrams.

Deployment Diagrams- Terms and Concepts, modeling an embedded system, modeling a client/server system, modeling a fully distributed system.

(Book1-Chapters: 25, 26, 27, 29, 30)

Suggested Readings:

1. Grady Booch, James Rumbaugh, Ivor Jacbson, The Unified Modeling Language User Guide,(Covering UML 2.0) 2nd Edition , Pearson Education, India, 2007.

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2. Ivor Jacbson, Grady Booch, James Rumbaugh, The Unified Software Development Process, Pearson Education, India, 2008.
3. Mark Priestley, Practical Object Oriented Design with UML, McGraw Hill Education, 2005.
4. D Jeya Mala, S Geetha, Object Oriented Analysis and Design using UML, McGraw Hill Education, 2013.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA543 CO1: Acquire knowledge on overview & architecture of UML and to design the classes and relationships.

BCA543 CO2: Acquire knowledge on diagrams, advanced classes, advanced relationships, interfaces and packages.

BCA543 CO3: Be familiar with object diagrams, use cases, use case diagrams, interaction diagrams, activity diagrams.

BCA543 CO4: Be familiar with events and signals, state machines, process and threads, time and spaces, state chart diagrams.

BCA543 CO5: Be familiar with Collaborations, component diagrams and deployment diagrams.

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PROGRAM NAME: BCA
COURSE NAME: OOSD LAB
(w.e.f 2022-23)

PAPER CODE: BCA543P   **YEAR/SEMESTER: III/V**

COURSE OBJECTIVE: Analyze and design the problem by representing E-R Diagrams, DFD & UML diagrams.

UNIT-WISE COURSE OBJECTIVES:

COb1: To draw the UML diagrams for the given specifications.

COb2: To design appropriate design patterns and diagrams.

Students have to perform the following OOSD steps for the given list of Programs:

Select one Information System/Approach and device the following using UML tool:

1. Structured Diagrams (Data Flow Diagrams, Entity-Relationship Diagrams) etc.
2. Preparation of Software Requirement Specification Document for a given Case Study.

UML Diagrams
1. Use Case Diagrams
2. Class Diagrams
3. Object Diagrams
4. Sequence Diagrams
5. Collaboration Diagrams
6. Activity Diagrams
7. State Chart Diagrams
8. Component Diagrams
9. Deployment Diagrams

Problems That May Be Considered Are:

1. **Passport Automation System.**
Passport Automation System is an interface between the Applicant and the Authority responsible for the Issue of Passport. It aims at improving the efficiency in the Issue of Passport and reduces the complexities involved in it to the maximum possible extent.

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2. Book Bank

The book bank management system is software in which a member can register themselves and then he can borrow books from the book bank. It mainly concentrates on providing books for Degree students.

The book bank holds an online interface with its members for maintaining all kinds of transaction details. Each member is provided with a unique user id at the time of registering as a member.

3. Exam Registration

The main objective of Exam Registration System is to make applicants register themselves and apply for the exam. Exam Registration System provides easy interface to all the users to apply for the exam easily.

Exam Registration System is an interface between the Student and the Exam Controller responsible for the Issue of Hall Ticket. It aims at improving the efficiency in the Issue of Hall ticket and reduces the complexities involved in it to the maximum possible extent.

4. Stock Maintenance System

Stock Maintenance System is a real time application used in the merchant's day to day system. This is a database to store the transaction that takes places between the Manufacturer, Dealer and the Shop Keeper that includes stock inward and stock outward with reference to the dealer. It provides a complete version of a stock management system and to manage the entire stock management process of a company.

5. Online Course Reservation System

The aim is to design a course registration system for the admission of students in XYZ College of Technology for the academic year.All the processes involved in the course registration system is computerized. It must contain all the details about: Student, Course offerings, Registering a course , Availability of courses , Eligibility for Admission

6. E-Book Management System

E-book Management System gives an idea about how books are maintained in the particular websites. The books that are to be purchased, the books that are to be sold are maintained here. Further some additional details of the current books that is available in the store are also given.

7. BPO Management System

A call center is a centralized office used for the purpose of receiving and transmitting a large volume of request by telephone. A BPO is operated by a company to administer product support or information inquiries from customers. Outgoing calls for telemarketing, client and dept collection are also made. A BPO is often operated through an extensive open workspace for call center agents, with work stations that include a computer for each agent, a telephone set/headset connected to a telecom switch and one or more supervisor stations. It can be independently operated or networked with additional centers, often linked to a corporate computer network, including mainframes, micro computers and LANS

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8. Library Management System

The purpose of the Library Management System is mainly to provide automation to the library. The categories of users provided are:

LIBRARIAN: He can read or write the information about any member and can update, delete or create a membership plan.

MEMBER: He can get a book issued.

The three major components in the application are: Login, Issue/Borrow Book, and Balance Dues

The Library Management System implements databases to make the existing system more efficient. It is difficult to catch defaulters in a usual library system, but Library Management System solves this problem by providing messages to the administrator about the fine to be paid and books to be returned.

9. Student Information System

The Student Management System can handle all the details about a Student. The details include College details, Course details, Students personal details, Academic details etc., The Student Management System is an automated version of manual Student Management System. The student management system allows authorized members to access the record of academically registered students.

