ANNAMALAI UNIVERSITY

BACHELOR OF COMPUTER APPLICATONS (BCA)

Programme Structure and Scheme of Examination (under CBCS)
(Applicable to the candidates admitted in Affiliated Colleges from the
academic year 2022 -2023 onwards)

Course Code	Part	Study Components & Course Title	Hours/ Week	Credit	CIA	ESE	Total
		SEMESTER – I					
22UTAML11	I	Language Course - I : Tamil/Other Languages	5	3	25	75	100
22UENGL12	II	English Course - I : Communicative English I	5	3	25	75	100
22UBCAC13	III	Core Course – I: Programming in C	5	4	25	75	100
22UBCAC14		Core Course – II : Digital Computer Fundamentals	5	4	25	75	100
22UBCAP15		Core Practical – I :Programming in C Lab	3	2	40	60	100
		Allied Course - I : Paper -1 Mathematical Foundations	5	4	25	75	100
22UENVS18	IV	Environmental Studies	2	2	25	75	100
		Total	**30**	**22**			**700**
		SEMESTER – II					
22UTAML21	I	Language Course - II : Tamil/Other Languages	5	3	25	75	100
22UENGL22	II	English Course - II : Communicative English II	5	3	25	75	100
22UBCAC23	III	Core Course – III :C++ & Data Structures	5	4	25	75	100
22UBCAC24		Core Practical – II :C++ & Data Structures Lab	3	2	40	60	100
		Allied Course - I : Paper -2 Statistical Methods and their Applications	5	4	25	75	100
22UBCAE26		Internal Elective – I	3	3	25	75	100
22UVALE27	IV	Value Education	2	1	25	75	100
22USOFS28		Soft Skill	2	1	25	75	100
		Total	**30**	**21**			**800**

INTERNAL ELECTIVE COURSES

22UBCAE26-1		Computer Organization and Architecture
22UBCAE26-2	Internal Elective - I	Computer Graphics
22UBCAE26-3		Internet and its Applications

SEMESTER:I PART: III	22UBCAC13 : PROGRAMMING IN C	CREDIT:4 HOURS:5

COURSE 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 :CONCEPT OF C PROGRAMMING   **Hours:15**
History, Introduction of C programming language, Structure of C program, C character set, Data types, Variables, Constants, Keywords and Identifiers, Expression statements in C language, Operators (Arithmetic, Logical, Relational, Assignment etc.).

UNIT II: CONDITIONAL PROGRAM   **Hours:15**
Execution, IF statement, IF.....ELSE statements nested IF.....ELSE and ELSE IF ladder. Program Loops and Iteration, WHILE loop, DO loop and FOR loop, Nested Loops, Use of break, continue and GOTO statements, Switch statement, use of break and default with switch, Storage Class in C language.

UNIT III: FUNCTIONS   **Hours:15**
Built-In and User Defined functions, Function Declaration, Definition and Function Calling, Parameter Passing (Call by Value and Call by Reference), Recursion, Pointers, Macros.

UNIT IV: ARRAYS   **Hours:15**
Definition of array, declaration, Linear Arrays, Multidimensional Arrays, Passing Array to function, String, string handling functions, Dynamic Memory Allocation.

UNIT V: STRUCTURE AND UNION   **Hours:15**
Definition, Programs using Structure and Union, Difference between Structure and Union. File Handling: Opening and Closing data files, Read and Write Functions, different modes of files.

COURSE OUTCOMES
After completing the Course successfully, the student will be able to
1. The Student will be able to understand the concepts of Constants, Variables, and Data Types, Operators and Expressions
2. The Student will be able to understand the concepts of Managing Input and Output Operations, Decision Making and Branching, Decision Making and Looping.
3. The Student will be able to understand the concepts of Arrays, Character Arrays and Strings, User Defined Functions.

4. The Student will be able to understand the concepts of Structure and Unions, Pointers, File Management in C.
5. The Student will be able to understand the concepts of Fundamental Algorithms, Factoring Methods.

Text Books (In API Style)

1. BalaguruswamyE., TMH, "Programming in ANSI C".
2. Kanitkar Yashwant, BPB, "Let Us C".
3. Kanitkar Yashwant, BPB, "Working With C".

