

## 14. COMPUTER SCIENCE (Code No. 083) (2016-17)

**Note:** Schools may choose from option 1 (Python) or option 2 (C++) and teach accordingly.

### Learning Objectives:

- To understand basics of computers.
- To develop logic for Problem Solving.
- To develop problem solving skills and their implementation through **Python (version: 2.7)** or using C++.
- To understand and implement the concept of Object Oriented Methodology.
- To understand the concept of working with Relational Database.
- To understand the basic concept of Computing Logic.
- To understand the basic concepts of Communication and Networking technologies.
- To understand Open Source Software.

### CLASS XI (Theory) - Python

Unit No.	Unit Name	Marks
1	Computer Fundamentals	10
2	Programming Methodology	12
3	Introduction To Python	18
4	Programming with Python	30
<b>Total</b>		<b>70</b>

### Unit 1: Computer Fundamentals

**(18 Theory + 6 Practical) Periods**

**Classification of computers:** Basics of computer and its operation; Functional Components and their interconnections, concept of Booting.

**Software concepts:** Types of Software - System Software, Utility Software and Application Software

**System Software:** Operating System, Compiler, Interpreter and Assembler;

**Operating System:** Need for Operating System, Functions of Operating System (Processor Management, Memory Management, File Management and Device Management), Types of Operating System-Interactive (GUI based), Time Sharing, Real Time and Distributed, Commonly used Operating System: UNIX, LINUX, Windows, Solaris, BOSS (Bharat Operating System Solutions); Mobile OS - Android, Symbian.

**Utility Software:** Anti Virus, File Management tools, Compression tools and Disk Management tools (Disk Cleanup, Disk Defragmenter, Backup).

**Open Source Concepts:** Open Source Software, Freeware, Shareware, and Proprietary Software.

**Application Software:** Office Tools - Word Processor, Presentation Tool, Spreadsheet Package, Database Management System; Domain Specific tools - School Management System, Inventory Management System, Payroll System, Financial Accounting, Hotel Management, Reservation System and Weather Forecasting System.

**Number System:** Binary, Octal, Decimal, Hexadecimal and conversion between different number systems.

**Internal Storage encoding of Characters:** ASCII, ISCII (Indian Scripts Standard Code for Information Interchange), and UNICODE (for multilingual computing)

**Microprocessor:** Basic concepts, Clock speed (MHz, GHz), 16 bit, 32 bit, 64 bit, 128 bit processors; Types - CISC Processors (Complex Instruction Set Computing), RISC Processors (Reduced Instruction Set Computing), and EPIC (Explicitly Parallel Instruction Computing).

**Memory Concepts:** Units: Byte, Kilo Byte, Mega Byte, Giga Byte, Tera Byte, Peta Byte, Exa Byte, Zetta Byte, Yotta Byte.

**Primary Memory:** Cache, RAM, ROM

**Secondary Memory:** Fixed and Removable storage - Hard Disk Drive, CD/DVD Drive, Pen Drive, Blue Ray Disk.

**Input Output Ports/ Connections:** Serial, Parallel and Universal Serial Bus, PS-2 port, Infrared port, Bluetooth, Firewire.

## Unit 2: Programming Methodology

(28 Theory + 10 Practical) Periods

**General Concepts:** Modular Approach, Clarity and Simplicity of Expressions, Use of proper names for Identifiers, Comments, Indentation; Documentation and Program Maintenance; Running and Debugging programs, Syntax Errors, Run-Time Errors, Logical Errors

**Problem Solving Methodologies:** Understanding of the problem, Solution for the problem, Identifying minimum number of inputs required for output, Writing code to optimizing execution time and memory storage, step by step solution for the problem, breaking down solution into simple steps (modular approach), Identification of arithmetic and logical operations required for solution; Control Structure- Conditional control and looping (finite and infinite).

**Problem Solving:** Introduction to Algorithms/Flowcharts.

## Unit 3: Introduction to Python

(44 Theory + 36 Practical) Periods

**Getting Started:** Introduction to Python - an integrated high level language, interactive mode and script mode. Data types - Number (Integer - boolean, decimal, octal, hexadecimal; Floating point; Complex), none, Sequence (String, Tuples, List ) Sets, Mapping.

**Mutable and Immutable Variables**

**Variables, Expressions and Statements:** Values, Variables and Keywords; Operators and Operands in Python: (Arithmetic, Relational and Logical operators), Operator precedence, Expressions and Statements (Assignment statement); Taking input (using raw\_input() and input() and displaying output(print statement); (single and multiple line) prints with escape sequence and various formats; Putting Comments.