10. Hospital Management System

Hospital Management System is an organized computerized system designed and programmed to deal with day to day operations and management of the hospital activities. The program can look after inpatients, outpatients, records, database treatments, status illness, billings in the pharmacy and labs. It also maintains hospital information such as ward id, doctors in charge and department administering.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA 543P CO1: Find solutions to the problems using object oriented approach.

BCA 543P CO2: Represent UML notations and interact with the customer to refine the UML diagrams.

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PROGRAM NAME: BCA
COURSE NAME: SOFTWARE QUALITY TESTING
(w.e.f 2022-23)

PAPER CODE: BCA544   **PPW: 4**
YEAR/SEMESTER: III/V   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To impart knowledge in students to develop software and its Quality.

UNIT-WISE COURSE OBJECTIVES:

COb1: To learn different process models and software quality.

COb2: To understand how to build software quality metrics and project management

COb3: To distinguish different levels of testing.

COb4: To integrate the Test Plan and Management.

COb5: To explain Software Configuration Management

UNIT I
Introduction to Software Quality: Software Quality, Defining Quality –Total Quality Management – Software Processes Models (Waterfall Model, Spiral Model, Iterative and Object-Oriented Model) – Achieving Software QualityQuality Standards, Practices & Conventions –Improving Quality with Methodologies – Structured/Information Engineering – Measuring Customer Satisfaction.
(Book 2: Chapters: 2, 14) (Book 3: Chapter: 14)

UNIT II
Software Quality Metrics and Reliability: Writing Software Requirements and Design Specifications – Analyzing Software Documents Using Inspections and Walkthroughs – Software Metrics – Lines of Code, Qualityand Quality Management Metrics, Project Management.
(Book 2: Chapters: 11, 12)

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UNIT III
Test Case Design: Testing Fundamentals – Defects – Strategies and Methods for Black Box Test Case Design – Strategies and Methods for White-Box Test Case Design– Levels of Testing and different Types of Testing (Unit Testing. Integration Testing, System Testing, Functional, stress, Performance Testing, Security Testing)
(Book 1 - Chapters: 4, 5, 6)

UNIT IV
Test Management: Testing and Debugging Goals and Policies – Test Planning – Test Plan Components– Test Plan Attachments – Locating Test Items – Reporting Test Results – The Role of Three Groups in Test Planning and Policy Development – Process and the Engineering.
(Book 1 - Chapter: 7)

UNIT V
Controlling and Monitoring: Measurement and Milestones for Controlling and Monitoring (coverage measures, Test case development, Test case Execution, Measurements for monitoring testing costs, errors, faults and failures) – Status Meetings – Reports and Control Issues – Criteria for Test Completion – SCM – Types of Reviews – Developing a Review Program – Components of Review Plans – Reporting Review Results.
(Book 1 - Chapters: 9, 10)

Suggested Readings:

1. Ilene Burnstein, Practical Software Testing, Springer International Edition, 2003.
2. StephenKan, Metrics and Models in Software Quality, Addison-Wesley, Second Edition, 2004.
3. Pressman Roger, Software Engineering, Seventh Edition, 2010.
4. Milind Limaye, Software Quality Assurancel, McGraw Hill, 2011.
5. M G Limaye, Software Testing – Principles, Techniques and Toolsl, McGraw Hill,2011

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA544 CO1: Describe different process models and software quality.

BCA544 CO2: Summarize how to build Software Quality Metrics and Project Management.

BCA544 CO3: Paraphrase different levels of Testing.

BCA544 CO4: Integrate the Test plan and Management.

BCA544 CO5: Implement Software Configuration Management and Monitor Testing Tools.

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PROGRAM NAME: BCA
COURSE NAME: MOBILE COMPUTING (ELECTIVE I)
(w.e.f 2022-23)

PAPER CODE: BCA545a　　　　　　　　　　　　　　　　**PPW: 4**
YEAR/SEMESTER: III/V　　　　　　　　　　　　**NO. OF CREDITS: 4**

COURSE OBJECTIVE: 'To enrich students with the concepts of mobile application development and make sure they develop simple mobile applications.

UNIT-WISE COURSE OBJECTIVES:

COb1: To explain the basics of wireless communication and the benefits of next generation wireless systems over the previous.

COb2: To describe protocols and mechanisms developed for the network layer to support mobility.

COb3: To inculcate different approaches that lead to device development, content availability and service deployments.

COb4: To explain how this language is suitable for use in wireless environment, how to provide a more dynamic and responsive interface.

COb5: To illustrate the approaches for delivering the content to the client.

UNIT I
Introduction to Mobile Computing: Applications, History of mobile communications, A simplified Reference Model.
Wireless Transmission – Introduction to Radio Transmission Frequencies, Signals, Antennas, introduction to Signal Propagation, Multiplexing, Basics of Modulation, Spread spectrum, cellular systems
Medium Access Control – Specialized MAC, SDMA, FDMA, CDMA
(Book 2 – Chapters: 1, 2, 3)

UNIT II
Wireless LAN - Infrared Vs Radio Transmission, Infrastructure and Ad-Hoc Network, IEEE 802.11, Introduction to HIPERLAN and Bluetooth.
Mobile Network Layer: Mobile IP - Goals, Assumptions, Requirements, Entities and Terminologies, IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimization, Reverse Tunneling. Dynamic Host Configuration Protocol. Mobile Ad-hoc Networks.