Supplementary Readings

1. Shaum's Series ,TMH, "Programming in C".
2. Forouzan, Thomson, Cengase, "Computer Science"

OUTCOME MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	3	2
CO2	1	2	2	3	1
CO3	3	3	3	3	2
CO4	1	3	2	2	1
CO5	1	3	3	3	1

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER:I PART: III	22UBCAC14 : DIGITAL COMPUTER FUNDAMENTALS	CREDIT: 4 HOURS: 5

COURSE OBJECTIVES
1. Develop an understanding of digital circuit design and analysis.
2. Learn design techniques for working with digital electronic devices, and their application to solving problems.
3. Learn analysis skills to effectively report on the design, analysis and data of projects so that others can understand their methodology and results.
4. Become familiar with digital design, analysis and simulation tools.
5. Develop effective written communication skills using various media tools.

UNIT–I: NUMBER SYSTEM AND CODES   Hours: 12

Decimal Numbers, Binary Numbers, Decimal to Binary Conversions, Binary Arithmetic, 1's and 2's complements of Binary Numbers, Signed Numbers, Arithmetic Operations with Signed numbers, Hexadecimal Numbers, Octal Numbers, Digital Codes, Error Detection Codes.

UNIT–II: LOGIC GATES   Hours :12

The Inverter, The AND gate, The OR gate, The NAND gate, NOR gate, The Exclusive–OR gate and Exclusive OR gate: Boolean Algebra and Logic Simplification-Boolean Operations and Expressions, Laws and Rules, De Morgan's Theorems, Boolean Expressions and Truth Tables, The Karnaugh Map, SOP minimizations.

UNIT - III: COMBINATIONAL LOGIC ANALYSIS   Hours: 12

Basic combinational Logic Circuits, Implementing Combinational Logic, The Universal Property of NAND and NOR Gates. Functions of Combinational Logic - Basic Adder, Parallel Binary Adders, Comparators, Decoders, Encoders, Code Converters, Multiplexers, Parity Generator/Checkers.

UNIT–IV: LATCHES AND FLIP-FLOPS   Hours : 12

Latches, Edge Triggered Flip-Flops, Flip-Flop Operating characteristics, Flip-Flop Applications, Registers, Counters.

UNIT–V: MEMORY AND STORAGE   Hours: 12

Memory Basics, The RAM, The ROM, Programmable ROMs, The Flash Memory, Memory Expansion, Special Types of Memories, Magnetic and Optical Storage.

COURSE OUTCOMES
After completing the Course successfully, the student will be able to
1. Identify the logic gates and their functionality.
2. Perform number conversions from one system to anothersystem.
3. Design basic electronic circuits (combinationalcircuits).
4. Perform a comparative analysis of the components of different memoryUNITs.
5. Perform numberconversions.

Text Books

1. Floyd, Thomas L,1997, University Book Stall, 10thEdition"Digital Computer Fundamentals".

Supplementary Readings:

1. Malvino, Paul Albert and Leach, Donald P, 2000,TMH, 4thEdition, "Digital Principles and Applications".
2. Malvino, Paul Albert and Leach, Donald P,1995,TMH, 3rd Edition, "Digital Computer Fundamentals".
3. Bartee, Thomas C,1995, TMH,6th Edition, "Digital Computer Fundamentals".

OUTCOME MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	1	3	3	1	3
CO2	1	2	2	2	1
CO3	3	2	3	3	2
CO4	1	3	2	2	1
CO5	1	3	2	3	1

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER:I PART: III	22UBCACP15: PROGRAMMING IN C LAB	CREDIT: 2 HOURS: 3

COURSE OBJECTIVES

1. Apply the specification of syntax rules for numerical constants and variables, data types.
2. Usage of Arithmetic operator, Conditional operator, logical operator and relational operators and other C constructs.
3. Write C programs using decision making, branching, looping constructs
4. Apply and Write C programs to implement one dimensional and two dimensional arrays
5. Writing programs using functions

LIST OF EXPERIMENTS

1. Write a program to find the largest number and smaller number by using if statement
2. Write a program to convert the decimal to binary conversion by using while statement.
3. Write a program to count the positive, negative & zero numbers.
4. Write a program to check whether a given number is a prime or not.
5. Write a program to display the Fibonacci series.
6. Write a program to concatenate two strings without using string library function.
7. Write a program to count the number of vowels, consonants, and digits in a line of Text.
8. Write a program to reverse a String.
9. Write a program to design the calculator functions as
   a) Addition
   b) Subtraction &
   c) Multiplication function.
10. Write a program to find the factorial of a number using recursion.
11. Write a program for ascending order of given N Numbers.
12. Write a program to separate odd and even numbers using file.

