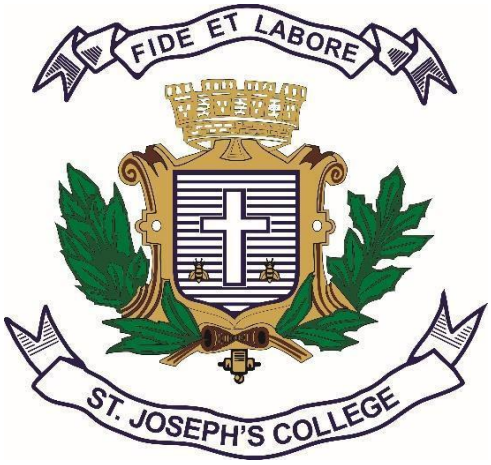
ST. JOSEPH'S COLLEGE (AUTONOMOUS)

BENGALURU-27



Re-accredited with **'A++' GRADE with 3.79/4 CGPA** by NAAC
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DEPARTMENT OF COMPUTER SCIENCE AND COMPUTER APPLICATIONS

SYLLABUS FOR UNDERGADUATE PROGRAMME

For Batch 2021-2024

SUMMARY OF CREDITS IN COMPUTER SCIENCE AND APPLICATIONS

DEPARTMENT OF COMPUTER SCIENCE AND 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	**CS121**	**Digital Computer Fundamentals and Programming in C**	**60**	**04**	**04**	**30**	**70**	**100**
Practical	**CS1P1**	**C Programming Lab**	**22**	**02**	**01**	**15**	**35**	**50**
Total Number of credits:					**05**			

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	**CS221**	**Data Structures UsingC++ and Operating System**	**60**	**04**	**04**	**30**	**70**	**100**
Practical	**CS2P1**	**Data Structures using C++Lab**	**22**	**02**	**01**	**15**	**35**	**50**
Total Number of credits:					**05**			

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	**CS321**	**Object Oriented programming using Python and Database Management Systems**	**60**	**04**	**04**	**30**	**70**	**100**
Practical	**CS3P1**	**Python Programming andDBMS Lab**	**22**	**02**	**01**	**15**	**35**	**50**
Total Number of credits:					**05**			

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	CS421	.NET Technologies	30	02	02	15	35	50
Theory	CSOE 4121	Basic Programming Skills	30	02	02	15	35	50
Practical	CS4P1	.NET Technologies lab	22	02	01	15	35	50
Total Number of credits:					05			

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	CS5121	Java Programming	45	03	03	30	70	100
Practical	CS5P1	Java Programming Lab	22	02	01	15	35	50
Theory	CS5221	Software Engineering	45	03	03	30	70	100
Practical	CS5P2	Website DevelopmentLab	22	02	01	15	35	50
Total Number of credits:					08			

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	CS6121	Computer Networks	45	03	03	30	70	100
Practical	CS6P1	UNIX programming lab	22	02	01	15	35	50
Theory	CS6221	UNIX Programming	45	03	03	30	70	100
Practical	CS6P2	Major Project Lab	22	02	01	15	35	50
Total Number of credits:					08			

CORE COURSES (CC)	
Course Title	Code Number
Programming in C and Digital Computer Fundamentals	CS 121
Data Structures Using C++ and Operating System	CS 221
Object Oriented programming using Python and Database Management Systems	CS 321
.NET Technologies	CS 421
Java Programming	CS 5121
Software Engineering	CS 5221
Computer Networks	CS 6121
UNIX Programming	CS 6221

GENERIC ELECTIVE COURSES (GSE)/ Can include open electives offered	
Course Title	Code Number
Basic Programming Skills	CSOE 4121

SKILL ENHANCEMENT COURSE (SEC)	
Course Title	Code Number
C Programming Lab	CS 1P1
Data Structures using C++ Lab	CS 2P1
Python and DBMS Lab	CS 3P1
.NET lab	CS 4P1
Java Programming Lab	CS 5P1
Website Development Lab	CS 5P2
UNIX lab	CS 6P1
Major Project Lab	CS 6P2

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
Fundamentals of Web Technology (NPTEL)	

Course Outcomes and Course Content

Semester	I
Paper Code	**CS 121**
Paper Title	**DIGITAL COMPUTER FUNDAMENTALS AND PROGRAMMING IN C**
Number of teaching hours per week	04
Total number of teaching hours per semester	60
Number of credits	04

Objective of the Paper:

- To understand the components and the working principle of a computer.
- To understand concepts of Boolean algebra, number systems and gates.
- To know the efficiency of combinational and sequential logic circuits.
- To understand the logic of solving a problem.
- To learn good Coding standards for writing programs.

DIGITAL COMPUTER FUNDAMENTALS **30 Hrs**

UNIT 1 **(18)**

1. INTRODUCTION TO COMPUTERS: Functional block diagram of a digital computer, Generation of computers, Classification of Computers- Analog, Digital, Hybrid, Micro, Mini, Mainframe computers etc. REPRESENTATION OF DATA Number Systems, and Inter-conversions among them, Binary arithmetic (Addition, Subtraction, multiplication, division) Binary number system complements- 1's and 2's Complements subtractions, 9's and 10's complement, ASCII, Excess-3 code and Gray code, EBCDIC code and BCD code.