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Mobile Transport Layer – Traditional TCP, Classical Traditional Improvements - Indirect TCP, Snooping TCP, Mobile TCP.
(Book 2 – Chapters: 7, 8, 9)

UNIT III
Wireless Application Protocol - WAP Architecture, Components of WAP standard, Design principles.
The Wireless Markup Language – The WML Document Model, WML Basics, Controls, Application Security.
(Book 1- Chapters: 6, 7)

UNIT IV
Wireless binary extensible markup language: Overview, Content Structure, Document Structure.
Enhanced WML: WML Script - Language Basics, WML Script Standard Libraries.
User interface design - Structured Usability methods, User Interface Design Guidelines.
(Book 1 – Chapters: 8, 9, 10)

UNIT V
Tailoring content to client: **Push messaging**-Overview of WAP Push, Push Access Protocol and Push Over-the-Air Protocol.
Wireless Telephony Applications- Overview of WTA Architecture, WTA Client Framework.
Building and deploying End-to-End WAP services- Mapping Deployment Chain to the business Value Chain, Security Domains.
(Book 1- Chapters: 11, 12, 13. 14)

Suggested Readings:

1. Sandeep Singhal, Thomas Bridgeman ,The Wireless Application Protocol, 6th Edition, 2010.
2. Jochen Schiller, Mobile Communications , 2nd Edition, 2009.
3. Rajkamal, Mobile Computing, Oxford University, 2007.
4. Stojmenovic,Cacute, Handbook of Wireless Networks and Mobile Computing, Wiley, 2002.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA545a CO1: Summarize the basics of Wired and Wireless Communication.

BCA545a CO2: Familiarize Mobile Network and Transport layers.

BCA545a CO3: Paraphrase content management and services provided.

BCA545a CO4: Develop a dynamic and more responsive interface.

BCA545a CO5: Explore the various methods of delivering the content to the clients.

PROGRAM NAME: BCA
COURSE NAME: INTERNET OF THINGS(IoT) (ELECTIVE I)
(w.e.f 2022-23)

PAPER CODE: BCA545b   **PPW: 4**

YEAR/SEMESTER: III/V   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: Enable students to acquire knowledge on Internet of Things, IoT Physical Devices & Endpoints and Case Studies of IoT Design.

UNIT-WISE COURSE OBJECTIVES:

COb1: To Introduce basic knowledge on Internet of Things and Physical Design of IoT.

COb2: To acquire knowledge on IoT and M2M Communications.

COb3: To explain the NETCONF-YANG and IoT Platforms Design Methodology.

COb4: To infer about IoT Physical Devices & Endpoints.

COb5: Case Studies on IoT Design and Introduce Data Analytics for IoT.

UNIT I
Introduction to Internet of Things: Introduction, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates.
Domain Specific IoTs: Energy, Retail, Industry, Health and Lifestyle.
(Book 1-Chapters: 1, 2)

UNIT II
IoT and M2M: Introduction to M2M, Difference between IoT and M2M, SDN and NFV for IoT.
Machine–to-Machine(M2M)Communications: MQTT, Quality of service (QoS) ,Wills, Reconnecting, BBB MQTT Publisher Client, Adding MQTT Features to the Application,MQTT Brokers, MQTT Dashboard.
(Book1-Chapter: 3, Book 2-Chapter: 11)

UNIT III
IoT System Management with NETCONF-YANG: Need for IoT Systems Management, SNMP, Network Operator requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG.
IoT Platforms Design Methodology: Introduction, IoT Design Methodology, Case Study on IoT system for weather Monitoring.
(Book 1-Chapter: 4, 5)

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UNIT IV

IoT Physical Devices & Endpoints: What is an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, programming Raspberry Pi with Python-controlling LED wth Rasperry Pi.

IoT Physical Servers & Cloud Offerings: Introduction to Cloud Storage Models & Communication APIs, WAMP- AutoBahn for IoT, Xively Cloud for IoT Python Web Application Framework- Amazon Web Services for IoT-Amazon EC2,Amazon Auto scaling, Amazon S3,Amazon RDS.

(Book 1-Chapters: 7, 8)

UNIT V

Case Studies of IoT Design: Home Automation-Smart Lighting, Cities-Smart Parking, Environment-Weather Monitoring System, Agriculture.

Data Analytics for IoT: Introduction to Data Analytics for IoT, Apache Hadoop, Apache Oozie, Apache Spark, Apache Storm,

(Book 1-Chapters: 9, 10)

Suggested Readings:

1. Arshdeep Bahga, Vijay Madisetti, Internet of Things – A Hands-on Approach, Universities Press, 2015.
2. Donald Norris, The Internet of Things, McGraw-Hill Education, 2015.
3. Graham Meikle, Mercedes Bunz, The Internet of Things, 1st Edition, 2017.
4. Rajkumar Buyya, Amir Vahid Dastjerdi, Internet of Things, 1st Edition, 2016.
5. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, 1st Edition, 2013.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA545b CO1: Correlate Internet of Things and Physical Design of IoT.

BCA545b CO2: Implement M2M Communications.

BCA545b CO3: Understand NETCONF-YANG and IoT Platforms Design Methodology.

BCA545b CO4: Design IoT Physical Devices & Endpoints.

BCA545b CO5: Comprehend knowledge of IoT design using Case Studies and Data Analytics for IoT.

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PROGRAM NAME: BCA
COURSE NAME: DATA MINING (ELECTIVE I)
(w.e.f 2022-23)

PAPER CODE: BCA545c   **PPW: 4**
YEAR/SEMESTER: III/V   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To imbibe students with the knowledge of Data Mining Concepts.

