THIRUVALLUVAR UNIVERSITY

BACHELOR OF COMPUTER APPLICATIONS

CBCS PATTERN

(With effect from 2020-2021)

S. No.	Part	Study Components		Ins. Hrs / week	Credit	Title of the Paper	Maximum Marks		
		Course Title							
		SEMESTER I					CIA	Uni. Exam	Total
1	I	Language	Paper-1	6	4	Tamil/Other Languages	25	75	100
2	II	English (CE)	Paper-1	6	4	**Communicative English I**	25	75	100
3	III	Core Theory	Paper-1	6	4	Programming in C	25	75	100
4	III	Core Practical	Practical-1	3	2	Programming in C Lab	25	75	100
5	III	Allied -1	Paper-1	7	3	Mathematical Foundations - I	25	75	100
6	**III**	**PE**	**Paper 1**	**6**	**3**	**Professional English I**	**25**	**75**	**100**
7	IV	Environmental Studies		2	2	Environmental studies	25	75	100
		Sem. Total		36	22		175	525	700
		SEMESTER II					CIA	Uni. Exam	Total
7	I	Language	Paper-2	6	4	Tamil/Other Languages	25	75	100
8	II	English (CE)	Paper-2	6	4	**Communicative English II**	25	75	100
9	III	Core Theory	Paper-2	5	4	C++ & Data Structure	25	75	100
10	III	Core Practical	Practical-2	2	2	C++ and Data Structures Lab	25	75	100
11	III	Allied-1	Paper-2	7	5	Mathematical Foundations - II	25	75	100
12	**III**	**PE**	**Paper 1**	**6**	**3**	**Professional English II**	25	75	100
13	IV	Value Education		2	2	Value Education	25	75	100
14	IV	Soft Skill		2	1	Soft Skill	25	75	100
		Sem. Total		36	25		200	600	800

THIRUVALLUVAR UNIVERSITY
BACHELOR OF COMPUTER APPLICATIONS

SYLLABUS
UNDER CBCS
(With effect from 2020-2021)

SEMESTER I

CORE THEORY PAPER -1

PROGRAMMING IN C

OBJECTIVES:

1. To understand simple algorithms,
2. To understand language constructs
3. To understand and develop programming skills in C.
4. To understand the basic concepts of decision making and looping statements.
5. To understand the concepts of arrays , structures, union, pointers and files.

UNIT – I

Overview of C: History – Importance – Sample Programs – Basic Structure – Programming Style – Executing – Unix System – MS-DOS System - **Constants, Variables, and Data Types:** Character Set – C Token – Keyword and Identifiers – Constants – Variables – Data Types – Declaration of Storage Class – Assigning Values to Variables – Defining Symbolic Constants – Declaration – Overflow and Underflow of Data - **Operators and Expressions:** Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional, Bitwise, Special Operators – Arithmetic Expressions, Evaluation of Expressions – Precedence of Arithmetic Operators – Some Computational Problems – Type Conversions in Expressions – Operator Precedence and Associativity – Mathematical Functions .

UNIT – II

Managing Input and Output Operations: Reading, Writing a Character – Formatted Input, Output - **Decision Making and Branching:** Decision Making with If statement – Simple If Statement – The If…Else Statement – Nesting of If…Else Statements – The Else If Ladder – The Switch Statement- The ?: Operator – The Goto Statement - **Decision Making and Looping:** The while Statement – The do Statement – The for Statement – Jumps in Loops – Concise Test Expressions.

UNIT – III

Arrays: One-Dimensional Arrays - Declaration, Initialization of One-Dimensional Arrays – Two-Dimensional Arrays - Initializing Two-Dimensional Arrays – Multi-Dimensional Arrays – Dynamic Arrays - **Character Arrays and Strings:** Declaring and Initializing String Variables – Reading Strings from Terminal – Writing Strings to Screen – Arithmetic

Operations on Characters – Putting String Together – Comparison of Two Strings –String-Handling Functions – Table of Strings – Other Features of Strings - **User Defined Functions**: Need for User-Defined Functions – A Multi-Function Program – Elements of User-Defined Functions – Definition of Functions – Return Values and Their Types – Function Calls – Function Declaration – Category of Functions – No Arguments and No Return Values – Arguments but no return values – Arguments with Return Values – No Arguments but Returns a value – Functions that Return Multiple Values – Nesting of Functions – Recursion – Passing Arrays, Strings to Functions – The Scope, Visibility and Lifetime of Variables – Multi file Programs.

