

ST. JOSEPH'S COLLEGE (AUTONOMOUS)

BENGALURU-27



Re-accredited with 'A++' **GRADE** with **3.79/4 CGPA** by
NAAC Recognized by UGC as College of Excellence

**DEPARTMENT OF COMPUTER SCIENCE AND
COMPUTER APPLICATIONS**

**SYLLABUS FOR UNDERGRADUATE
PROGRAMME BCA**

For Batch 2021-2024

**DEPARTMENT OF COMPUTER SCIENCE AND COMPUTER
APPLICATIONS(UG)
(2021-2024)**

Semester 1	Code Number	Title	No. of Hours of Instructions	Number of Hours of teaching per week	Number of credits	Continuous Internal Assessment (CIA) Marks	End Semester Marks	Total marks
Theory	CA1121	Problem Solving and Introduction To Emerging Technologies	60	04	04	30	70	100
Theory	CA1221	Discrete Mathematics	60	04	04	30	70	100
Theory	CA1321	Programming in C	60	04	04	30	70	100
Theory	CA1421	Digital Fundamentals And Logic Design	60	04	04	30	70	100
Practical	CA1P1	C Programming Lab	22	02	1	30	70	100
Practical	CA1P2	Office Automation And Digital Electronics Lab	22	02	1	30	70	100
Total Number of credits:18								
Semester 2	Code Number	Title	No. of Hours of Instructions	Number of teaching hrs /week	Number of credits	Continuous Internal Assessment (CIA) Marks	End Semester Marks	Total marks
Theory	CA2121	Data Structures using C++	60	04	04	30	70	100
Theory	CA2221	Microprocessor	60	04	04	30	70	100
Theory	CA2321	Operating System	60	04	04	30	70	100
Theory	CA2421	Probability and Statistics	60	04	04	30	70	100
Practical	CA2P1	Data Structures using C++ Lab	22	02	1	30	70	100
Practical	CA2P2	Microprocessor Lab	22	02	1	30	70	100
Total Number of credits:18								
Semester 3	Code Number	Title	No. of Hours of Instructions	Number of teaching hrs /week	Number of credits	Continuous Internal Assessment (CIA) Marks	End Semester Marks	Total marks

Theory	CA3121	Object Oriented Programming Using Python	60	04	04	30	70	100
Theory	CA3221	.NET Technologies	60	04	04	30	70	100
Theory	CA3321	Software Engineering	60	04	04	30	70	100
Theory	CA3421	Database Management System	60	04	04	30	70	100
Practical	CA3P1	Python Programming Lab	22	02	01	30	70	100
Practical	CA3P2	.NET and Database Management System Lab	22	02	01	30	70	100
Total Number of credits: 18								
Semester 4	Code Number	Title	No. of Hours of Instructions	Number of teaching hrs /week	Number of credits	Continuous Internal Assessment (CIA) Marks	End Semester Marks	Total marks
Theory	CA4121	JAVA Programming	60	04	04	30	70	100
Theory	CA4221	UNIX Programming	60	04	04	30	70	100
Theory	CA4321	Data Communication and Computer Networks	60	04	04	30	70	100
Theory (Open Elective)	CAOE4121	Web Development	30	02	02	15	35	50
Practical	CA4P1	Java Programming Lab	22	02	01	30	70	100
Practical	CA4P2	UNIX Programming Lab	22	02	01	30	70	100

Total Number of credits:16								
Semester 5	Code Number	Title	No. of Hours of Instructions	Number of teaching hrs /week	Number of credits	Continuous Internal Assessment (CIA) Marks	End Semester Marks	Total marks
Theory	CA5121	Web Technologies	60	04	04	30	70	100
Theory	CA5221	Cryptography and Network Security	60	04	04	30	70	100
Theory	CA5321	Computer Graphics and Multimedia	60	04	04	30	70	100
Department Elective(One out of the Two)								
Theory (Elective)	CADE5421	Operations Research	60	04	04	30	70	100
Theory (Elective)	CADE5521	Data Analytics	60	04	04	30	70	100
Practical	CA5P1	Network Security Lab	22	02	01	30	70	100
Practical	CA5P2	Graphics and Web Technologies Lab	22	02	01	30	70	100
Total Number of credits:18								
Semester 6	Code Number	Title	No. of Hours of Instructions	Number of teaching hrs /week	Number of credits	Continuous Internal Assessment (CIA) Marks	End Semester Marks	Total marks
Theory	CA6121	Computer Organization and Architecture	60	04	04	30	70	100
Theory	CA6221	Software Testing And Quality Assurance	60	04	04	30	70	100
Theory	CA6321	Mobile Applications	60	04	04	30	70	100
Department Elective(One out of the Two)								

Theory (Elective)	CADE6421	Cloud Computing	60	04	04	30	70	100
Theory (Elective)	CADE6521	Internet Of Things	60	04	04	30	70	100
Practical	CA6P1	Mobile Application Development lab	22	02	01	30	70	100
Practical	CA6P2	Major Project Lab	22	02	01	30	70	100
Total Number of credits:18								

SUMMARY OF CREDITS IN COMPUTER APPLICATIONS

CORE COURSES (CC)	
Course Title	Code Number
Problem Solving and Introduction To Emerging Technologies	CA1121
Discrete Mathematics	CA1221
Programming in C	CA1321
Probability and Statistics	CA1421
Data Structures using C++	CA2121
Microprocessor	CA2221
Operating System	CA2321
Probability and Statistics	CA2421
Object Oriented Programming Using Python	CA3121
.NET Technologies	CA3221
Software Engineering	CA3321
Database Management System	CA3421
JAVA Programming	CA4121
UNIX Programming	CA4221
Data Communication and Computer Networks	CA4321
Web Technologies	CA5121
Cryptography and Network Security	CA5221
Computer Graphics and Multimedia	CA5321
Computer Organization and Architecture	CA6121
Software Testing And Quality Assurance	CA6221
Mobile Applications	CA6321