UNIT-WISE COURSE OBJECTIVES:

COb1: To learn the Functionalities and issues of Data Mining.

COb2: To explain the usage of Frequent Item set Mining methods and Association Rules.

COb3: To elucidate the importance of Classification and Prediction.

COb4: To analyze major clustering methods.

COb5: To discuss the applications and Trends in Data Mining.

UNIT I
Introduction: Introduction to Data Mining -What Motivated Data Mining, Why is it important, what is Data Mining, Kind of Data – Data Mining on what kind of Data, Data Mining Functionalities—What Kinds of Patterns can be Mined, Interesting Patterns – Are All of the Patterns Interesting, Task Primitives – Data Mining Task Primitives, Issues in Data Mining - Major Issues in Data Mining.**Data Preprocessing** -Why Preprocess the Data.
(Book 1-Chapters: 1, 2)

UNIT II
Association Rules: Mining Frequent Patterns: Associations and Correlations - Basic Concepts, Market Basket Analysis, Frequent Item sets, Closed Item sets, and Association Rules. Frequent Item Set Mining Methods – The Apriori Algorithm, Generating Association Rules from Frequent Item sets, Improving the Efficiency of Aprior, Mining Frequent Item sets without Candidate Generation, Mining Frequent Item Sets Using Vertical Data Format, Mining Closed Frequent Item sets, Mining Various Kinds of Association Rules- Mining Multilevel Association Rules, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses.
(Book 1-Chapter: 5)

UNIT III

Classification and Prediction: Issues Regarding Classification and Prediction, Preparing the Data for Classification and Prediction, Comparing Classification and Prediction Methods, Classification by Decision Tree Induction –Decision Tree Induction, Attribute Selection Measures, Tree Pruning, Bayesian-Bayesian Classification, Bayes' Theorem, Naïve Bayesian Classification, Rule Based Classification –Using IF-THEN Rules for Classification, Rule Extraction from a Decision Tree, Support Vector Machine-The Case When the Data are Linearly Separable, The Case When the Data are Linearly Inseparable
(Book 1-Chapter: 6)

UNIT IV

Cluster Analysis: What is Cluster Analysis, Types of Data in Cluster Analysis –Interval-Scaled Variables, Binary Variables, Categorical Variables, A Categorization of Major Clustering Methods, Partitioning Methods – Classical Partitioning Methods: k-Means and k-Medoids, Hierarchical Methods- Agglomerative and Divisive Hierarchical Clustering
(Book 1-Chapter: 7)

UNIT V

Applications and Trends in Data Mining: Data Mining Applications –Data Mining for Financial Data Analysis, Data Mining for the Retail Industry, Data Mining for the Telecommunication Industry, Data Mining for Intrusion Detection, Data Mining System Products and Research Prototypes- How to Choose a Data Mining System, Additional Themes on Data Mining-Theoretical Foundations of Data Mining, Statistical Data Mining, Visual and Audio Data Mining, Social Impacts of Data Mining- Ubiquitous and Invisible Data Mining, Data Mining, Privacy, and Data Security
(Book 1-Chapter: 11)

Suggested Readings:

1. Jiawei Han and Micheline Kamber, "Data Mining – Concepts and Techniques", Second Edition, Morgan Kaufmann Publishers, 2006.
2. M. H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education. 2001.
3. D. Hand, H. Mannila and P. Smyth, "Principles of Data Mining", PrenticeHall. 2001.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA545c CO1: Explain the Functionalities and issues of Data Mining

BCA545c CO2: Summarize and synthesize the concepts of Frequent Item set Mining methods and Association Rules

BCA545c CO3: Elucidate the importance of Classification and Prediction

BCA545c CO4: Describe major clustering methods

BCA545c CO5: Discuss the applications and Trends in Data Mining

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PROGRAM NAME: BCA
COURSE NAME: INFORMATION SECURITY
(w.e.f 2022-23)

PAPER CODE: BCA641   **PPW: 4**
YEAR/SEMESTER: III/VI   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To impart knowledge to students on the importance of Information Security.

UNIT-WISE COURSE OBJECTIVES:

COb1: To identify the need of security for an Information System.

COb2: To infer various laws and ethics in Information Security and its Risk Management factors.

COb3: To discuss and plan for security by implementing Security Technology.

COb4: To describe various Cryptographic Algorithms and Tools.

COb5: To enumerate the concepts of Information Security and Maintenance.

UNIT I
Introduction to Information Security: History, What is Security?, CNSS Security Model, Components of an Information System, Balancing Information Security and Access, The SDLC, The security SDLC.
The Need for Security: Introduction, Business Needs First, Threats, Attacks- Secure Software Development.
(Book 1- Chapters: 1, 2)

UNIT II
Legal, Ethical and professional Issues in Information Security: Introduction, Law and Ethics in Information Security, Relevant U.S Laws, International Laws and Legal Bodies, Ethics and Information Security.
Risk Management: Introduction, An Overview of Risk Management, Risk Identification, Risk Assessment, Risk Control Strategies, Selecting a Risk Control Strategy, Quantitative versus Qualitative Risk Control Practices, Risk Management Discussion Points, Recommended Risk Control Practices.
(Book 1- Chapters: 3, 4)

UNIT III

Planning for Security: Information Security Policy, Standards and Practices, The Information Security Blueprint, Security Education, Training and Awareness Program, Continuity Strategies.