UNIT – IV

Structure and Unions: Defining a Structure – Declaring Structure Variables – Accessing Structure Members – Structure Initialization and Copying and Comparing Structure Variable – Operations on Individual Members – Arrays of Structures – Arrays within Structures – Structures within Structures – Structures and Functions – Unions – Size of Structures – Bit Fields **Pointers:** Understanding Pointers – Accessing the Address of Variable – Declaring, Initialization of Pointer Variables – Accessing a Variable through its pointer – Chain of Pointers – Pointer Expression – Pointer Increments and Scale Factor – Pointers and Arrays – Pointers and Character Strings – Array of Pointers – Pointers as Function Arguments – Functions Returning Pointers – Pointers to Functions – Pointers and Structures – Troubles with Pointers **File Management in C**: Defining and Opening a File – Closing a File – Input/Output Operations on File – Error Handling During I/O Operations – Random Access to Files – Command Line Arguments.

UNIT – V

Fundamental Algorithms: Exchanging the values of Two Variables- Counting- Summation of a Set of Numbers-Factorial Computation -Sine Function Computation –Generation of the Fibonacci Sequence-Reversing the Digits of an Integer- Base Conversion – Character to Number Conversion **- Factoring Methods:** Finding the square Root of a Number –The Smallest Divisor of an Integer-The Greatest Common Divisor of the two integers-Generating Prime Numbers- Computing the Prime Factors of an integer –Generation of Pseudo-random Numbers-Raising a Number to a Large Power-Computing the nth Fibonacci Number (Chapters: 2 & 3)

TEXT BOOK:
1. Programming in ANSI C, E. Balagurusamy, Tata McGrawhill Education, 6th Edition, 2013. (Unit I to IV)
2. How to Solve it by Computer, R.G.Dromey, PHI International (Unit V)
REFERENCE BOOKS:
1. The C Programming Language (ANSI C), Kernighan, B.W. and Ritchie, D.M., PHI.
2. C by Discovery , Foster & Foster , Penram International Publishers, Mumbai.

E - REFERENCES
1. NPTEL, Introduction to C Programming, Prof.SatyadevNandakumar ,IIT, Computer Science and Engineering Kanpur.
2. NPTEL, Introduction to Problem Solving & Programming, by Prof. Deepak Gupta Department of Computer Science and Engineering IIT Kanpur.

Course Outcomes:

- The Student will be able to understand the concepts of Constants, Variables, and Data Types, Operators and Expressions
- The Student will be able to understand the concepts of Managing Input and Output Operations, Decision Making and Branching, Decision Making and Looping.
- The Student will be able to understand the concepts of Arrays, Character Arrays and Strings, User Defined Functions.
- The Student will be able to understand the concepts of Structure and Unions, Pointers, File Management in C.
- The Student will be able to understand the concepts of Fundamental Algorithms, Factoring Methods.

CORE PRACTICAL-1

Programming in C – Lab

Objectives:

1. To understand concepts of for/while loop and switch.
2. To understand language Functions and recursions.
3. To understand and develop String Manipulations.
4. To understand the basic concepts of searching and sorting.
5. To understand the concepts of structures.

Outcomes:

CO1 - Enhance the analyzing and problem solving skills and use the same for writing programs in C.

CO2 - Write diversified solutions, draw flowcharts and develop a well-documented and indented
        program according to coding standards.

CO3 - Learn to debug a given program and execute the C program.

CO4 - To have enough practice the use of conditional and looping statements.

CO5 - To implement arrays, functions and pointers.

Control Statements:
1. Print n Fibonacci numbers – (using for)

2. Print n Prime numbers – (using while)

3. Simple arithmetic on two numbers – (using switch/case)

Functions:
4. Swap two values using call by value / call by reference.

Recursion:
5. To compute NcR and NpR

6. To Compute GCD and LCM

String Manipulation.
7. Operations on string such as length, concatenation, reverse, counting, and copy of a string to another.

Matrices:
8. Matrix Addition, Subtraction, Multiplication, Transpose of n x m matrices.

9. Inverse of a square matrix.

Searching:
10. Binary Search.

Sorting:
11. Bubble Sort

12. Insertion Sort

Structures:
13. Students Mark statement

Pointers:
14. Arithmetic operations on pointers.

Files
15. Creating/ Reading/ Writing a text/binary file.

REFERENCE BOOK:

1. Programming in ANSI C, E. Balagurusamy, Tata McGrawhill Education, 6th Edition, 2013.

ALLIED 1

PAPER - I

MATHEMATICAL FOUNDATIONS - I

Objectives

To know about Logical operators, validity of arguments, set theory and set operations, relations and functions, Binary operations, Binary algebra, Permutations & Combinations, Differentiation, Straight lines, pair of straight lines, Circles, Parabola, Ellipse, Hyperbola.

UNIT-I: SYMBOLIC LOGIC

Proposition, Logical operators, conjunction, disjunction, negation, conditional and bi-conditional operators, converse, Inverse, Contra Positive, logically equivalent, tautology and contradiction. Arguments and validity of arguments.