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE)	
Course Title	Code Number
Operations Research	CADE5421
Data Analytics	CADE5521
Cloud Computing	CADE6421
IOT	CADE6521

GENERIC ELECTIVE COURSES (GSE)/ Can include open electives offered	
Course Title	Code Number
Web Development	CAOE4121

SKILL ENHANCEMENT COURSE (SEC) –	
Course Title	Code Number
C Programming Lab	CA1P1
Office Automation And Digital Electronics Lab	CA1P2
Data Structures using C++ Lab	CA2P1
Microprocessor Lab	CA2P2
Python Programming Lab	CA3P1
.NET and Database Management System Lab	CA3P2
Java Programming Lab	CA4P1
UNIX Programming Lab	CA4P2
Network Security Lab	CA5P1
Graphics and Web Technologies Lab	CA5P2
Mobile Application Development lab	CA6P1
Major Project Lab	CA6P2

VALUE ADDED COURSES (VAC)	
Course Title	Code Number
Cyber security and Ethical Hacking	
Web Design	

Online courses offered or recommended by the department to be listed	
Course Title	Code Number
NPTEL COURSE ON INTERNET OF THINGS	
NPTEL COURSE ON DATAANLYTICS	
NPTEL COURSE ON CLOUD COMPUTING	

COURSE OUTCOMES AND COURSE CONTENT

Semester	I
Paper Code	CA 1121
Paper Title	Problem Solving and Introduction to Emerging Technologies
Number of teaching hours per week	04
Total number of teaching hours per semester	60
Number of credits	04

Objective of the Paper:

The course would make students acquainted with the fundamentals of computer and the current emerging technologies. It covers topics such as problem solving methodologies, Input and Output devices, and basic concepts of computers, Artificial Intelligence and Cloud Computing.

UNIT 1

(12 hours)

1. FUNDAMENTALS OF COMPUTERS

Functional block diagram of a digital computer: Input device, Output device and memory, Historical overview-history of computers, Generation of computers-up to the present, Application of computers, Classification of Computers- Analog, Digital, Hybrid, Micro, Mini, Mainframe computers etc. Types of Computers: Servers-Mobile Devices- Game Devices- Embedded Computers

2. COMPUTER COMPONENTS

General structure of the CPU, how instructions are executed, Factors affecting speed of a computer, Specifications of computer components (Motherboard), Power consumption of PC.

3. ADVANCED FEATURES

Advanced I/O interfaces, Configuring specifications of a computer, additional accessories such as UPS for various applications, Importance of computer maintenance, Computer viruses and Computer security.

Self-Study: Applications of Computers in new fields, Improved Input and Output devices.

UNIT 2

(12 hours)

1. SOFTWARE CONCEPTS

Introduction, Types of Software (Application and System software), Introduction to computer languages (Machine level language, assembly level language, high-level language), Language translators (Compilers, interpreters, linkers, loaders).

2. OPERATING SYSTEM CONCEPTS

Introduction to Operating Systems, Functions of Operating Systems, Types of Operating Systems, Functional features of commonly used operating systems

3. DATA PROCESSING CONCEPTS

Introduction to data processing, Difference between data and information, Examples of data processing

systems, Data processing cycle and functions, Data Hierarchy, types of data processing systems (Manual and Electronic).

UNIT 3

(12 hours)

FUNDAMENTALS OF PROBLEM SOLVING APPROACHES

Introduction to problem Solving, Characteristics of a Good Program, Approaches to Problem Solving-Top-down and Bottom-up approach – system design and development, Advantages, Disadvantages, Differences. Modularity-objective, Structure Chart. Structured-Basic Control Structures – Sequence and Iteration and object oriented approach- Objects and classes, Encapsulation, Data hiding, Polymorphism and inheritance. Introduction to UX problem solving.

UNIT 4

(12 hours)

1. WORD PROCESSING

Word Processing applications: creation of documents, Parts of the Menu/window, copy and move, formatting features, spell check, print, creation of tables and other basic operations.

2. SPREADSHEETS

Spreadsheet applications, Basics concepts of spreadsheet and other features such as, entering text, menus, commands, column width, copy, paste, to insert rows/columns, formatting, formula, print, sort, filter and other basic operations. Some advanced features such as graphs, library functions (Arithmetic, Date and Time, Financial, Logical, text and statistical).

3. INTERNET CONCEPTS

Introduction to the Internet and Internet services.

UNIT 5

(12 hours)

INTRODUCTION TO EMERGING TECHNOLOGIES

Introduction, overview, features, limitations and application areas of Augmented Reality, Virtual Reality, Grid computing, Green computing, Artificial Intelligence, Machine learning, Data Warehousing, Data Mining, Big data analytics, Internet of Things, Cyber security, Cloud Computing: It nature and benefits, Crypto currencies: Introduction, Applications.

REFERENCES:

1. Norton P., "Introduction to Computers", McGraw Hill Education.
2. Tools For Structured and Object-Oriented Design - Marilyn Bohl, Maria Rynn – Seventh Edition
3. Fundamentals of Computers – 5th Ed. – PHI - V. Rajaraman
4. Fundamentals of Computer - 1st Ed. Publisher – Balaguruswamy- McGraw-Hill
5. Thareja R., "Fundamentals of Computers", Oxford University Press.