Security Technology-Firewalls and VPNs: Introduction, Access Control, Firewalls, Protecting Remote Connections.

(Book 1- Chapters: 5, 6)

UNIT IV

Security Technology-Intrusion Detection, Access Control and Other Security Tools: Introduction, Intrusion Detection and Prevention Systems, Honeypots, Honeynets, and Padded Cell Systems, Scanning and Analysis Tools, Biometric Access Controls.

Cryptography: Introduction, Foundations of Cryptology, Cipher Methods, Cryptographic Algorithms, Cryptographic Tools, Protocols for Secure Communications, Attacks on Cryptosystems.

(Book 1- Chapters: 7, 8)

UNIT V

Implementing Information Security: Introduction, Information Security Project Management, Technical Aspects of Implementation, Non-Technical Aspects of Implementation, Information Systems Security Certification and Accreditation.

Security and Personal: Introduction, Positioning and Staffing the Security Function, Employment Policies and Practices, Internal Control Strategies.

Information Security Maintenance: Introduction, Security Management Maintenance Models, Digital Forensics.

(Book 1- Chapters: 10, 11, 12)

Suggested Readings:

1. Michael E Whitman and Herbert J Mattord, Principles of Information Security, Cengage Learning, 6th Edition, 2017.
2. Thomas R Peltier, Justin Peltier, John Blackley, Information Security Fundamentals, Auerbach Publications, 2010.
3. Detmar W Straub, Seymour Goodman, Richard L Baskerville, Information Security, Policy, Processes and Practices, PHI, 2008.
4. Mark Merkow and Jim Breithaupt, Information Security Principle and Practices, Pearson Education, 2007.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA641 CO1: Analyze the priority given to Security in Information System.
BCA641 CO2: Interpret various Security related laws and risk management in
           Information System.
BCA641 CO3: Implement security through security technology.
BCA641 CO4: Apply various Cryptographic Algorithms and Tools.
BCA641 CO5: Describe Information Security and Maintenance.

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PROGRAM NAME: BCA
COURSE NAME: ADVANCED JAVA PROGRAMMING
(w.e.f 2022-23)

PAPER CODE: BCA642 **PPW: 4**
YEAR/SEMESTER: III/VI **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To impart knowledge in students to develop client server applications.

UNIT-WISE COURSE OBJECTIVES:

COb1: To illustrate the concepts of connecting database through java programming.

COb2: To demonstrate web applications using java servlets.

COb3: To illustrate web applications using java server pages.

COb4: To describe the concepts on the usage of JSTL tags.

COb5: To describe the concepts of Java Server Faces (JSF), Struts, Springs and Hibernate.

UNIT I
Getting Started with JDBC: Introducing JDBC- Describing Components of JDBC, Features of JDBC. JDBC Architecture - Types of Drivers, Advantages and Disadvantages of Drivers, Use of Drivers.
Implementing JDBC Statements and Methods: Statement Interface, PreparedStatement Interface, CallableStatement Interface, Working with ResultSet Interface.
(Book 1-Chapters: 2, 4)

UNIT II
Understanding Java Servlet: Introducing CGI, Introducing Java Servlet, Advantages of Servlet over CGI , Features of Servlet. Introducing Servlet API - Javax.servlet package, Javax.servlet.http package, Servlet Lifecycle, Working with GenericServlet class methods.
Understanding Request Processing and HTTP: Understanding Request Dispatching, Dispatching the Request, Working with HttpServletRequest, Working with HttpServletResponse, Describing HttpServlet – The HttpServlet Lifecycle.
Handling Sessions in Servlet: Introducing Session Tracking, Describing Cookies, HttpSession.
(Book 1-Chapters: 6, 7, 8)

UNIT III

Introduction to JSP : - Advantages of JSP over Servlet , JSP architecture , JSP Life Cycle.
Working with JSP Tags and Implicit Objects: Exploring Scripting Tags, Exploring Implicit Objects in JSP, Exploring Directive Tags.
(Book 1-Chapters: 10, 11)

UNIT IV

Working with JSTL: JSTL Core Tags - General-Purpose Tags, Conditional and Looping Tags, Networking Tags, JSTL SQL Tags, JSTL Formatting Tags, JSTL XML Tags. Custom Tags: Empty Tag, Body Content Tag, Iteration Tag, Simple Tag.
(Book 1-Chapters: 16, 13)

UNIT V

Working with JSF: Features of JSF, JSF Architecture, Describing JSF Elements, JSF Request Processing Life cycle, JSF Tag Libraries-JSF HTML Tags.
Introduction to Spring Frameworks: Introduction, Introducing Spring Framework, Benefits of Spring Framework, Spring Framework Overview.
Understanding Hibernate: What is ORM, Main Features of ORM, Object/Relational Mapping, Understanding Hibernate Architecture.
(Book 1-Chapter: 17, Book 2-Chapters: 1, 7)

Suggested Readings:

1. Santosh Kumar K, JDBC, Servlets and JSP Black Book, New Edition, Dreamtech Publication, 2016.
2. Santosh Kumar K, Spring and Hibernate, McGraw Hill Education, 2017.
3. Jitendra Patel, Advanced Java, Kindle Edition, 2016.
4. Uttam K Roy, Advanced Java Programming, Oxford University Press, 2015.
5. Brayan Basham, Kathy Sierra, Bert Bates, Head First Servlets and JSP, O'Reilly Media, Latest Edition, 2005.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA642 CO1: Apply JDBC Concepts.