UNIT-II: SET THEORY

Sets, set operations, venndiagram, Properties of sets, number of elements in a set, Cartesian product, relations & functions,

Relations : Equivalence relation. Equivalence class, Partially and Totally Ordered sets,

Functions: Types of Functions, Composition of Functions.

UNIT-III: BINARY OPERATIONS

Types of Binary Operations: Commutative, Associative, Distributive and identity, Boolean algebra: simple properties. Permutations and Combinations.

UNIT-IV: DIFFERENTIATION

Simple problems using standard limits,

$$\underset{X \to a}{Lt} \frac{x^n-a^n}{x-a}, \; \underset{x \to 0}{lt} \frac{\sin x}{x}, \; \underset{x \to 0}{lt} \frac{\tan x}{x} \; \underset{x \to 0}{lt} \frac{e^x-1}{x}, \; \underset{n \to \infty}{lt} (1+1/n)^n, \; \underset{n \to 0}{lt} (1+n)^{1/n}$$

Differentiation, successive differentiation, Leibnitz theorem, partial differentiation, Applications of differentiation, Tangent and normal, angle between two curves.

UNIT-V: TWO DIMENSIONAL ANALYTICAL GEOMETRY

Straight Lines - Pair Straight Lines

Text Book.

P.R. Vittal, Mathematical Foundations – Maragham Publication,

Chennai.

Reference Books

1. U. Rizwan, Mathematical Foundation - SciTech, Chennai

2. V.Sundaram& Others, Dircrete Mathematical Foundation - A.P.Publication, sirkali.

3. P.Duraipandian& Others, Analytical Geometry 2 Dimension - Emerald publication 1992 Reprint.

4. Manicavachagompillay&Natarajan. Analytical Geometry part I - Two Dimension - S.Viswanathan (printers & publication) Put Ltd., 1991.

SEMESTER II

CORE THEORY PAPER -2
C++ & DATA STRUCTURES

Objectives:

1. To understand the concepts of object-oriented programming and master OOP using C++.
2. To understand the concepts of Inheritance, polymorphism and templates.
3. To understand the concepts of different view of data, stack and queues.
4. To understand the concepts of Programming with Recursion, Binary Search Tree and graphs.
5. To understand the concepts of Sorting and Searching Algorithms.

UNIT-I :

Principles of Object Oriented Programming – Beginning with C++ – Token , Expressions and Control Structures- Functions in C++ – Classes and Objects – Constructors and Destructors.

UNIT-II :

Operator Overloading and Type Conversions – Inheritance : Extending Classes – Pointers, Virtual Functions and Polymorphism - Managing Console I/O Operations. Working with Files - Templates – Exception Handling – Manipulating Strings.

UNIT-III:

Data Design & implementations: Different views of data – Abstraction and Built-in Types – Arrays
ADTs Stacks and Queue (Linear and Linked) , Stack (Array and Pointer)- Applications- Infix to Postfix Conversions – Queue(Array and Pointer) – List(Array and Pointer) – Applications: (Polynomial Addition) - Doubly Linked Lists.

UNIT – IV:
Programming with Recursion : Recursion – Verifying and Writing Recursive Functions **– Binary Search Tree :** Implementation – Tree Traversal **– Graphs:** Implementations – BFS – DFS – Dijkstras Shortest Path Algorithm.*(Chapter 7:Section 7.1,7.4 7.5, Chapter 8:Section 8.1,8.4, Chapter 9:Section 9.3)*

UNIT-V:

Sorting and Searching Algorithms: Sorting – Searching – Hashing *(Chapter 10: Section 10.1,10.2,10.3)*

TEXT BOOK:

1. Object Oriented Programming with C++, E Balagurusamy , Tata McGraw Hill, 6th Edition, 2014.
(Units I, II)
2. C++ Plus Data Structure, Nell Dale, Jones & Bartlett Publishers , 4th Edition, 2010. (Units III, VI & V)

REFERENCES:

1. C++ The Complete Reference, Herbert Schildt, Tata McGraw Hill, 4th Edition, 2003.
2. OOP In ANSI C and Turbo C, Ashok N.Kamthene, Pearson Education, 6th Edition, 2008.
3. Data Structures and Algorithms, Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, Addison Wesley Longman Inc., 2nd Edition, 1999.

Course Outcomes:

- The Student will be able to understand the concepts of object oriented programming Apply structure and inline functions.
- The Student will be able to understand the concepts of the types of inheritances and Applying various levels of Inheritance for real time problems Apply the OOPs concepts class and object. Understand Explain the file concept and exception handlings in C++
- The Student will be able to understand the concepts of Stacks and Queue using array and pointers.
- The Student will be able to understand the concepts of Recursion, Binary Search Tree and graphs.
- The Student will be able to understand the concepts of Sorting and Searching Algorithms.