BLUEPRINT

Code number: **CA 1121**

Title of the paper: **Problem Solving and Introduction to Emerging Technologies**

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit I	12	21
Unit II	12	21
Unit III	12	21
Unit IV	12	21
Unit V	12	21
Maximum marks for the paper (Excluding bonus question)= 70		

COURSE OUTCOMES: At the end of the course, the student should

CO1	Knowledge	State the basics of a computer, recognize data processing aspects and understand the problem solving aspect.
CO2	Understand	Have developed a very good understanding of the characteristics of different types of computer software, describe the various built-in functions in MS office, illustrate the emerging trends and technologies in the field of Information Technology
CO3	Apply	Be able to demonstrate the algorithm and flowchart for the given problem using various programming constructs and work with MS office.
CO4	Analyze	Be able to contrast and explain the components of a computer and the emerging technologies
CO5	Evaluate	Be able to comment on the evolution of technology.
CO6	Create	Be able to design the new methodologies and techniques to overcome the disadvantages in the current technology.

Semester	1
Paper Code	CA1221

Paper Title	DISCRETE MATHEMATICS
Number of teaching hours per week	04
Total number of teaching hour per semester	60
Total Number of Credits	04

Objective of the Paper:

To inculcate in students, the fundamental mathematical background in computer science. To know the abstraction, notation, and critical thinking in Discrete Mathematics.

UNIT 1

15 HRS

MATHEMATICAL LOGIC

Propositions, Logical connectives, Compound propositions, Conditional and bi conditional propositions, Tautologies and contradictions, Contra-positive, Logical equivalences and implications, De Morgan's Laws, Normal forms, Principal conjunctive and disjunctive normal forms, Rules of inference.

COUNTING

Basics of counting, pigeonhole principle, permutation and combination, recurrence relations, generating functions, inclusion and exclusion principle, application of inclusion and exclusion.

UNIT 2

15 HRS

RELATIONS

Relations on sets, Types of relations and their properties, representing relation, partial ordering, Hasse diagram.

GROUP THEORY

Groups, Properties, Subgroups, Cosets and Lagrange's theorem, Normal subgroups, Algebraic system with two binary operations, Preliminaries of Coding, Hamming Metric, rings, internal domains and fields

UNIT 3

10 HRS

LATTICE THEORY

Lattices and algebraic systems, principle of duality, basic properties of algebraic systems, distributive and complemented lattices, Boolean lattices and Boolean algebra, propositional calculus.

UNIT 4

10 HRS

CODING THEORY

Coding of binary information and error detection, Preliminaries of Coding, Hamming Metric, error recovery in group codes decoding and error detection

UNIT 5

10 HRS

GRAPH THEORY

Definition of a Graph, Finite and Infinite Graphs, Incidence and Degree of a Vertex, Sub graphs, Walks, Paths, Circuits, Euler Graph and Hamiltonian Circuit, Properties of Trees, Spanning Trees and Fundamental Circuits, graph colouring.

REFERENCES:

- Tremblay J.P and Manohar R, “Discrete Mathematical Structures with Applications to ComputerScience”, Tata McGraw–Hill Pub. Co. Ltd, New Delhi, 2003.
- B. Kalman Discrete mathematics structure 3rd edition.
- Ralph.P.Grimaldi, “Discrete and Combinatorial Mathematics: An Applied Introduction”, Fifth Edition, Pearson Education Asia, Delhi, 2002.
- K.H Rosen, Discrete Mathematics and application 5th edition TATA McGraw

BLUE PRINT

Paper Code: CA 1221

Title of the Paper: DISCRETE MATHEMATICS

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit 1	15	23
Unit 2	15	22
Unit 3	10	20
Unit 4	10	20
Unit 5	10	20
Maximum marks for the paper (Excluding bonus questions) – 70 marks		

COURSE OUTCOMES: At the end of the course, the student should

CO1	Knowledge	About numerous themes and general principles that have broader application in the field of computer science and discrete mathematics.
CO2	Understand	The range of applying the gained knowledge in real world problem solving and opportunities & limitations in computing.
CO3	Apply	Tools and ideas from mathematics and theoretical computer science to structure solve complex problems.
CO4	Analyze	Multiple solutions to a given problem and efficiently apply them with greater impact.
CO5	Evaluate	Individual and collective responsibility and individual limitations as well as the limitations of technical tools.
CO6	Create	A solid foundation that allows and encourages them to maintain relevant skills as the field evolves.

Semester	I
Paper Title:	PROGRAMMING IN C
Paper Code :	CA1321
Total number of teaching hours per semester	60 Hrs.
Total number of teaching hours per week	4

Credits:	4
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OBJECTIVE OF THE PAPER:

This paper introduces the students to the field of Programming and provides students with a detailed study of programming technique using C Programming language. It also helps students to inculcate good programming habits, proper logical thinking and algorithm and flowchart development. This paper acts as the first step to gain insight about the basics of the vast field of Programming.

UNIT 1

(12 hours)

INTRODUCTION TO PROGRAMMING CONCEPTS

Design of a solution-Algorithms and flowcharts, History of C, Character set, C tokens, Identifiers, Keywords, Data types, Variables, Constants, Symbolic Constants , Operators in C, Hierarchy of Operators, Expressions, Type Conversions and Library Functions.

UNIT 2

(12 hours)

MANAGING INPUT AND OUTPUT OPERATION

Managing Input and Output Operation: Formatted and Unformatted I/O Functions, Decision making, branching and looping: Decision Making Statements - if Statement, if- else statement, nesting of if-else statements, else-if ladder, switch statement, conditional operator, Looping - while, do-while, for loop, Nested loop, break, continue, and goto statements.

UNIT 3

(12 hours)

ARRAYS

Declaring and Initializing, One Dimensional Arrays, Two Dimensional Arrays, Multi Dimensional Arrays - Passing arrays to functions. Strings: Declaring and Initializing strings, Operations on strings, Arrays of strings, passing strings to functions. Storage Classes - Automatic, External, Static and Register Variables.