2. BOOLEAN ALGEBRA AND LOGIC CIRCUITS: Boolean Algebra Laws and theorems, Gates- AND, OR, NOT, NAND, NOR, XOR truth tables, Boolean expressions and their simplifications, SOP & POS- Karnaugh map simplification methods.

UNIT 2 **(12)**

1. COMBINATIONAL AND SEQUENTIAL CIRCUITS: Multiplexers, Demultiplexers, Decoders, Encoders, Half Adder, Full Adder, Parallel Adder-subtractor, Flip flops- RS, JK, D, T, Master Slave

2. MEMORY: Memory hierarchy, ROM, RAM, Cache Memory and Organization of Cache Memory, Virtual memory, Addressing modes, Instruction format and instruction set.

PROGRAMMING IN C **30 Hrs**

UNIT 3 **(10)**

1. PROGRAMMING INTRODUCTION TO PROGRAMMING: Problem Solving Using Computers-Language Classification, Problem Analysis, Algorithm and Flowchart design. Algorithms - Steps in developing algorithms, advantages and disadvantages. Flowcharts- Symbols used in developing flowcharts, advantages and disadvantages**.**

2. INTRODUCTION TO C PROGRAMMING: History, C Conventions, Character Set, Identifiers, Keywords, Simple Data types, Modifiers, Variables, Constants, Operators, Operator precedence, Structure of a C program. Input and Output-Input and Output operation formatted and unformatted input and output, type casting.

UNIT 4 **(10)**

1. CONTROL AND LOOPING STRUCTURES: Introduction, Conditional statement, if statement, if-else statement, nested if statement, else-if statement and switch statement. Goto statement. Looping statement, while statement, do-while statement, for statement, break and continue, nested for statement.

2. ARRAYS AND FUNCTIONS: Introduction, ARRAY Introduction (One and two-dimensional), Declaration of arrays, Initialization of arrays, processing with arrays. String manipulation, declaration of string, string operations. Advantages of subprograms, Function definition, function call, Actual and formal arguments, local and global variables, function prototypes, types of functions, recursive functions, types of storage classes, arrays and functions.

UNIT 5 **(10)**

1. STRUCTURES AND UNIONS: Introduction to union, difference between union and structure, Introduction to structures, Advantages of structures, accessing elements of a structure, nested structures, array of structures, functions and structures, Unions, enumerated data types.

2. POINTERS: Introduction, pointer variable, pointer operator, pointer arithmetic, pointers and arrays, pointers and strings, array pointers, malloc(), calloc(), realloc(), free().

TEXT BOOKS

- Digital Computer Fundamentals by Thomas C Bartee, McGraw Hill.
- ANSI C by Balaguruswamy. (7th Edition)

REFERENCES

- Computer Organization by Carl Hamacher V. Zaki, McGraw Hill.
- Digital computer Fundamentals by Malvino& Leach.
- Digital Computer Fundamentals by Malvino.
- Computers today by Sanders, Mcgraw Hill,
- C programming by Stephen C Kochan. , [kindle edition]
- The C programming Language, Brain W Kernigham, Dennis M Ritchie, Prentice Hall Software Series.
- Spirit of C by Coop

BLUEPRINT

Code number: **CS 121**

Title of the paper: Digital Computer Fundamentals and Programming in C

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit I	18	24
Unit II	12	21
Unit III	10	20
Unit IV	10	20
Unit V	10	20
Maximum marks for the paper (Excluding bonus question)= 70		

Course Outcomes: At the end of the course, the student should

C01	Knowledge	A. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits B. It helps in understanding and solving the problems in algorithm, flowchart and programming format
C02	Understand	A. Have a thorough understanding of the fundamental concepts and techniques used in digital electronics B. Helps in understanding technologies used in the field of software developments.
C03	Apply	A. Ability to identify basic requirements for a design application and propose a cost effective solution. B. Helps in Designing and development of modular programming.
C04	Analyze	A. To analyze the ability and design of various combinational and sequential circuits. B. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.
C05	Evaluate	A. To prepare students to perform the analysis and design of various digital electronic circuits. B. Able to comment on the evolution of technology.
C06	Create	A. Able to design combinational and sequential circuits. B. Students will be able to adapt to the new technologies.

Practical I
CS 1P1 – C PROGRAMMING LAB
(11 sessions 2hr/week)

1. Demonstrate the usage of operators.
2. Demonstrate the usage of data types.
3. Demonstrate the usage of control structure (all).
4. Demonstrate the usage of looping statements (all).
5. Demonstrate the usage of arrays (1D and 2D).
6. Demonstrate the usage of string.
7. Demonstrate the usage of function and recursion.
8. Demonstrate the usage of structure and union.
9. Demonstrate the usage of pointer.