CORE PRACTICAL -2

C++ & DATA STRUCTURES LAB

Objectives:
1. To develop C++ programming skills in design
2. To understand the basic concepts of different abstract types and structure of data.
3. To understand the concepts of Function Overloading
4. To understand the concepts of Stack, Queue, List, Doubly Linked List - using Pointers- using Arrays.
5. To understand the concepts of Searching and Sorting Algorithms.

LIST OF LAB EXERCISES

1. Constructors & Destructors, Copy Constructor.
2. Friend Function & Friend Class.
3. Inheritance.
4. Polymorphism & Function Overloading.
5. Virtual Functions.
6. Overload Unary & Binary Operators Both as Member Function & Non Member Function.
7. Class Templates & Function Templates.
8. Exception Handling Mechanism.
9. Standard Template Library concept.
10. File Stream classes.
11. Array implementation of Stack, Queue : Infix to postfix
12. Implementation of Stack, Queue, List, Doubly Linked List - using Pointers- Polynomial Addition
13. Implementation of Binary Search Tree, Traversal
14. Implementation of Searching and Sorting Algorithms.
15. Graph Implementation of shortest path (Djikstras)

REFERENCE :
1. Object Oriented Programming with C++, E Balagurusamy , Tata McGraw Hill, 6th Edition, 2014.
2. C++ Plus Data Structure, Nell Dale, Jones & Bartlett Publishers , 4th Edition, 2010.

Course Outcomes:
- Understand the Creating and Deleting the Objects with the Concepts of Constructors and Destructors.
- Demonstrate the Polymorphism Concepts and Operator Overloading.
- Understand basic Data Structures such as Arrays, Linked Lists, Stacks, Queues, Doubly Linked List and Infix to Postfix Conversion.
- Apply Algorithm for solving problems like Sorting and Searching.
- Apply Algorithms and use Graphs and Trees as tools to visualize and simplify Problems

MATHEMATICAL FOUNDATIONS II

Objectives

To know about Matrix Operations, Symmetric, Skew-Symmetric, Hermitian, Skew-Hermitian, Orthogonal, Unitary Matrices. Rank of a Matrix Solutions of linear equations Consistency and Inconsistency, Characteristic roots and Characteristics Vectors, Cayley - Hamilton Theorem, Integration of rational functions, Integration by parts, Reduction formulae, Area and volume using integration, Planes, Straight lines, Spheres, Curves, Cylinders.

UNIT-I: MATRICES

Multiplication of matrices, Singular and Non-Singular matrices, Adjoint of a Matrix, Inverse of a matrix Symmetric and Skew-Symmetric, Hermitian and Skew-Hermition, Orthogonal and unitary matrices, Rank of a matrix, Solution of Simultaneous Linear equations by

     (i) Cramer's rule.

     (ii) Matrix Inversion Method.

UNIT-II: MATRICES

Test for Consistency and Inconsistency of linear equations, (Rank Method), characteristic roots and characteristic vectors, Cayley - Hamilton theorem, matrix of linear transformations: reflection about the x, y axes and the line y=x, rotation about the origin through an angle, expansion or compression, shears, translation.

UNIT-III

Integration Simple problems, integration of rational function involving algebraic expressions of the form

$$\frac{1}{ax^2+bx+c}, \quad \frac{1}{\sqrt{ax^2+bx+c}}, \quad \frac{px+q}{ax^2+bx+c}, \quad \frac{px+q}{\sqrt{ax^2+bx+c}}$$

integrations using simple substitutions integrations involving trigonometric functions of the form

$$\frac{1}{a+b\cos x}, \quad \frac{1}{a^2\sin^2 x+b^2\cos^2 x},$$

Integration by parts.

UNIT-IV

Properties of definite integrals. Reduction formulae for

$\int x^n e^{ax} dx$, $\int \sin^n x\, dx$, $\int \cos^n x\, dx$, $\int x^m (1-x)^n\, dx$, applications of integration for (i) Area under plane caurves, (ii) Volume of solid of revolution.

UNIT-V: ANALYTICAL GEOMETRY OF THREE

DIMENSION

Planes, straight lines.

Text Book.

P.R.Vittal, Mathematical Foundations - Margham Publication,

Chennai.

Reference Books

1. U. Rizwan, Mathematical Foundation - SciTech, Chennai
2. V.Sundaram& Others, Dircrete Mathematical Foundation - A.P.Publication, sirkali.
3. P.Duraipandian& Others, Analytical Geometry 3 Dimension – Emerald publication 1992 Reprint.
4. Manicavachagompillay&Natarajan. Analytical Geometry part II - three

   Dimension - S.Viswanathan (printers & publication) Put Ltd., 1991.