Other university B.E./B.Tech - G IT
Level 2 syllabus

Object Oriented Programming using C++

PCC CS 302 Object Oriented Programming using C++

5 credits

Module 1
Introduction to C++ : Object Oriented Technology, Advantages of OOP, Input- output in C++, Tokens, Keywords, Identifiers, Data Types C++, Derives data types. The void data type, Type Modifiers, Typecasting, Constant, Operator, Precedence of Operators, Strings.

Module 2
Control Structures and Functions: Decision making statements like if-else, Nested if-else, goto, break, continue, switch case, Loop statement like for loop, nested for loop, while loop, do-while loop. Parts of Function, User- defined Functions, Value- Returning Functions, void Functions, Value Parameters, Function overloading, Virtual Functions.

Module 3
Classes and Data Abstraction : Structure in C++, Class, Build- in Operations on Classes, Assignment Operator and Classes, Class Scope, Reference parameters and Class Objects (Variables), Member functions, Accessor and Mutator Functions, Constructors, default Constructor, Destructors.

Module 4
Overloading, Templates and Inheritance: Operator Overloading, Function Overloading, Function Templates, Class Templates. Single and Multiple Inheritance, virtual Base class, Abstract Class, Pointer and Inheritance, Overloading Member Function.

Module 5
Pointers, Arrays and Exception Handling: Void Pointers, Pointer

to Class, Pointer to Object, Void Pointer, Arrays. The keywords try, throw and catch. Creating own Exception Classes, Exception Handling Techniques (Terminate the Program, Fix the Error and Continue, Log the Error and Continue), Stack Unwinding.

Suggested books:

1. Thinking in C++, Volume 1 & 2 by Bruce Eckel, Chuck Allison, Pearson Education
2. Mastering C++, 1/e by Venugopal, Tata McGraw Hill.
3. Object Oriented Programming with C++, 3/e by E. Balaguruswamy, Tata McGraw Hill.
4. Starting Out with Object Oriented Programming in C++, by Tony Gaddis, Wiley India.

Suggested Reference Books:

1. The C++ Programming language 3/e by Bjarne Stroustrup, Pearson Education.
2. C++, How to Programme, 4e, by Deitel, Pearson Education.
3. Big C++ by Cay Horstmann, Wiley India.
4. C++ Primer, 3e by Stanley B. Lippmann, JoseeLajoie, Pearson Education.
5. C++ and Object Oriented Programming Paradigm, 2e by Debasish Jana, PHI.
6. Programming with C++, 2/e by Ravichandran, Tata McGraw Hill.
7. C++ Programming Black Book by Steven Holzner, Dreamtech Press.

Digital Circuits

204182: Digital Circuits

Credit 03

Unit I Digital Logic Families

Classification and Characteristics of digital Logic Families: Speed, power dissipation, figure of merit,
fan in, fan out, current, voltage, noise immunity, operating temperatures and power supply requirements.
TTL logic. Operation of TTL NAND gate, active pull up, wired AND, open collector output, unconnected
inputs. Tri-State logic. CMOS logic: CMOS inverter, NAND, NOR gates, unconnected inputs, wired logic,
open drain output. Interfacing CMOS and TTL, Data sheet specifications.

Mapping of Course Outcomes for Unit I CO1: Identify and prevent various hazards and timing problems in a digital design.

Unit II Combinational Logic Design

Definition of combinational logic, canonical forms, Standard representations for logic functions, k-map representation of logic functions (SOP and POS forms), minimization of logical functions for min-terms and max-terms (upto 4 variables), don‟t care conditions, Design Examples: Arithmetic Circuits, BCD to 7 segment decoder, Code converters. Introduction to Quine-McCluskey method, Quine McCluskey using don‟t care terms, Reduced prime implicants Tables.

Mapping of Course Outcomes for Unit II CO2: Use the basic logic gates and various reduction techniques of digital logic circuit.

Unit III Combinational Circuits

Adders and their use as subtractor, look ahead carry, ALU, Digital Comparator, Parity generators/checkers, Multiplexers and their use in combinational logic designs, multiplexer trees, De- multiplexers and their use in combinational logic designs, Decoders, Demultiplexer trees.

Mapping of Course Outcomes for Unit III CO3: Analyze, design and implement combinational logic circuits.

Unit IV Sequential Logic Design

1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, hold and setup time and metastability.

Excitation Table for flip flop, Conversion of flip flops, Typical data sheet specifications of Flip flop application of Flip flops.

Registers, Shift registers, Counters (ring counters, twisted ring counters), ripple counters, Mod-n counters, up/down counters, synchronous counters, lock out, Clock Skew, Clock jitter. Effect on synchronous designs, Sequence Generators.

Mapping of Course Outcomes for Unit IV CO4: Analyze, design and implement sequential circuits.

Unit V State Machines

Basic design steps- State diagram, State table, State reduction, State

assignment, Mealy and Moore
machines representation, Implementation, finite state machine implementation, Sequence detector.
Introduction to Algorithmic state machines- construction of ASM chart and realization for sequential
circuits
Mapping of Course Outcomes for Unit V CO5: Differentiate between Mealy and Moore machines.