BCA642 CO2: Program Java Servlets.

BCA642 CO3: Create programs using Java Server Pages.

BCA642 CO4: Compile programs using JSTLTags.

BCA642 CO5: Apply JSF Tags.

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PROGRAM NAME: BCA
COURSE NAME: ADVANCED JAVA PROGRAMMING LAB
(w.e.f 2022-23)

PAPER CODE: BCA642P   **YEAR/SEMESTER: III/VI**

COURSE OBJECTIVE: To impart knowledge in students on the execution process of client server applications.

UNIT-WISE COURSE OBJECTIVES:

COb1: To demonstrate connecting database and implementing servlets.

COb2: To illustrate the usage of Java Server Pages and JSTL.

1. Jdbc program to connect the Oracle database.
2. Create a new database table using JDBC.
3. Jdbc program to insert records into database.
4. Jdbc program to update records in database.
5. Jdbc program to delete records from database.
6. Jdbc program to read the data from database using ResultSet.
7. Jdbc program to demonstrate PreparedStatement.
8. Jdbc program to demonstrate CallableStatement.
9. Installation and Configuring Apache Tomcat Server.
10. Installation and Configuring Netbeans, MyEclipse IDEs.
11. Servlet program to print "Hello World".
12. Program to demonstrate Servlet Lifecycle methods.
13. Servlet Program to demonstrate Session Tracking.
14. Servlet Program to demonstrate Cookies.
15. Servlet Program to demonstrate RequestDispatcher.
16. Program to demonstrate JSP scripting elements.
17. Program to demonstrate JSP implicit objects.
18. JSP program to process the Form.
19. Develop simple application to process the registration form using JSP and JDBC with the help of IDE.
20. JSP program to demonstrate JSTL.

COURSE OUTCOMES:
At the end of the course students will:

BCA642P CO1: Develop applications using JDBC and Servlets.
BCA642P CO2: Implement the concepts of Java Server Pages and JSTL.

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PROGRAM NAME: BCA
COURSE NAME: BIG DATA ANALYTICS (ELECTIVE II)
(w.e.f 2022-23)

COURSE CODE: BCA643a **PPW: 4**
YEAR/SEMESTER: III/VI **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To impart knowledge in students with the concepts of big data, handling huge data for analytics.

UNIT-WISE COURSE OBJECTIVES:

COb1: To inculcate knowledge on big data and technologies for handling Big Data.

COb2: To demonstrate the concepts of Hadoop Ecosystem, HDFS and Hbase.

COb3: To inculcate knowledge on MapReduce Fundamentals, HBase and Big Data Stack.

COb4: To illustrate the concepts of big data analyticsand the usage of Big Data analytics in social mediaand text mining.

COb5: To discuss NoSQL Data Management and Hive Queries.

UNIT I
Getting an overview of Big Data: Introduction to Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Big Data Analytics, Advantages of Big Data Analytics.
Introducing Technologies for Handling Big Data: Distributed and Parallel Computing for Big Data, Introducing Hadoop, HDFS and MapReduce, Hadoop Functionality, Cloud Computing and Big Data, Features of Cloud Computing, Cloud Deployment Models, Cloud Services for Big Data, Cloud Providers in Big Data Market.
(Book 1 - Chapters: 1, 3)

UNIT II
Understanding Hadoop Ecosystem: Hadoop Ecosystem, Hadoop Distributed File System, HDFS Architecture, Concept of Blocks in HDFS Architecture, Namenodes and Datanodes, The Command-Line Interface, Using HDFS Files, Hadoop Specific File System Types, HDFS COMmands, The org.apache.hadoop.io package, HDFS High Availability, Features of HDFS. MapReduce, Hadoop YARN, Introducing HBase - HBase Architecture, Regions, Storing Big Data with HBase, Interacting with the Hadoop Ecosystem, HBase in Operation- Programming with HBase, Combining HBase and HDFS, REST and Thrift, Data Integrity in HDFS, Features of HBase, Hive, Pig and Pig Latin, Sqoop, Zookeeper, Flume, Oozie.
(Book 1 - Chapter: 4)

UNIT III

Understanding MapReduce Fundamentals and HBase: The MapReduce Framework, Exploring the features of MapReduce, Working of MapReduce, Techniques to optimize MapReduce Jobs, Hardware/Network Topology, Synchronization, File system, Uses of MapReduce, Role of HBase in Big Data Processing- Characteristics of HBase.

Understanding Big Data Technology Foundations: Exploring the Big Data Stack, Data Sources Layer, Ingestion Layer, Storage Layer, Physical Infrastructure Layer, Platform Management Layer, Security Layer, Monitoring Layer, Visualization Layer, Virtualization and Big Data, Virtualization Approaches.

(Book 1 - Chapters: 5, 6)

UNIT IV

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Reporting, Analysis, Analytic Process, Types of Analytics-Basic Analytics, Advanced Analytics, Operationalized Analytics, Monetized Analytics, Characteristics of Big Data Analysis, Points to consider during Analysis- Frame the Problem Correctly, Statistical Significance or Business Importance, Making Inferences versus Computing Statistics, Developing an Analytic Team-Skills Required for an Analyst, Convergence of IT and Analytics. Understanding Text Analytics.

Social Media Analytics and Text Mining: Introducing social media, Key elements of social media, Introducing Text Mining, Understanding Text Mining Process, Sentiment Analysis.

