

THIRUVALLUVAR UNIVERSITY
BACHELOR OF SCIENCE
B.Sc. SOFTWARE COMPUTER SCIENCE
CBCS PATTERN
(With effect from 2020-2021)

S. No.	Part	Study Components		Ins. Hrs / week	Credit	Title of the Paper	Maximum Marks		
		Course Title					CIA	Uni. Exam	Total
SEMESTER I									
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	(to choose any one) 1. Mathematics I 2. 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									
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	to choose any one) 1. Mathematics II 2. 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 SCIENCE

B.Sc. SOFTWARE COMPUTER SCIENCE

SYLLABUS
UNDER CBCS
(With effect from 2020-2021)

SEMESTER I

CORE PAPER -1
PROGRAMMING IN C

OBJECTIVES:

The subject aims to build the concepts regarding:

1. To acquire basic knowledge in C programming
2. In-depth understanding of functional and logical programming in C
3. To provide exposure to problem-solving through programming

UNIT-I

Overview of C: History of C - Importance of C – Sample Programs - Basic Structure of C Programs-Executing a ‘C’ Program. **Constants, Variables, and Data Types:** Introduction - Character Set - C Tokens - Keywords and Identifiers - Constants - Variables - Data Types - Declaration of Variables - Declaration of Storage Class -Assigning Values to Variables - Defining Symbolic Constants –Declaring a Variable as Volatile. **Operators and Expressions:** Introduction- Arithmetic Operators - Relational Operators - Logical Operators - Assignment Operators- Increment and Decrement Operators - Conditional Operator- Bitwise Operators - Special Operators - Arithmetic Expressions - Evaluation of Expressions – Precedence of Arithmetic Operators - Type Conversions in Expressions - Operator Precedence and Associativity

UNIT-II

Managing Input and Output Operations: Introduction - Reading a Character -Writing a Character - Formatted Input- Formatted Output. **Decision Making and Branching:** Introduction - 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:** Introduction - The While Statement– The Do Statement– The for Statement - Jumps in Loops.

UNIT -III

Arrays: Introduction – One-Dimensional Arrays - Declaration of One-Dimensional Arrays - Initialization of One-Dimensional Arrays – Two-Dimensional Arrays - Initializing Two-dimensional Arrays – Multi-dimensional Arrays- Dynamic Arrays. **Character Arrays and Strings:** Introduction-Declaring and Initializing String Variables- Reading Strings from Terminal - Writing Strings to Screen - Arithmetic Operations on Characters - Putting Strings Together - Comparison of Two Strings – String-Handling Functions - Table of Strings.

UNIT -IV

User-defined Functions: Introduction-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 to Functions-Passing Strings to Functions - The Scope, Visibility and Lifetime of Variables.

UNIT -V

Structures and Unions:Introduction-Defining a Structure - Declaring Structure Variables - Accessing Structure Members - Structure Initialization –Copying and Comparing Structuring Variables - Operation on Individual Members- Arrays of Structures - Arrays within Structures - Structures within Structures –Structures and Functions - Unions - Size of Structures - Bit Fields.**Pointers:** Introduction- Understanding Pointers- Accessing the Address of a Variable- Declaring Pointer Variables- Initialization of Pointer Variables- Accessing a Variable Through its Pointer –Chain of Pointers—Pointer Expressions-Pointers 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.

TEXT BOOK:

1. *Balagurusamy E.* 2017. **Programming in ANSI C.** [Seventh Edition]. Tata Mc-Graw Hill, New Delhi.

REFERENCEBOOKS:

1. *YashavantKanetkar.* 2004. **Let Us C.** [Fifth Edition]. BPB Publications, NewDelhi.
2. *Jeyapoovan T.* 2007. **A First Course in Programming with C.** [Second Edition].Vikas Publishing House Pvt. Ltd., New Delhi.
3. Deitel&Deitel. 2016. **“C How to Program”.** [Eighth Edition]. Prentice Hall
4. Byron Gottfried. 2006. **“Programming in C”.** [Second Edition]. Tata McGraw Hill

WEB REFERENCES:

- <http://www.learn-c.org/>
<http://www.tutorialspoint.com/cprogramming/index.htm>
<http://www.geeksforgeeks.org>

OUTCOMES:

On successful completion of this course, the student can

- Understand the basic terminology of C Programming
- Recognize Input / Output statements and control structures
- Develop programs using Arrays
- Grasp the concepts of Function and its types
- Develop the program using Structures and Pointers

CORE PRACTICAL-1

Programming in C - Lab

OBJECTIVES:

The subject aims to build the concepts regarding:

1. To acquire the knowledge in structured programming language

LIST OF PRACTICALS

1. Program to implement the formatted Input / Output Functions.
2. Program to illustrate the working of Branching Statements.
3. Program to illustrate the working of Looping Statements.
4. Program to highlight the Relational and Logical Operations.
5. Program to illustrate Array Concepts.
6. Program using String Handling Functions
7. Program using User Defined Function.
8. Program to illustrate the Concept of Recursion.
9. Program to implement the Structure Concept.
- 10 . Program to implement Unions
11. Program to illustrate Pointer Concept.
12. Program using Pointers and Structures.