**Functions:** Importing Modules (entire module or selected objects), invoking built in functions, functions from math module (for e.g. ceil, floor, fabs, exp, log, log10, pow, sqrt, cos, sin, tan, degrees, radians, factorial, trunc, fmod), functions from random module (uniform, random, randint choice shuffle). Function from datetime module (date, time, datetime, timedate), functions from remodule (compile, match, group, start, end, span, search, findall, finditer), composition.

**Defining functions,** invoking functions, arguments and parameters, scope (local and global), passing parameters (*default parameter values, keyword arguments*), scope of variables, void functions and functions returning values, flow of execution, recursion.

**Conditional and looping construct:** if else statement while, for (range function), break, continue, else, pass, nested if, nested loops, use of compound expression in conditional and looping construct.

#### Unit 4: Programming with Python

(50 Theory + 48 Practical) Periods

**Strings:** Creating, initializing and accessing the elements; String operators: +, \*, in, not in, slice [n:m]; Comparing strings using relational operators; String functions & methods: len( ), capitalize( ), find( ), isalnum( ), isalpha( ), isdigit( ), lower( ), islower( ), isupper( ), upper( ), lstrip( ),rstrip( ), isspace( ), istitle( ), partition( ), replace( ), join( ), split( ), count( ), decode( ), encode( ), swapcase( ), String( ), constants, Regular Expressions and Pattern Matching.

**Lists:** Concept of mutable lists, creating, initializing and accessing the elements, traversing, appending, updating and deleting elements, composition, lists as arguments .

**List operations:** Joining, slicing, +, \*, in, not in.

**List functions and methods:** len( ), insert( ), append( ), extend( ), sort( ), remove( ), reverse( ), pop( ), list( ), count( ), extend( ), index( ), cmp( ), max( ), min( ).

**Dictionaries:** Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, traversing, appending, updating and deleting elements.

**Dictionary functions and methods:** cmp( ), len( ), clear( ), get( ), has\_key( ), items( ), keys( ), update( ), values( ), pop( ), fromkeys( ), dict( ).

**Tuples:** Immutable concept, creating, initializing and accessing elements in a tuple, Tuple assignment, Tuple slices, Tuple indexing.

**Tuple Functions:** cmp( ), len( ), max( ), min( ), tuple( ), index( ), count( ), sum( ), any( ), all( ), sorted( ), reversed( ).

### Class XI (Practical) Python

Duration: 3 hours

Total Marks: 30

#### 1. Programming in Python

10

One programming problem in Python to be developed and tested on Computer during the examination. Marks are allotted on the basis of following:

Logic : 6 Marks  
Documentation : 2 Marks

Output presentation : 2 Marks

2. One logical problem to be solved through flow charts. 04

3. Project Work 06

**Problems using String or List manipulation:** General Guidelines: Initial Requirement, developing an interface for user (it is advised to use text based interface screen), developing logic for playing the game and developing logic for scoring points

- Hollywood/Hangman: A word Guessing game
- Cows 'N Bulls: A word/number Guessing game
- Random Number Guessing Game (High\Low)
- A game to check whether a word does not use any of the forbidden letters

or

Similar projects may be undertaken in other domains.(As mentioned in general guidelines for project, given at the end of the curriculum in a group of 2-4 students)

4. Practical File (5+1\*)=6

(a) Record of the configuration of computer system used by the student in the computer lab (by exploring inside computer system in the first 2 lab classes).

(b) Must have minimum 20 programs from the topics covered in class XI course.

- Programs on Control structures
- Programs on String manipulations
- Programs on List Manipulations
- Program in tuple & dictionary manipulation.  
\*1 mark is for innovating while developing programmes.

5. Viva Voce 04

Viva will be asked from the syllabus covered in class XI and the project developed by the student(s).

OR

### Class XI (Theory) C++

Duration: 3 hours

Total Marks: 70

Unit No.	Unit Name	Marks
1.	COMPUTER FUNDAMENTALS	10
2.	PROGRAMMING METHODOLOGY	12
3.	INTRODUCTION TO C++	14
4.	PROGRAMMING IN C++	34
	<b>Total</b>	<b>70</b>

#### Unit-1: Computer Fundamentals

Common to both the options. Refer to Unit 1 mentioned in case of Python for further details.

## Unit-2: Programming Methodology

Common to both the options Refer to Unit 2 mentioned in case of Python for further details.

## Unit-3: Introduction to C++

(44 Theory + 36 Practical) Periods

**Getting Started:** C++ character set, C++ Tokens (Identifiers, Keywords, Constants, Operators,), Structure of a C++ Program (include files, main function), Header files - iostream.h, iomanip.h, **cout, cin;** use of I/O operators (<<and>>), Use of endl and setw ( ), Cascading of I/O operators, compilation , Error Messages; Use of editor, basic commands of editor, compilation, linking and execution.