Course Outcomes: At the end of the course, the student should

CO1	Knowledge	Helps in understanding and solving the problems in algorithm, flowchart and programming format.
CO2	Understand	Helps in understanding technologies used in the field of software developments.
CO3	Apply	Helps in Designing and development of modular programming
CO4	Analyze	The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.
CO5	Evaluate	Be able to comment on the evolution of technology.
CO6	Create	Be able to adapt to the new technologies.

Semester	II
Paper Code	**CS 221**
Paper Title	**DATA STRUCTURES AND 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 fundamental concept of data structure and techniques of linear and non-linear data structures. It emphasizes the importance of data structures in developing and implementing efficient algorithms.
- 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.

DATA STRUCTURES **(30 HOURS)**

UNIT 1 **(10)**

1. INTRODUCTION TO DATA STRUCTURES

Definition, Classification of data structures. Operations on data structures. Introduction to Time and Space complexity.

2. PRIMITIVE DATA STRUCTURES

Integer, Character, float, Strings, memory representation and primitive operations. String manipulations using pointers.

3. ARRAYS

Storage representation of 1D and 2D arrays. Insertion and deletion on 1D arrays, advantages and dis-advantages of arrays.

UNIT 2 **(10)**

STACKS AND QUEUES

Concepts, operations, sequential and linked implementation, Applications of stacks - recursion, tower of Hanoi, Infix to postfix, Evaluation of postfix expressions. Concepts of queues, operations, sequential and linked implementation, circular queues, Priority queues and Dequeues (Introductory Concept) - Application of queues.

UNIT 3 **(10)**

1. LINKED LISTS

Dynamic memory allocation, singly linked lists, operations on linked lists - Insertion and Deletion of a node. Introduction to circular linked list and doubly linked list.

2. TREES

Definitions and concepts-Binary trees, sequential and linked representation of Binary trees, Insertion and Deletion of binary trees, Binary tree traversals.

3. SEARCHING AND SORTING

Linear search and Binary search, Selection sort, Insertion sort and merge sort.

OPERATING SYSTEM **(30 HOURS)**

UNIT 4 **(18)**

1. INTRODUCTION TO OPERATING SYSTEMS

Introduction, Simple Batch systems, Multi-programmed Batched Systems, Time sharing systems, Personal Computer Systems, Distributed Systems and Real time Systems, structure of Operating System, System calls.

2. PROCESS CONCEPT

Program and process, States of a process, Process control block, Process Scheduling, CPU Scheduling- Basic concepts, Scheduling criteria, Scheduling algorithms- FIFO, RR, SJF, Priority scheduling, Multi- level and Multi-level feedback.

UNIT 5 **(12)**

1. MEMORY MANAGEMENT

Basic Concepts, logical and Physical Address space, Swapping, single Contiguous, partitioned Allocation, Virtual memory-Demand paging, page replacement and page replacement algorithm (LRU,FIFO), Segmentation,

2. FILE SYSTEM

File concept, file attributes, file operations, access methods, directory structure, protection, File system structure.

Self-Study: Compare the applications of trees as a data structure. External and internal commands of DOS

TEXT BOOKS

- Data Structure by Schaum Series. (Revised 1ST Edition)
- Fundamentals of Data Structure by Horowitz Sahni(2nd Edition).
- Operating System by Milan Milenkovic, McGraw Hill. (5th Edition)

REFERENCES

- Data Structure by Dale and Lilly.
- Data Structures and Algorithm Analysis in C, Second Edition, Mark Allen Weiss, Pearson.
- Operating System by Madnick and Donoval, 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: **CS 221**

Title of the paper: **Data Structures and Operating System**

Chapter	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Unit I	10	21
Unit II	10	21
Unit III	10	21
Unit IV	18	24
Unit V	12	18
Maximum marks for the paper (Excluding bonus question)= 70		

Practical I
CS 2P1: Data Structures using C++
(11 sessions 2hr/week)

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

Course Outcomes: At the end of the course, the student should

CO1	Knowledge	A. Will develop a good knowledge of the different types of linear and nonlinear data structure. B. Have developed a good knowledge of the fundamentals of operating systems and the role of OS in process, memory, file and device management.
CO2	Understand	A. Understand the different categories of data structure and algorithms to be used. B. Have developed a very good understanding of the different scheduling algorithms, memory management techniques, disk scheduling algorithm file and directory structures.
CO3	Apply	A. Be able to identify user defined data types, linear data structures for solving real world problems. B. Be able to apply the policies of scheduling, deadlocks, memory management, synchronization and file systems.
CO4	Analyze	A. Be able to analyze algorithms and correctness of the algorithm. B. Be able to analyze various algorithms of process scheduling and memory management.
CO5	Evaluate	A. Be able to select the appropriate data structure based on its time and space complexity. B. Be able to critique the role of different types of operating systems based on their features.
CO6	Create	A. Be able to generate a suitable algorithm in order to solve a real life problem.