WEB REFERENCES:

<https://www.cprogramming.com/tutorial/c-tutorial.html>

<https://www.learn-c.org/>

<https://www.geeksforgeeks.org>

OUTCOMES:

On successful completion of this course, the student can

- Implement various input and output functions
- Develop program using control structures
- Develop program using Arrays and String Handling concepts
- Execute Function concepts
- Implement Structure and Pointer concepts

**ALLIED 1
PAPER -1
1. MATHEMATICS – I**

Objectives of the Course:

To Explore the Fundamental Concepts of Mathematics

UNIT-I: ALGEBRA

Partial Fractions - Binomial, Exponential and logarithmic Series (without Proof) - Summation - Simple problems

UNIT-II : THEORY OF EQUATIONS

Polynomial Equations with real Coefficients - Irrational roots - Complex roots-Transformation of equation by increasing or decreasing roots by a constant - Reciprocal equations - Newton's method to find a root approximately - Simple problems.

UNIT-III : MATRICES

Symmetric - Skew-Symmetric - Orthogonal and Unitary matrices - Eigen roots and eigen vectors – Cayley - Hamilton theorem (without proof)-Verification and computation of inverse matrix

UNIT-IV: TRIGONOMETRY

Expansions of $\sin^n \theta$, $\cos^n \theta$, $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ - Expansions of $\sin \theta$, $\cos \theta$, $\tan \theta$ in terms of θ .

UNIT-V: DIFFERENTIAL CALCULUS

Successive differentiation upto third order, Jacobians -Concepts of polar co-ordinates-Curvature and radius of curvature in Cartesian co-ordinates and in polar co-ordinates.

Recommended Text:

P.Duraipandian and S.Udayabaskaran,(1997) *Allied Mathematics*, Vol. I & II.Muhil Publishers, Chennai.

Reference Books:

1. P.Balasubramanian and K.G.Subramanian,(1997) *Ancillary Mathematics*. Vol. I & II. Tata McGraw Hill, New Delhi.
2. S.P.Rajagopalan and R.Sattanathan,(2005) *Allied Mathematics* .Vol. I & II. VikasPublications, New Delhi.
3. P.R.Vittal (2003) *Allied Mathematics* .Marghan Publications, Chennai
4. P.Kandasamy, K.Thilagavathy (2003) *Allied Mathematics* Vol-I, II S.Chand& company Ltd., New Delhi-55.
5. Isaac, *Allied Mathematics*. New Gamma Publishing House, Palayamkottai.

ALLIED 1

PAPER - I

2. 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,

$$\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}, \lim_{x \rightarrow 0} \frac{\sin x}{x}, \lim_{x \rightarrow 0} \frac{\tan x}{x}, \lim_{x \rightarrow 0} \frac{e^x - 1}{x}, \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n, \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$$

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 PAPER -2

C++ & DATA STRUCTURES

OBJECTIVES:

The subject aims to build the concepts regarding:

1. The improvements in C++ over C
2. The Object Oriented Features in C++
3. The various design and analysis of algorithms
4. The representation of data in memory
5. Various sorting and searching algorithm

UNIT- I

Principles of Object-Oriented Programming: Basic concepts of Object Oriented Programming - Difference between Procedure Oriented and Object-Oriented Programming – Operators - Control Structures - Expressions - Manipulators. **Functions in C++:** Introduction - The Main Function – Function Prototyping – Call by value - Call by Reference – Return by Reference—Inline functions—Function Overloading - Static Data Members and Static Member Functions - Friend Functions. Classes and Objects - Constructors and Destructors.

UNIT - II

Inheritance and Polymorphism: Single inheritance - Multilevel Inheritance- Multiple inheritance – Hierarchical inheritance – Hybrid inheritance – Virtual base classes – Abstract classes – Pointers, Virtual Functions and Polymorphism. **Working with Files:** Introduction - classes for file stream operations—Opening and Closing a file – Detecting end of file – File modes- File Pointers and their Manipulations– Error Handling During File Operations.

UNIT - III

Introduction to Data Structures and Algorithms: Basic Terminology - Classification of Data Structures - Abstract Data Type - Time and Space Complexity – Arrays - **Stacks and Queues:** Introduction to Stacks - Array Representation of Stacks - Operations on a Stack - Applications of Stacks - Queues: Array Representation of Queues – Circular Queues - Deques - Priority Queues - Multiple Queues.

UNIT - IV

Linked Lists: Singly Linked Lists - Circular Linked Lists - Doubly Linked Lists - Polynomial Representation. **Trees:** Binary Trees - Expression Trees - Traversing a Binary Tree - Efficient Binary Trees: Binary Search Trees - Operations on Binary Search Trees.