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1. Read, understand and trace the execution of programs written in C language.
2. Write the C code for a given algorithm.
3. Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
4. Write programs that perform operations using derived data types.
5. Know concepts in problem solving

OUTCOME MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	2	2
CO2	2	2	2	3	1
CO3	2	3	3	3	2
CO4	1	3	2	2	2
CO5	1	2	3	3	1

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER: II PART: III	22UBCAC23: C++ AND DATA STRUCTURES	CREDIT:4 HOURS:5

COURSE OBJECTIVES

1. To Understand the Principles of Object Oriented Programming
2. To understand the concepts of Classes and Objects
3. To Understand the Concepts of Inheritance
4. To Understand the Concepts of Data Structures
5. To Understand in developing C++ programs

UNIT I: BASICS OF OOP AND C++   Hours:15

Object Oriented Programming Concepts – Benefits and Applications of OOP – C++ Program structure, Program Statements, Classes – Creating, Compiling and Linking Source file – Keywords, Identifiers and Constants – Data types: Basic, User defined and derived – Declaration and Dynamic Initialization of Variables, Reference Variables – Operators: Scope resolution, Member Dereferencing, Memory management and Type Cast - Manipulators – Expressions and their Types – Implicit Conversions, Operator Overloading, Operator Precedence.

UNIT II: CONTROL STRUCTURES & ARRAYS.   Hours:15

Control Structures: If, If…else, switch, do..while, while, for statements, Functions – The Main function, Function Prototyping, Call by Reference, Return by Reference, Inline functions, Classes and Objects – Specifying a Class, Defining Member Functions, Making an Outside function Inline, Nesting of Member functions, Arrays within a Class, Arrays of Objects, Objects as function Arguments, Friendly functions, Returning Objects.

UNIT III: CONSTRUCTORS & FILES   Hours:15

Constructors Parameterized Constructors, Multiple Constructors in a class, Copy constructor and Destructors -Defining Operator Overloading, Overloading Unary and Binary Operators, Overloading, String manipulation using Operators, Rules for overloading operators, Type Conversions. Inheritance: Defining derived classes.-Single, Multilevel , Hierarchical and multiple Inheritance-Pointers, Pointers to derived classes. Files: Opening and closing file, detecting End-of-files.

UNIT IV: FUNDAMENTALS OF DATA STRUCTURES   Hours:15

Stack(Arrays)-Operations-Applications of Stack(Infix and Postfix)-Queue(Array)-operations-Linked list (Singly, circular, Doubly)- Applications of List(Polynomial Addition) Trees: Binary Trees –Binary Search Tree- Operations - Recursive Tree Traversals.

UNIT V: SORTING & SEARCHING   **Hours:15**

Graph - Definition, Types of Graphs, Graph Traversal –Dijkstras shortest path-DFS and BFS-Sorting-Heaps-Quick sort-Merge sort-Bubble sort-searching-Binary search.

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1. To learn the basic concepts Object oriented programming.
2. To learn the control structures and arrays.
3. To implementing the constructors & File opening and closing.
4. To learn the fundamentals of stack & Queue operations.
5. To learn the concepts of graphs, sorting & searching methods.

TEXT BOOKS (In API Style)

1. E Balagurusamy , 2014,Tata McGraw Hill,6th Edition, "Object Oriented Programming with C++".
2. Ellis Horowiz, sartajSahni,2008, Galgotia Publications " Fundamentals of Data Structure".

SUPPLEMENTARY READINGS

1. ReemaThareja , 2015, Oxford University Press , "Object Oriented Programming with C++".
2. Balagurusamy, Tata McgRaw Hill Edition "C++ programming".

OUTCOME MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	1	2
CO2	1	2	2	3	1
CO3	2	1	2	3	2
CO4	1	2	2	2	1
CO5	2	3	3	3	1

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER:II PART: III	22UBCAP24 : C++ & DATA STRUCTURE LAB	CREDIT: 2 HOURS: 3

COURSE OBJECTIVES

1. Illustrate basic concepts of Java programming.
2. Understand Apply the necessary operations and classes in the required fields.
3. Analyze, design and implement the inheritance concepts using OOP concepts.
4. Demonstrate the simple file operations and data manipulation techniques.
5. To Know the Packages using Java classes.