UNIT 4

(12 hours)

FUNCTIONS

Function Definition, prototyping, types of functions, passing arguments to functions, Nested Functions, Recursive functions.

UNIT 5

(12 hours)

FILES AND POINTERS

File modes, File functions, and File operations, Text and Binary files, Command Line arguments. Structures-Declaring and Initializing, Nested structure, Array of Structure, Passing Structures to functions, Unions, typedef, enum, Bit fields. Declarations, Pointer arithmetic, Pointers and functions, Call by value, Call by reference, Pointers and Arrays, Arrays of Pointers, Pointers and Structures. static and dynamic memory allocation, Memory allocation functions.

Self Study: Data types, memory allocation and programs related to all the units.

REFERENCES

E. Balaguruswamy, "Programming In ANSI C", 6th edition, TMH Publications.
Ashok N. Kamthane, "Programming with ANSI and Turbo C", Pearson Education.

BLUEPRINT

Code number: CA1321

Title of the paper: PROGRAMMING IN C

CHAPTER	No of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit I	12	21
Unit II	12	21
Unit III	12	21
Unit IV	12	21
Unit V	12	21
Maximum marks for the paper [Excluding bonus questions: 70]		

PRACTICAL I

CA1P1: C PROGRAMMING LAB [11 Session, 2 hours /week]

1. To demonstrate the usage of operators and data types in C
2. To demonstrate the usage of if, if-else, nested-if and switch
3. To demonstrate the usage of while, do-while and for loops
4. To demonstrate the concept of arrays and strings
5. To demonstrate the usage of functions and recursion
6. To demonstrate the concept of structures
7. To demonstrate the concept of pointers

COURSE OUTCOME: At the end of the course, the student should

CO1	Knowledge	Have developed a good knowledge of the basics of programming in C along with the syntax of C language.
CO2	Understand	Read, understand and trace the execution of programs written in C language.
CO2	Apply	Be able to apply their own ideas to solve a given problem using a program.
CO4	Analyze	Be able to analyze problems efficiently and develop comprehensive logic to solve it.
CO5	Evaluate	Have the ability to evaluate a program and debug.
CO6	Create	Be able to design a solution using small projects in order to solve a cluster of interconnected problems.

Semester	I
Paper Code	CA1421
Paper Title	DIGITAL FUNDAMENTALS AND LOGIC
Number of teaching hours per week	04
Total number of teaching hours per semester	60
Number of credits	04

Objective of the Paper:

To introduce Number Systems and Conversions, able to understand basic postulates of Boolean algebra and Boolean expressions, implementing various methods for simplifying Boolean expressions. To learn formal procedures to analyze and design combinational circuits and sequential circuits

UNIT 1

INTRODUCTION TO NUMBER SYSTEM AND CODES

14 HRS

Number systems: Decimal numbers , Binary numbers : Counting in binary, The weighted structure of binary numbers, Octal numbers, hexadecimal numbers and their mutual conversions.

Binary arithmetic : Addition, subtraction, multiplication and division of binary numbers, 1's and 2's complement, signed numbers, arithmetic operations(addition, subtraction) with signed numbers, 9's and 10's complement, BCD numbers, BCD addition , BCD subtraction.

Gray code: Binary to Gray code conversion, Gray to Binary conversion, Weighted code : 8421 code and Non weighted codes : ASCII and EBCDIC.

Practice for various number systems and its conversions.

UNIT 2

14 HRS

BOOLEAN ALGEBRA AND LOGIC GATES

Boolean algebra: Boolean operations and expressions, Laws and rules of Boolean algebra, Demorgan's Theorem, Boolean expressions, Simplification of Boolean expression.

AND gate, OR gate, NOT gate, NAND gate , NOR gate , X-OR gate , X-NOR gate, The universal property of NAND gate and NOR gate, Realization of basic gates. Boolean expression for logic circuits, Karnaugh map (SOP with examples)

Hands-on practice of various logical gates, Logic circuits and K-map using falstad simulator.

UNIT 3

12 HRS

Basic Adders and Subtractors : Half adder, Full adder, 4-bit Parallel adders, Subtractor : half subtractor , full subtractor (Implementation using logic gates),

Decoders and Encoders: 4 bit decoder, BCD to decimal decoder, Encoder: Decimal to BCD encoder.

Multiplexer and Demultiplexer: 4 to 1 multiplexer, 1 to 4 demultiplexer .

Hands-on practice of all Combinational Circuits using falstad simulator.

UNIT 4

8 HRS

FLIP FLOPS

Latches: SR latch, Clocked flip-flops: SR flip-flop, D flip-flop, JK flip-flop, Positive edge triggered flip flops, Timing diagrams, Master slave JK flip-flop.

Hands-on practice of all sequential circuits using falstad simulator

UNIT 5

12 HRS

REGISTERS AND COUNTERS

Registers: Modes of operation of registers (SISO, SIPO, PISO, and PIPO).

Asynchronous counters (Four bit ripple counter, Decade counter), **Synchronous counter** (Four bit synchronous counter, Decade counter).

Hands-on practice of Counters using falstad simulator.