(Book 1 - Chapter: 18, 28)

UNIT V

NoSQL Data Management: Introduction to NoSQL, Benefits and Challenges of NoSQL, Characteristics of NoSQL, History of NoSQL, Types of NoSQL Data Models, Key Value Data Model, Column-Oriented Data Model, Document Data Model, Graph Databases, Schema-Less Databases, Materialized Views, Distribution Models, CAP Theorem,Sharding.

Exploring Hive: Introducing Hive, Data Types in Hive, Hive DDL, Creating Databases, Viewing a Database, Dropping a Database, Altering a Database, Creating Tables- External Table, Creating a Table Using the Existing Schema, Dropping Tables, Altering Tables, Rename Tables, Modify Columns, Add Columns, Replace Columns, Data Manipulation in Hive – Loading Files into Tables, Inserting Data into Tables(Simple Insert), Update in Hive, Delete in Hive, Data Retrieval Queries – Using the Select Command, Using the Where Clause, Using the Group By Clause, Using the Having Clause, Using the Limit Clause.

(Book 1 - Chapters: 15, 12)

Suggested Readings:

1. BIG DATA, Black BookTM, DT Editorial Services, DreamTech Press, 1st Edition, 2016.
2. SeemaAcharya, Subhashini Chellappan, BIG DATA and ANALYTICS, Wiley publications, 2nd Edition, 2015.
3. Nathan Marz and James Warren, BIG DATA- Principles and Best Practices of Scalable Real-Time Systems, 1st Edition, 2015.
4. Raj Kamal, Preeti Saxena, Bigdata Analytics: Introdution to Hadoop, Spark and Machine-Learning, McGraw Hill Education, 1st Edition, 2019.

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COURSE OUTCOMES:

At the end of the course students will:

BCA643a CO1: Acquire knowledge on big data and technologies for handling Big Data.

BCA643a CO2: Be familiar with Hadoop Ecosystem, HDFS and HBase.

BCA643a CO3: Comprehend MapReduce Fundamentals, HBase and Big Data Stack.

BCA643a CO4: Acquire knowledge on the usage of Big Data Analytics and the usage of big data analytics in social media and text mining.

BCA643a CO5: Outline NoSQL database Management and Hive Queries.

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Bharatiya Vidya
Bhavan
BHAVAN'S VIVEKANANDA COLLEGE
OF SCIENCE, HUMANITIES AND COMMERCE
(Accredited with 'A' Grade by NAAC)
Autonomous College – Affiliated to Osmania University
Department of Computer Science

PROGRAM NAME: BCA
COURSE NAME: BLOCKCHAIN TECHNOLOGY (ELECTIVE II)
(w.e.f 2022-23)

PAPER CODE: BCA643b   **PPW: 4**
YEAR/SEMESTER: III/VI   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To impart knowledge in students to develop web based applications.

UNIT-WISE COURSE OBJECTIVES:

COb1: To describe the concepts of Blockchain and Decentralized Systems.

COb2: To demonstrate Hash Functions and Consensus Methods.

COb3: To discuss Blockchain Components and its Allied Technologies.

COb4: To illustrate the concepts of Smart Contracts and Blockchain Usecases.

COb5: To analyze the concepts of Bitcoins and Decentralized Applications.

UNIT I
Basics of Blockchain: Introduction, Concept of Blockchain, History, Definition of Blockchain, Fundamentals of Blockchain, Characteristics of Blockchain, Consensus in Trust-Building Exercise; Public, Private, and Hybrid Blockchains, Distributed Ledger Technologies, DLT Decentralized Applications and Databases, Architecture of Blockchain, Transactions, Chaining Blocks, Value Proposition of Blockchain Technology.
Decentralized System: Introduction, Distributed Decentralized Databases, Decentralized Enterprise, Decentralization, Disintermediation, Decentralized Enterprise Regulation.
(Book 1-Chapters: 1, 2)

UNIT II
Hash Functions: Introduction, Hashing, Message Authentication Code, Secure Hash Algorithm (SHA-1), Secure Hash Algorithm Version, Distributed Hash Tables, Hashing and Data Structures, Hashing in Blockchain Mining.
Consensus: Introduction, Consensus Approach, Consensus Algorithms, Byzantine Agreement Methods.
(Book 1-Chapters: 3, 4)

UNIT III
Blockchain Components: Introduction, Ethereum, History, Ethereum Virtual Machine, Working of Ethereum, Ethereum Clients, Ethereum Key Pairs, Ethereum Addresses, Ethereum Wallets, Ethereum Transactions, Ethereum Languages, Ethereum Development Tools.