LIST OF EXPERIMENTS

1. Develop a program that for sorting using arrays.
2. Develop a program to find and replace method.
3. Develop a program to implement arithmetic operations
4. Develop a program to find a area of rectangle.
5. Develop a program to prepare a student mark list.
6. Develop a program to implement the concept of AWT and graphics.
7. Develop a program to prepare a company detail using inheritance.
8. Develop a program to implement the thread creation
9. Develop a program for audio clip applet.
10. Develop a program for creating a checkbox using applet.

OUTCOME MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	3	2
CO2	1	2	2	2	1
CO3	1	3	3	1	3
CO4	1	3	2	3	1
CO5	1	3	3	3	1

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER:II PART: III	INTERNAL ELECTIVE-I 22UBCAE26 :1 COMPUTER ORGANIZATION & ARCHITECTURE	CREDIT: 3 HOURS: 3

COURSE OBJECTIVES

1. To understand the basic concepts of instruction and its essentials.
2. To Understand the concept of programmed control.
3. To learn how to implement micro operations & instruction formats..
4. To Explain the Input , output controls .
5. To understand the concept of memory concepts.

UNIT I : Basic Computer Organization and Design　　　　　　　**Hours:9**

Instruction Codes: Stored program Organization, Indirect address – Computer Registers: Common bus system – Computer Instructions: Instruction set Completeness – Timing and Control – Instruction Cycle: Fetch and decode, Determine the type of Instruction, Register reference Instructions- Memory reference Instructions – Input Output and Interrupt: I/O Configuration, I/O Instructions, Program Interrupt, Interrupt Cycle.

UNIT II: Microprogrammed Control　　　　　　　　　　　　**Hours:9**

Control memory – Address sequencing: Conditional Branching, Mapping of Instruction, Subroutines – Microprogram Example: Computer Configuration, Microinstruction formats, Symbolic Microinstructions, The fetch routine, Symbolic Microprogram, Binary Microprogram – Design of Control UNIT: MicroProgram Sequences.

UNIT III: Central Processing UNIT　　　　　　　　　　　　**Hours:9**

General Register Organization: Control word, Examples of Microoperations – Instructionformats : Three-Address, Two-Address, One-Address and Zero-Address Instructions, RISC Instructions – Addressing Modes: Numerical Example.

UNIT IV: Input-Output Organization　　　　　　　　　　　**Hours:9**

Peripheral Devices: ASCII Alphanumeric Characters – Input-Output Interface: I/O Bus and Interface modules, I/O versus Memory Bus, Isolated versus Memory Mapped I/O, Example of I/O Interface – Asynchronous Data Transfer: Strobe Control, Handshaking, Asynchronous Serial Transfer, Asynchronous Communication Interface, First-In, First-Out Buffer – Modes of Transfer – DMA, DMA Controller.

UNIT V: Memory Organization　　　　　　　　　　　　　**Hours:9**

Memory Hierarchy, Main memory: RAM, ROM, Memory Address map, Memory Connection to CPU – Auxiliary Memory - Associative Memory – Cache & virtual Memory.

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1. To learn the computer instructions and bus system.
2. To learn about the addressing modes.
3. To learn about the Input and output controls.
4. To learn about the memory and its types.

Text Books (In API Style)

1. Morris Mano M. , 2011, Prentice Hall of India Private Limited, "Computer System Architecture" New Delhi .

Supplementary Readings

1. William Stallings, 2010,Pearson publications, "Computer Organization and architecture",

OUTCOME MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	1	3	3	2	2
CO2	1	2	3	2	1
CO3	3	2	3	3	1
CO4	1	3	2	2	1
CO5	1	2	3	2	1

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER:II PART: III	INTERNAL ELECTIVE- I 22UBCAE26 : 2 COMPUTER GRAPHICS	CREDIT: 3 HOURS: 3

COURSE OBJECTIVES
1. To understand the basic concepts of drawing algorithms.
2. To understand the concept of Attributes & 2D transformations
3. To understand clipping concepts & its types.
4. To understand the concepts of 3D transformations.
5. To understand the surface detection methods.