REFERENCES:

- **Digital Computer Fundamentals by Thomas C Bartee, McGraw Hill, VI Edition, Computer Organization by Carl Hamacher V. Zaki, McGraw Hill.**
- **Digital computer Fundamentals by Malvino& Leach.**
- **Malvino, Digital Principles and Applications, Tata McGraw Hill, 4th Edition**
- **M. Ercegovac, T. Lang, J.H. Moreno, Introduction to Digital Systems, John Wiley and Sons**

BLUEPRINT

Code number: **CA1421**

Title of the paper: **DIGITAL FUNDAMENTALS AND LOGIC**

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit 1	14	23
Unit 2	14	22
Unit 3	12	21
Unit 4	8	18
Unit5	12	21
Maximum marks for the paper (Excluding bonus question)= 70		

CA1P1- OFFICE AUTOMATION AND DIGITAL ELECTRONICS LAB

OFFICE AUTOMATION LAB

1. Create a news-paper document with at least 200 words

- a. Use margins as, top:1.5, bottom:2, left:2, right:1 inches.
- b. Use heading “Gandhi Jayanti”, font size: 16, font color: red, font face:Arial Black.
- c. With first letter “dropped” (use drop cap option) of the first paragraphcontaining a picture at the right side
- d. Use three columns from the second paragraph onwards till the half of thepage.
- e. Then use heading “Computer basics”
- f. Create paragraph using two columns till the end of the page.

2. Create a Mathematical question paper using, at least five equations

- a. With fractions, exponents, summation function
- b. With at least one “m*n” matrix
- c. Basic mathematical and geometric operators.
- d. Use proper text formatting, page color and page border.

3. Create a flowchart using,

- a. Proper shapes like ellipse, arrows, rectangle, and parallelogram.
- b. Use grouping to group all the parts of the flowchart into one single object.

4. Create a table using table menu with

- a. At least 5 columns and 10 rows.
- b. Merge the first row into one cell.
- c. Merge the second row into one cell, then split the second row into three cells.
- d. Use proper table border and color.
- e. Insert proper content into the table with proper text formatting.

5. Create a table using two columns

- a. The left column contains all the short-cut keys and right side column contains the function of the short-cut keys.
- b. Insert a left column using layout option. Name the heading as Serial No.

6. Create two letters with the following conditions in MS Word and find the difference.

- a. Write a personal letter to your friend using at least 100 words and two paragraphs. The date must be in top-right corner. Use „justify“ text- alignment and 1.5 line spacing for the body of the letter. Letter must contain proper salutation and closing.
- b. Use step by step mail-merge wizard to design a letter. (Mailing → step by step mail merge wizard → letters → start from a template → select template → letters → select proper template → create new document → OK)

7. Create a letter, which must be sent to multiple recipients.

- a. Use Mail-Merge to create the recipient list.
- b. Use excel sheet to enter the recipient.
- c. Start the mail merge using letter and directory format. State the difference.

(MS Excel)

1. Create a table “Student result” with following conditions.

- a. The heading must contain, Sl. No., Name, Mark1, Mark2, Mark3, Total, average and result with manual entry.
- b. Use formulas for total and average.
- c. Find the name of the students who has secured the highest and lowest marks.
- d. Round the average to the nearest highest integer and lowest integer (use ceiling and floor function respectively).

2. Do as directed

- a. Create a notepad file as per the following fields

Slno name th1 th2 th3 th4 th5 total % grade

- b. Import this notepad file into excel sheet using „data → from text“ option.

- c. Grade is calculated as,

- i. If % ≥ 90, then grade A
- ii. If % ≥ 80 and < 90, then grade B
- iii. If % ≥ 70 and < 80, then grade C
- iv. If % ≥ 60 and < 70, then grade D
- v. If % < 60, then grade F

3. Create a sales table using the following data,

Item	Year1	Year2	Year3	Year4
Item1	1000	1050	1100	1200
Item2	950	1050	1150	1200
Item3	1100	1200	1200	1300

- Draw the bar-graph to compare the sales of the three items for four years using insert option.
- Draw a line-graph to compare the sales of three items for four years using insert option.
- Draw different pie-charts for the given data using insert option.
- Use condition, to highlight all the cells having value ≥ 1000 with red color (use conditional formatting).

(MS PowerPoint)

1. Create a power-point presentation with minimum 5 slides.

- The first slide must contain the topic of the presentation and name of the presentation.
- Must contain at least one table.
- Must contain at least 5 bullets, 5 numbers.
- The heading must be, font size:32, font-face: Arial Rounded MT Bold, font-color: blue.
- The body must be, font size: 24, font-face: Comic Sans MS, font-color:green.
- Last slide must contain „thank you“.

2. Create a power-point presentation with minimum 10 slides

- Use word art to write the heading for each slides.
- Insert at least one clip-art, one picture
- Insert at least one audio and one video
- Hide at least two slides

3. Create a power-point presentation with minimum 5 slides

- Use custom animation option to animate the text; the text must move left to right one line at a time.
- Use proper transition for the slides.

(MS Access)

1. Create a database “Student” with,

- At least one table named “mark sheet” with field name “student name, rollnumber, mark1, mark2, mark3, mark4, total”
- The data types are, student name: text, roll number: number, mark1 to mark4: number, total: number. Roll number must be the primary key.
- Enter data in the table. The total must be calculated using update query.
- Use query for sorting the table according to the descending/ascending order of the total marks.

2. With addition to the table above,

- Add an additional field “result” to the “mark sheet” table.
- Enter data for at least 10 students
- Calculate the result for all the students using update queries, if total ≥ 200 , then

- pass, else fail.
- d. Search the students, whose name starts with “sh”.
 - e. Show the names and total marks of the students who have passed the examination.