Blockchain and Allied Technologies: Blockchain and Cloud Computing, Characteristics of Blockchain Cloud, Blockchain and Artificial Intelligence, Blockchain and IoT, Blockchain and Machine Learning, Blockchain and Robotic Process Automation.
(Book 1-Chapters: 5, 11)

UNIT IV
Smart Contracts: Introduction, Smart Contracts, Absolute and Immutable, Contractual Confidentiality, Law Implementation and Settlement, Chracteristics, Internet of Things, Utilities: Smart Grid, Proof of Origin, Supply Chain Management, Medical Sciences, Finance, Media and Entertainment, Public Services, Legal Services, Darknet, The Future.
Blockchain Vertical Solutions and Use Cases: Blockchain, Blockchain in Insurance, Assets Management, Smart Assets, Electronic Currency, Maufacturing.
(Book 1-Chapters: 7, 10)

UNIT V
Bitcoins: Introduction, Working of Bitcoin, Merkle Trees, Bitcoin Block Structure, Bitcoin Address, Bitcoin Transactions, Bitcoin Network, Bitcoin Wallets, Bitcoin Payments, Bitcoin Clients, Bitcoin Supply.
Decentralized Applications: Introduction, Today's Web Applications Requirement, Mining in Blockchain Bitcoin, Blocks Validation and Identification, Bitcoins Creation, Mining Hardware, Mining Software, Running Miner Software, Executing Several Miners, Bitcoins Management, Reasons for Bitcoin Mining, Swarm, Robotic Possibilities, Sidechain Hopping, Blockchain Fork.
(Book 1-Chapters: 8, 9)

Suggested Readings:

1. Kumar Saurabh, Ashutosh Saxena, Blockchain Technology Concpets and Applications, Wiley Publications, First Edition, 2020.
2. Daniel Hellwig, Goran Karlic, Arnd Huchzermeier, Build Your Own Blockchain – A Practical guide to Distributed Ledger Technolog, Springer,2020.
3. Arshdeep Bahga, Vijay Madisetti, Blockchain Applications – A Hands-on Approach, VPT Publications, 2018.
4. Debajani Mohanty, Blockchain from Concept to Execution, BPB Publications, 2018.

COURSE OUTCOMES:

At the end of the course students will be able to:

BCA643b CO1: Explain the concepts of Blockchain and Decentralized Systems.

BCA643b CO2: Implement Hash Functions and Consensum Methods.

BCA643b CO3: Summarize Blockchain Components and its Allied Technologies.

BCA643b CO4: Paraphrase the concepts of Smart Contracts and Blockchain Usecases.

BCA643b CO5: Analyze Bitcoins and Decentralized Applications.

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PROGRAM NAME: BCA
COURSE NAME: MULTIMEDIA (ELECTIVE – II)
(w.e.f 2022-23)

PAPER CODE: BCA643c   **PPW: 4**
YEAR/SEMESTER: III/VI   **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To impart knowledge in students about multimedia software and its use.

UNIT-WISE COURSE OBJECTIVES:

CEb1: To explain basic multimedia components.

CEb2: To contrast various software tools to present multimedia applications.

CEb3: To analyze various vector graphic tools.

CEb4: To synthesis virtual reality applications.

CEb5: To explore audio functionality and its applications.

UNIT I
Introduction - Applications, Delivery, Multimedia Production, Interactivity Writer.
Multimedia Skills and Training - Project Manager, Multimedia Designer, Interface Designer, Writer, Video Specialist, Audio Specialist, Programmers.
Multimedia Hardware - Connections, Memory and Storage devices, Input, Output, Communication.
(Book 1-Chapters: 1, 2)

UNIT II
Multimedia Software - Basic Tools, Authoring Tools Text - Fonts and Faces.
Using Test in Multimedia- Font Editing and Design Tools.
Hypermedia and Hypertext Sound - Digitizing Sound, Processing Sound, Compression, Formats, MIDI.
(Book 1-Chapters: 7, 9, 12, 13)

UNIT III
Computer Graphics - Vector Graphics, Bitmapped Graphics, Combining Vectors and Bitmaps, File Formats.
Vector Graphics - Fundamentals, Shapes, Transformations and Filters, 3-D Graphics.

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Bitmapped Images - Resolution- Image Compression, Image manipulation, Geometric Transformations.
(Book 1- Chapters: 3, 4, 5)

UNIT IV
Introduction to Immersive Technologies - A Brief History of Virtual Reality, The five Classic Components of a VR System , Early Commercial VR Technology , VR Becomes an Industry , Reality, Virtuality and Immersion, VR, AR, MR, xR: similarities and differences , Current Trends and State of the Art in Immersive Technologies, Developing Platforms and Consumer Devices, The Future of Human Experience.
(Book 2-Chapter: 1, Book 3-Chapter: 8)

UNIT V
Sound in Immersive Environments - Evolution of Sound Systems, From mono to stereo to surround, Object Based Sound, Ambisonics, HRTF, Sound Design Basics, Sound as Information, Earcons, Impact of Sound in Objects and Actions, Natural vs Real Sound.
(Book 2-Chapter: 13)

Suggested Readings:
1. Nigel Chapman, Jenny Chapman - Digital Multimedia, Wiley 2000.
2. Kelly S. Hale (Editor), Kay M. Stanney (Editor). 2014. Handbook of Virtual Environments: Design, Implementation, and Applications, Second Edition (Human Factors and Ergonomics) ISBN-13: 978-1466511842.
3. Michael Heim. 1994. The Metaphysics of Virtual Reality.
4. Tay Vaughan - Multimedia: Making it Work, Fourth Edition, McGraw 1998.
5. T M Savage, K E Vogel – An Introduction to Digital Multimedia, Second Edition, 2014.

COURSE OUTCOMES:
At the end of the course students will be able to:

BCA643c CO1: Acquire knowledge on Multimedia Components.

BCA643c CO2: Summarize various Multimedia Software Tools.

BCA643c CO3: Categorize on Computer and Vector Graphics.

BCA643c CO4: Acquire knowledge on Immersive Technologies of Virtual reality.

BCA643c CO5: Acquire Knowledge on Audio tools and analyze sound environment.

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