UNIT I : Overview of Computer Graphics   .   Hours: 9
        Video Display Devices- Raster Scan System- Random Scan Systems- Hard Copy Deices- Graphic Software- Line Drawing Algorithms: DDA- Bresenham's Line -Circle Generating Algorithms

UNIT II: Attributes & Two DimensionalTransformations   Hours: 9
        Line Attributes- Curve Attributes-Color And Gray Scale Level- Area Fill Attributes-Character Attributes- Inquiry Functions- Basic Transformations - Composite Transformation – Other transformation

UNIT III: Two Dimensional Viewing & Clipping   Hours: 9
        The Viewing Pipeline- Window To Viewport Transformation –Clipping Operations-Point Clipping- Line Clipping: Cohen Sutherland- Liang Barsky-Sutherland Hodgeman Polygon Clipping- Text Clipping- Exterior Clipping- Logical Classification Of Input Devices- Interactive Picture Construction

UNIT IV: Three Dimensional Transformations & Clipping   Hours: 9
        Translation-Rotation-Scaling-Viewing Pipeline- Viewing Coordinates- Projections -View Volumes and General Projection Transformation- Clipping

UNIT V: Visible Surface Detection Methods   Hours: 9
        Classification of Visible Surface Detection Algorithms - Back Face Detection - Depth Buffer Method - A Buffer Method - Scan Line Method - Depth Sorting Method- BSP Tree Method -Area Sub Division Method - Octree Methods - Ray Casting Method

COURSE OUTCOMES
After completing the Course successfully, the student will be able to
1. Learn about the basics of graphics drawings
2. To learn about the attributes & its transformations.
3. To learn about the clipping & its types.
4. To learn about the 3D transformations.
5. To learn about the surface detection methods.

Text Books
1. Donald Hearn and Hearn and M.Pauline ,2012, Pearson 2nd edition "Computer Graphics(C version).

Supplementary Readings:
1. Edward Angel, Pearson Edition, 5th Edtion, "Interactive Computer Graphics–A top down approach using Open GL".
2. Peter Shirley , 2009, Steve Marschner, Cengage Learning, Indian Edition "Computer Graphics".

OUTCOME MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	3	2
CO2	1	2	2	3	1
CO3	3	3	3	3	2
CO4	1	3	2	2	1
CO5	1	3	3	3	1

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER:II PART: III	INTERNAL ELECTIVE-I 22UBCACE26:3 INTERNET AND ITS APPLICATIONS	CREDIT:3 HOURS: 3

COURSE OBJECTIVES

1. Illustrate basic concepts of Internet.
2. Understand Apply the necessary of Internet Explorer.
3. Analyze, design and implement Email system.
4. Demonstrate the Hyper Text Markup languages
5. To learn the E-marketing & its usage.

UNIT – I:Fundamentals of Internet   **Hours:9**

Introduction to Computers Programming Language types History of Internet Personal Computers, History of World Wide Web- Micro software .NET Java-Web resources.

UNIT – II: Web Browsers   **Hours:9**

Web Browsers- Internet Explorer- connecting to Internet Features of Internet explorer6 Searching the Internet- online help and tutorials- File Transmission Protocol (FTP) Browser settings.

UNIT – III:E-Mail   **Hours:9**

Attaching a file, Electronic mail Creating an E-mail id Sending and Receiving mails- attaching a file-Instance messaging- other web browsers.

UNIT – IV:HTML   **Hours:9**

Introduction to HTML headers - Linking- Images-special characters and line breaks- unordered lists- simple HTML programs.

UNIT – V:E-Marketing   **Hours:9**

E-marketing consumer tracking Electronic advertising search engine-CRM- credit card Payments- Digital cash – e wallets – smart card.

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1. Explain basic usages of internet and its applications.
2. Define and demonstrate the use of Web Browsers.
3. To Explain the E-Mail applications.
4. To demonstrate the HTML & its tags.
5. To Know the E-Marketing and its advertisements.

Text Books (In API Style)

1. P.J. Deital and A.B.Goldberg , PHI, third Edition"Internet and World Wide Web".

Supplementary Readings

1. Harley hahn , Tata McGraw hill "The Internet- Complete Reference".
2. P.Rizwan Ahmed, 2014, , Margham Publication," Internet and its Applications"

OUTCOME MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	3	2
CO2	1	2	2	2	1
CO3	3	1	3	1	3
CO4	2	3	3	3	3
CO5	1	3	3	1	3

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)