Digital Electronics Lab

- 1) To illustrate the working of AND, OR and NOT gate.
- 2) To illustrate De Morgan’s theorem using Basic Logic gates.
- 3) To illustrate the working of full adder and half adder using various logic gates.
- 4) To illustrate the working of full subtractor and half subtractor using various logic gates
- 5) To illustrate the working of Exclusive OR and Exclusive NOR gate.
- 6) To illustrate the working of four to one multiplexer and verify the truth table.
- 7) To study IC7404, IC7432 and IC 7408 and verify the NOT gate, OR gate and AND gate present in it.
- 8) Realize 1:8 Demux and 3:8 Decoder using IC74138.
- 9) Realize the following flip-flops using NAND Gates. (a) Clocked SR Flip-Flop (b) JK Flip-Flop

COURSE OUTCOMES: At the end of the course, the student should have

CO1	Knowledge	Have developed a good knowledge of Boolean operations, various logical circuits
CO2	Understand	Have developed a very good understanding the theorems and Axioms

CO3	Apply	Be able to integrate the inputs and obtain the output for the digital circuits
CO4	Analyze	Able to select an optimal circuit to replace a complex circuit.
CO5	Evaluate	Able to compare the operations of logical circuits and improve its operation for the better result.
CO6	Create	Able to design various logical circuits to solve any Boolean expression.

II SEMESTER

Semester	II
Paper Code	CA2121
Paper Title	DATA STRUCTURES USING C++
Number of teaching hours per week	04
Total number of teaching hours per semester	60
Number of credits	04

Objective of the Paper:

This paper introduces the fundamental concept of data structures and emphasizes the importance of data structures in developing and implementing efficient algorithms. It provides an introduction to the basic concepts and techniques of Linear and non-linear data Structures and analyses the various algorithm

UNIT 1

12HRS

INTRODUCTION TO DATA STRUCTURES

Introduction. Classification of data structures. Operations on primitive and non- primitive data structures. Analysis of algorithms, space and time complexity, best and worst case, asymptotic notation, upper and lower bounds. Introduction to Analysis and Design of Algorithms and the use of different techniques such as Divide and Conquer Technique, Greedy Method and Dynamic Programming

UNIT 2

12HRS

SEARCHING AND SORTING TECHNIQUES

Sorting – Bubble sort, Insertion sort, selection sort, quick sort, merge sort.

Searching – Linear and Binary.

UNIT 3

12HRS

LINEAR DATA STRUCTURES

Introduction, Stacks, Storage representation of stacks, operations on stacks, applications of stacks, queues, operations on queues, circular queues, operations on circular queues, applications of queues and circular queues, polish notation, translation of expression, evaluation of expression.

UNIT 4

12HRS

LINKED LISTS

Introduction, singly linked list, operations on linked lists, traversing a linked list, creating a linked list, adding nodes at various positions in a linked list, deletion of Nodes, advantages and disadvantages, types of linked lists, applications of linked lists.

UNIT 5

12HRS

TREES

Introduction, terminologies and basic concepts, Binary tree, Storage representation of binary tree, tree

traversals, Binary search tree, building a binary search tree, height balanced tree, AVL rotation.

NOTE: 6 hours of self-study will be assigned from the above units.

TEXT BOOK

Data Structure by Schaum Series(Revised 1ST Edition)

REFERENCES

- **Fundamentals of Data Structure by Horowitz Sahni (2nd Edition).**
- **Data Structure by Dale and Lilly.**
- **S. Sahni, Data Structures, Algorithms and Applications, Tata McGraw Hill.**
- **Data Structures and Algorithm Analysis in C, Second Edition, Mark Allen Weiss,Pearson.**

BLUEPRINT

Code number: **CA 2121**

Title of the paper: **DATA STRUCTURES USING C++.**

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit I	12	21
Unit II	12	21
Unit III	12	21
Unit IV	12	21
Unit V	12	21
Maximum marks for the paper (Excluding bonus question)= 70		

PRACTICAL

CA 2P1- DATA STRUCTURES USING C++ LAB (11 sessions, 2hrs/week)

PROGRAMS LIST

1. Call by value and call by reference
2. Insertion Sort
3. Selection Sort
4. Quick Sort
5. Bubble Sort
6. Linear Search
7. Binary Search
8. Length of a string using pointer
9. Concatenate two strings using pointers
10. Copy a string using pointers
11. Array implementation of a stack.
12. Array implementation of a queue
13. Array implementation of circular queue.
14. Creating a linked list.
15. Adding nodes at various positions in a linked list.
16. Deleting nodes from various positions from a linked list.
17. Conversion of infix expression to postfix expression.
18. Evaluation of postfix expression
19. Creating a binary search tree and performing the various traversals on a binary search tree.

COURSE OUTCOMES: At the end of the course, the student should

CO1	Knowledge	Have developed a good knowledge of the various types linear and non-linear data structures
CO2	Understand	Understand the basic concepts of data structures and the various algorithms.
CO3	Apply	Will be able to implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures
CO4	Analyze	Identify user defined data types, linear data structures for solving real world problems. Also should be able to determine and analyze the complexity of given Algorithms.
CO5	Evaluate	Implement appropriate sorting/searching techniques for given problem.
CO6	Create	Be able to design and implement various data structure algorithms

Semester	II
Paper Code	CA2221
Paper Title	MICROPROCESSOR
Number of teaching hours per week	04
Total number of teaching hours per semester	60
Number of credits	04

Objective of the Paper:

This paper introduces the students to the history and evolution of Microprocessors, Architecture and instruction set of 8086, CPU Architecture, Configuration & Timing diagrams of 8086. This paper introduces the students how to write 8086 Assembly level programs using the 8086 instruction set, write modular programs using procedures and write 8086 Stack and Interrupts programming.

UNIT 1**12 HRS****HISTORY AND ARCHITECTURE OF 8086**

Microprocessor Overview, Historical Background, Intel 8086 Microprocessor-Register Organization, Architectural Block Diagram, Bus Interface Unit, Pin configuration, Flags, Data and Address Bus de Multiplexing, Machine language instruction formats.