**Data Types, Variables and Constants:** Concept of Data types; Built-in Data types: **char, int , float and double;** Constants: Integer Constants, Character constants (- \n, \t, \b), Floating Point Constants, String Constants; Access modifier: **const;** Variables of built-in-data types, Declaration/Initialization of variables, Assignment statement, Type modifier: **signed, unsigned, long**

**Operator and Expressions:** Operators: Arithmetic operators (-, +, \*, /, %), Assignment operator (=), c++ shorthands (+=, -=, \*=, /=, %=) Unary operators (-), Increment (++) and Decrement (--)  
Operators, Relation operator (>, >=, <=, !=), Logical operators (!, &&, ||), Conditional operator: <condition>?<if false>; Precedence of Operators; Automatic type conversion in expressions, Type casting;

## UNIT 4: PROGRAMMING IN C++

(50 Theory + 48 Practical) Periods

### Flow of control

**Conditional statements:** if else, Nested if, switch..case..default, use of conditional operator, Nested switch..case, break statement (to be used in switch..case only); **Loops:** while, do - while, for and Nested loops

### Inbuilt Functions

Header file Categorization	Header File	Function
Standard input/output functions	stdio.h	gets ( ), puts ( )
Character Functions	ctype.h	isalnum ( ), isalpha ( ), isdigit ( ), islower ( ), isupper ( ), tolower ( ), toupper ( )
String Function	string.h	strcpy ( ), strcat ( ), strlen ( ), strcmp ( ), strcmpi ( ), strev ( ), strupur ( ), strlwr ( )
Mathematical Functions	math.h	fabs ( ), pow ( ), sqrt ( ), sin ( ), cos ( ), abs ( )
Other Functions	stdlib.h	randomize ( ), random ( )

## Introduction to user-defined function and its requirements.

Defining a function; function prototype, Invoking/calling a function, passing arguments to function, specifying argument data types, default argument, constant argument, call by value, call by reference, returning values from a function, calling functions with arrays, scope rules of functions and variables local and global variables.

Relating to Parameters and return type concepts in built-in functions.

## Structured Data Type

**Arrays:** Introduction to Array and its advantages.

**One Dimensional Array:** Declaration/initialization of One-dimensional array, Inputting array elements, accessing array elements, manipulation of array elements (sum of elements, product of elements, average of elements, linear search, finding maximum/minimum value)

Declaration / Initialization of a String, string manipulations (counting vowels/ consonants/ digits/ special characters, case conversion, reversing a string, reversing each word of a string)

**Two-dimensional Array:** Declaration/initialization of a two-dimensional array, inputting array elements, accessing array elements, manipulation of Array elements (sum of row element, column elements, diagonal elements, finding maximum / minimum values)

**User-defined Data Types:** Introduction to user defined data types.

**Structure:** Defining a Structure (Keyword Structure), declaring structure variables, accessing structure elements, passing structure to functions as value and reference, argument/parameter, function returning structure, array of structure, passing an array of structure as an argument/ a parameter to a function.

Defining a symbol name using **typedef** keyword and defining a macro using **#define** preprocessor directive.

## Class XI (Practical) - C++

Duration: 3 hours

Total Marks: 30

1. **Programming in C++** 10  
One programming problem in C++ to be developed and tested on Computer during the examination. Marks are allotted on the basis of following:  
Logic : 6 Marks  
Documentation : 2 Marks  
Output presentation : 2 Marks
2. **One logical problem to be solved through flow charts.** 04
3. **Project Work** 06  
**Problems using String, Number, array and structure manipulation**  
General Guidelines: Initial Requirement, developing an interface for user (it is advised to use text based interface screen), developing logic for playing the game and developing logic for scoring points

- Memory game: A number guessing game with application of 2 dimensional arrays containing randomly generated numbers in pairs hidden inside boxes.
- Hollywood/Hangman: A word Guessing game
- Cows 'N Bulls: A word/number Guessing game
- Random Number Guessing Game (High\Low)
- A game to check whether a word does not use any of the forbidden letters
- Cross'N knots game: A regular tic-tac -toe game.

or

Similar projects may be undertaken in other domains. (As mentioned in general guidelines for project, given at the end of the curriculum in a group of 2-4 students)

#### 4. Practical File

(5+1\*)=6

- (a) Record of the configuration of computer system used by the student in the computer lab (by exploring inside computer system in the first 2 lab classes).
- (b) Must have minimum 20 programs from the topics covered in class XI course.
  - Programs on Control structures
  - Programs on String manipulations
  - Programs on array manipulations(1D & 2D)
  - Programs on structures.

\*1 mark is for innovating while developing programmes.

#### 6. Viva Voce

04

Viva will be asked from the syllabus covered in class XI and the project developed by the student(s).

\*1 mark is for innovating while developing programme.