UNIT - V

Graphs: Introduction - Representation of Graphs - Graph Traversal Algorithms. Shortest Path Algorithms: Minimum Spanning Trees - Prim's Algorithm - Kruskal's Algorithm - Dijkstra's Algorithm. **Searching and Sorting:** Linear Search - Binary Search - Bubble Sort - Insertion Sort - Selection Sort - Merge Sort - Quick Sort - Heap Sort.

TEXTBOOK:

1. *Balagurusamy, E.* 2013. **Object Oriented Programming with C++**. [Sixth Edition]. McGrawHill Education (India) Private Limited, New Delhi.
2. Reema Thareja, **Object Oriented Programming with C++**, Oxford University Press, 2015
3. **Fundamentals of Data Structures in C++** by Ellis Horowitz, Sartaj Sahni and Dinesh Mehtha, Second Edition, University Press

REFERENCE BOOKS:

1. *Robert Lafore.* 1994. **Object Oriented Programming in C++**. [Third Edition]. Galgotia Publications Pvt. Limited, New Delhi.
2. *Ashok Kamthane, N.* 2008. **Object Oriented Programming with ANSI & Turbo C++**. [Fourth Impression]. Pearson Education, India.

OUTCOMES

On successful completion of this course, the student can

- Understand the difference between Procedure-oriented and Object-Oriented Programming
- Create classes and objects with different types of functions
- Approach a program logically using Inheritance and Polymorphism
- Design and analyze of various data structures
- Understand various sorting and searching algorithms

CORE PRACTICAL-2

C++ & DATA STRUCTURES LAB

Objectives:

The subject aims to build the concepts regarding:

1. To implement various OOPs concepts
2. To implement various data structures using C++

LIST OF PRACTICALS

C++ & DATA STRUCTURE - LAB

1. Implementing classes, object, constructors and member functions for calculating area and perimeter of a circle.
2. Implementing function overloading (Find area / volume of rectangle, circle, sphere, cylinder, cone etc).
3. Implementing operator over loading (Addition, subtraction, multiplication of matrices)
4. Implementing single, multiple , hierarchical inheritance.
5. Implementing sequential file operations using error handling functions.
6. Implementing PUSH, POP operations of stack using Arrays.
7. Implementing add, delete operations of a queue using Arrays.
8. Implementing Infix to postfix conversion of an expression using stack.
9. Implementing Binary tree recursive traversals (in-order, pre-order, and post-order).
10. Implementing Polynomial addition using linked list.

WEB REFERENCES

<https://www.jdoodle.com/online-compiler-c++>

<https://www.cpp.thiyagaraaj.com/c-programs/c-basic-example-programs>

<https://www.programiz.com/cpp-programming/examples>

OUTCOMES:

On successful completion of this course, the student can

- The student could implement Classes and objects, Constructor, Operator Overloading concepts in C++
- Student could implement inheritance concept.
- The student could implement various Data structures such as Stack, Queue, Linked list, Tree Traversal and Graph Traversals.
- Student Could implement various file operations.
- Student Could implement various operations on array.

ALLIED 1

PAPER -2

1. MATHEMATICS II

Objectives of the Course

To Explore the Fundamental Concepts of Mathematics

UNIT-I: Application of Integration

Evaluation of double, triple integrals - Simple applications to area, volume - Fourier series for functions in $(0, 2\pi)$ and $\square\square\square\square\square\square\square\square$

UNIT-II: Partial Differential Equations

Formation, complete integrals and general integrals - Four standard types, Lagrange's equations.

UNIT-III: Laplace Transforms

Laplace Transformations of standard functions and simple properties - Inverse Laplace transforms - Applications to solutions of linear differential equations of order 1 and 2-simple problems

UNIT-IV: Vector Analysis

Scalar point functions - Vector point functions - Gradient, divergence, curl - Directional derivatives - Unit to normal to a surface.

UNIT-V: Vector Analysis (continued)

Line and surface integrals - Gauss, Stoke's and Green's theorems (without proofs) - Simple problem based on these Theorems.

Recommended Text

P.Duraipandian and S.Udayabaskaran,(1997) *Allied Mathematics*, Vol. I & II.Muhil Publishers, Chennai

Reference Books:

1. P.Balasubramanian and K.G.Subramanian,(1997)*Ancillary Mathematics*. Vol. I & II. Tata McGraw Hill, New Delhi.
2. S.P.Rajagopalan and R.Sattanathan,(2005) *Allied Mathematics* .Vol. I & II.Vikas Publications, New Delhi.
3. P.R.Vittal(2003). *Allied Mathematics* .Marghan Publications, Chennai.
4. P.Kandasamy, K.Thilagavathy (2003) *Allied Mathematics Vol-I, II* S.Chand& company Ltd., New Delhi-55.
5. Isaac, *Allied Mathematics*. New Gamma Publishing House, Palayamkottai

ALLIED 1

PAPER -2

2. 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-Hermitian, 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

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

integrations using simple substitutions integrations involving trigonometric functions of the form

$$\frac{1}{a+b\cos x}, \frac{1}{a^2\sin^2 x + b^2\cos^2 x}, \text{ Integration by parts.}$$

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 curves, (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, Discrete 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.