UNIT 2**16 HRS****INSTRUCTION SET OF 8086:**

Addressing Modes-Immediate, Register and Memory addressing modes, Data transfer and arithmetic instructions. Control/Branch Instructions, Illustration of these instructions with example programs

Logical Instructions, String manipulation instructions, Flag manipulation and Processor control instructions, Illustration of these instructions with example programs. Assembler Directives and Operators, Assembly Language Programming and example programs.

UNIT III**12 HRS****STACK AND INTERRUPTS**

Introduction to stack, Stack structure of 8086, Programming for Stack. Interrupts and Interrupt Service routines, Interrupt cycle of 8086, NMI, INTR, Interrupt programming, Timing and Delays.

UNIT IV**10 HRS****8086 BUS CONFIGURATION AND TIMINGS:**

Physical memory Organization, General Bus operation cycle, I/O addressing capability, Special processor activities, Minimum mode 8086 system and Timing diagrams, Maximum Mode 8086 system and Timing diagrams.

UNIT V**10 HRS****INTERFACING BASIC PERIPHERALS WITH 8086 AND OTHER PROGRAMMABLE DEVICES.**

RAM Interfacing with 8086, Interfacing I/O ports, PIO 8255, Modes of operation – Mode-0 and BSR Mode,

Programmable Interrupt Controller 8259A, DMA Controller 8257.

NOTE: 6 hours of self-study will be assigned from the above units.

REFERENCES:

- **Advanced Microprocessors and Peripherals - A.K. Ray and K.M. Bhurchandi, TMH, 3rd Edition, 2012, ISBN 978-1-25-900613-.**
- **Microprocessor and Interfacing- Douglas V Hall, SSSP Rao, 3rd edition TMH.**
- **Microcomputer systems-The 8086 / 8088 Family – Y.C. Liu and A. Gibson, 2nd edition, PHI.**
- **The 8086 Microprocessor: Programming & Interfacing the PC – Kenneth J Ayala, CENGAGE Learning.**
- **The Intel Microprocessor, Architecture, Programming and Interfacing - Barry B. Brey, 6e, Pearson Education / PHI.**

BLUEPRINT

Code number: **CA2221**

Title of the paper: **MICROPROCESSOR**

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit I	12	21
Unit II	16	24
Unit III	12	20
Unit IV	10	20
Unit V	10	20
Maximum marks for the paper (Excluding bonus question)= 70		

PRACTICAL

CA 2P2- MICROPROCESSOR LAB

(11 sessions 2hrs/week)

Programs to be executed in the lab:

1 Data transfer instructions like:

- 1.1 Byte and word data transfer in different addressing modes.
- 1.2 Block move
- 1.3 Block interchange

2 Arithmetic & logical operations like:

- 2.1 Addition and Subtraction of 8 bit and 16 bit numbers
- 2.2 Multiplication and Division.
- 2.3 complements.
- 2.4 Arithmetic programs to find square, cube, factorial

3. Bit manipulation instructions like checking:

- 3.1 Whether given data is positive or negative
- 3.2 Whether given data is odd or even
- 3.3 Logical 1's and 0's in a given data
- 3.4 Bit wise palindrome

4 Branch/Loop instructions like:

- 4.1 Arrays: addition/subtraction of N nos., finding largest and smallest nos., Ascending and descending order
- 4.2 Conditional and Unconditional jumps, Calls and Returns

5 .Programs on String manipulation like string transfer, string reversing, searching for a string, etc.

COURSE OUTCOMES: At the end of the course, the student should

CO1	Knowledge	Have developed a good knowledge of architecture and operation capabilities of 8086 microprocessor.
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CO2	Understand	Have developed a very good understanding of the working, components and functionalities of 8086 microprocessor.
CO3	Apply	Be able to write programs using the instructions from instruction set of 8086.
CO4	Analyze	Be able to compare instructions from the instruction set and write more efficient programs
CO5	Evaluate	Be able to find the capabilities of different processors.
CO6	Create	Be able to design and build small projects which does the basic operations of a microprocessor.

Semester	II
Paper Code	CA2321
Paper Title	OPERATING SYSTEM
Number of teaching hours per week	04
Total number of teaching hours per semester	60
Number of credits	04

Objective of the Paper:

This paper introduces the students to the history, types, functions and primary concepts of an operating system, in general. It gives an overview of the functionalities of an operating system with respect to the process creation, process management CPU scheduling aspects, to understand the concepts of process synchronization and deadlocks. It also gives an insight into the various memory management techniques with an understanding in the concepts of files secondary memory management. This paper acts as the first step to gain insight about the vast field of operating systems that will be learnt in depth in the coming semesters.

UNIT 1

12 HRS

INTRODUCTION

OS-Definition, functions, types- Single user ,simple batch system, Buffering & spooling, multiprogramming, time - sharing, Real time system, distributed system , parallel computer systems, protection, operating system structure, system components, system calls.

UNIT 2

12 HRS

PROCESS MANAGEMENT

Process concept states of a process, process control block, functions, Cooperating process, Inter-process communication, Scheduling Criteria, job and processor scheduling. (Pre-emptive and non-preemptive) FCFS, SJF, Round Robin, priority scheduling, multilevel, multilevel feedback algorithms.

UNIT 3

12 HRS

PROCESS SYNCHRONIZATION AND DEADLOCK

process synchronization – semaphores, critical section problems, classic problems of synchronization System model-dining philosopher problem and reader writer problem, deadlock characterization, methods for handling deadlock, deadlock prevention, avoidance and detection using resource allocation graph and wait for graph, Recovery from deadlock.

UNIT 4

12 HRS

MEMORY MANAGEMENT

Functions, Different Schemes-Single Continuous-Partitioned -Multiple Relocatable- Paging-Demand Paging-Segmentation-Paged segmentation. Virtual Memory management: Demand paging, Page replacement and page replacement algorithm (FIFO, LRU), and thrashing.

UNIT 5

12 HRS

DEVICE AND FILE SYSTEM

Disk structure, allocation methods, free space management, need for disk scheduling, scheduling algorithm-FCFS (First Come, First Served), SSTF (Shortest Seek Time First), SCAN, C-SCAN (circular scan), directory structure, organization, File concept, file attributes, file operations, access methods, File system structure file protections.

Self-Study: DOS- Internal and External commands, Case study of any one operating system like UNIX, Linux, and Windows.

TEXT BOOK:

- **Operating System by Milan Milenkovic, McGraw Hill. (5th Edition)**

REFERENCES:

- **Operating System by Madnick and Donovan, McGraw Hill.**
- **Operating Systems: Internals and Design Principles, by William Stallings, seventh edition**
- **Operating System Concepts by James L Peterson. (2nd Edition)**
- **Operating System Design and Implementation by Andrew S Tanenbaum. (3rd Edition)**

BLUEPRINT

Code number: **CA2321**

Title of the paper: **OPERATING SYSTEM**

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit I	12	21
Unit II	12	21
Unit III	12	21
Unit IV	12	21
Unit V	12	21
Maximum marks for the paper (Excluding bonus question)= 70		

COURSE OUTCOMES: At the end of the course, the student should

CO1	Knowledge	Have developed a good knowledge of the fundamentals of the discipline of operating systems and the role of OS in process, memory, file and device management.
CO2	Understand	Have developed a very good understanding of the different scheduling algorithms, memory management techniques, disk scheduling algorithm file and directory structures.
CO3	Apply	Be able to apply the policies of scheduling, deadlocks, memory management, synchronization and file systems.
CO4	Analyze	Be able to analyze various algorithms of process scheduling and memory management.
CO5	Evaluate	Be able to critique the role of different types of operating system based on their features.
CO6	Create	To be able to use the fundamental concepts in further studies/research

Semester	II
Paper Code	CA2421
Paper Title	PROBABILITY AND STATISTICS

Number of teaching hours per week	04
Total number of teaching hours per semester	60
Number of credits	04

Objective of the Paper:

To know the statistical tools in analyzing the various data. Students will be able to Use R for statistical programming, computation and modeling, Write functions and use R in an efficient way, Use R in their own research, Be able to expand their knowledge of R on their own.

UNIT 1

12 HRS

OVERVIEW OF STATISTICS AND INTRODUCTION TO R

Basic concepts – Population, Sample, Types of data - Primary and Secondary data, quantitative, cross sectional, time series, variables and attributes, discrete and continuous variables, types of scales - nominal, ordinal, ratio and interval construction of tables with one or more factors of classification and graphical and diagrammatic presentation of various types of data. Introduction to R statistics, How to run R, R Sessions, and Functions, Basic Math, Variables, Data Types, Vectors, Comparative study of Vectors, Data Structures, types, Data Frames, Lists, Matrices, Arrays, Classes

UNIT 2

12 HRS

UNIVARIATE ANALYSIS

Frequency distribution, central tendency and their measures: Mean, median , Mode, Geometric mean and Harmonic mean; Dispersion and their measures: Range, quartile deviation, Mean deviation and standard deviation, Variance Skewness , Bowleys coefficient, Kurtosis. Exercises in R.

UNIT 3

12HRS

PROBABILITY

Random experiment, trial, sample space, events, classical, empirical and axiomatic approaches to probability, properties of probability, additive law, conditional probability, multiplicative law and their applications, random variable, Discrete and continuous probability distribution with some examples, distribution function, mathematical expectation and properties, Bernoulli, Binomial, Geometric, Poisson, Uniform, Exponential, normal and chi-square distributions – with examples.

UNIT 4

12HRS

MULTIVARIATE ANALYSIS

Correlation-Karl Pearson's, and Spearman's; Linear regression-Simple and multiple; Method of least squares Time Series-Components of time series, Measurement of trend Exercises in R

UNIT 5

12HRS

HYPOTHESIS TESTING

Tests for means, proportions and variances, t-tests, ANOVA, Chi squared tests for goodness of fit. Exercises in R.

NOTE: 6 hours of self-study will be assigned from the above units.

REFERENCES:

- **Jacquelyn Gupta, S.C., and V. K. Kapoor: Fundamentals of Mathematical statistics: Sultan Chand & Sons**
- **Michael J. Evans and Jegrey S. Rosenthal: Probability and statistics: Second Edition**
- **The Art of R Programming, Norman Matloff, Cengage Learning**
- **R for Everyone, Lander, Pearson**

BLUEPRINT

Code number: CA2421

Title of the paper: PROBABILITY AND STATISTICS

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit I	12	21
Unit II	12	21
Unit III	12	21
Unit IV	12	21
Unit V	12	21
Maximum marks for the paper (Excluding bonus question)= 70		

COURSE OUTCOMES: At the end of the course, the student should

CO1	Knowledge	Have developed a good knowledge of the Different technique of Probability and Statistics and using of R programming to facilitate the Statistical analysis.
CO2	Understand	Have developed a very good understanding of better understanding, process, and interpret the vast amounts of quantitative data that exist all around them.
CO3	Apply	Be able to perform data analysis on vast amount of quantitative data.
CO4	Analyze	Be able to analyse the categorical and quantitative data.
CO5	Evaluate	Be able to measure uncertainty and make decisions in the face of uncertainty.
CO6	Create	Be able to translate real-world problems into probability model read and annotate an outline of a proof and be able to write a logical proof of a statement.