Unit VI Programmable Logic Devices
Programmable logic devices: Detail architecture, Study of PROM, PAL, PLA, General Architecture,
features and typical specifications of FPGA and CPLD. Semiconductor memories: memory
organization and operation, expanding memory size, Classification and characteristics of memories,
RAM ROM, EPROM, EEPROM, NVRAM, SRAM, and DRAM.
Designing combinational circuits
using PLDs.
Mapping of Course Outcomes for Unit VI CO6: Analyze digital system design using PLD.

Learning Resources

Text Books:
1. R.P. Jain, “Modern Digital Electronics”, Tata McGraw Hill Publication, 3rd Edition.

2. Thomas Floyd, “Digital Electronics”, 11th Edition.
3. M. Morris Mano, “Digital Logic and Computer Design”, Prentice Hall of India, 4th Edition.

4. Taub and Schilling, “Digital Principles and Applications,” TMH.
Reference Books:
1. Anand Kumar, “Fundamentals of Digital Circuits”, Prentice Hall of India, 1st Edition.

2. J. F. Wakerly, “Digital Design- Principles and Practices,”, Pearson, 3rd Edition.

3. M. M. Mano, “Digital Design,” Prentice Hall India.

Discrete Mathematics

214441: Discrete Mathematics

Unit I Sets And Propositions

Sets: Sets, Combinations of Sets, Venn Diagram, Finite and Infinite Sets, Countable Sets, Multisets,
Principle of Inclusion and Exclusion, Mathematical Induction.

Propositions: Propositions, Logical Connectives, Conditional and Bi-conditional Propositions, Logical
Equivalence, Validity of Arguments by using Truth Tables, Predicates and Quantifiers, Normal forms.
Applications of Sets and Propositions.

Unit II Combinatorics And Discrete Probability

Combinatorics: Rules of Sum and Product, Permutations, Combinations.

Discrete Probability: Discrete Probability, Conditional Probability, Bayes Theorem, Information and
Mutual Information, Applications of Combinatorics and Discrete Probability.

Unit III Graph Theory

Graphs: Basic Terminologies, Multi-Graphs, Weighted Graphs, Sub Graphs, Isomorphic graphs,
Complete Graphs, Regular Graphs, Bipartite Graphs, Operations on Graphs, Paths, Circuits, Hamiltonian
and Eulerian graphs, Travelling Salesman Problem, Factors of Graphs, Planar Graphs, Graph Colouring.

Trees: Tree Terminologies, Rooted Trees, Path Length in Rooted Trees, Prefix Codes, Spanning Trees,
Fundamental Cut Sets and Circuits, Max flow –Min Cut Theorem (Transport Network).
Applications of Graph Theory.

Unit IV Relations And Functions

Relations: Properties of Binary Relations, Closure of Relations, Warshall’sAlgorithm, Equivalence
Relations, Partitions, Partial Ordering Relations, Lattices, Chains and Anti Chains.

Functions: Functions, Composition of Functions, Invertible Functions, Pigeonhole Principle, Discrete
Numeric Functions.

Recurrence Relations: Recurrence Relation, Linear Recurrence Relations with Constant Coefficients,

Total Solutions, Applications of Relations and Functions.

Unit V Introduction To Number Theory

Divisibility of Integers: Properties of Divisibility, Division Algorithm, Greatest Common Divisor GCD and its Properties, Euclidean Algorithm, Extended Euclidean Algorithm, Prime Factorization Theorem,
Congruence Relation, Modular Arithmetic, Euler Phi Function, Euler's Theorem, Fermat's Little
Theorem, Additive and Multiplicative Inverses, Chinese Remainder Theorem.

Unit VI Algebraic Structures

Algebraic Structures: Introduction Semigroup, Monoid, Group, Abelian Group, Permutation Groups,
Cosets, Normal Subgroup, Codes and Group Codes, Ring, Integral Domain, Field.
Applications of Algebraic Structures.

Text Books:

1. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", 4th Edition, McGraw-Hill
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", & 7th edition, McGraw-Hill

Reference Books:

1. Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, "Discrete mathematical structures", 6th edition, Prentice Hall of India
2. Edgar G. Goodaire, Michael M. Parmenter, "Discrete Mathematics with Graph Theory", 3rd Edition, Pearson Education
3. Tremblay J. S., "Discrete mathematical structures with application", 3rdEdition, Tata McGraw Hill
4. Lipschutz Seymour, "Discrete mathematics", 4th Edition, Tata McGraw-Hill
5. Johnsonbaugh Richard, "Discrete Mathematics", 7th edition, Pearson
6. Biggs Norman L, "Discrete mathematics", 6th edition, Oxford
7. David M. Burton, "Elementary Number Theory", &7th Edition, McGraw-Hill

Mathematics III

Mathematics III

Linear Differential Equations (LDE)

LDE of nth order with constant coefficients, Complementary function, Particular integral, General
method, Short methods, Method of variation of parameters, Cauchy's and Legendre's DE,
Simultaneous and Symmetric simultaneous DE.

Transforms

Fourier Transform (FT): Complex exponential form of Fourier series, Fourier integral theorem, Fourier
Sine and Cosine integrals, Fourier transform, Fourier Sine and Cosine transforms and their inverses,
Discrete Fourier Transform.
Z - Transform (ZT): Introduction, Definition, Standard properties, ZT of standard sequences and their
inverses. Solution of difference equations.

Statistics

Measures of central tendency, Measures of dispersion, Coefficient of variation, Moments, Skewness
and Kurtosis, Curve fitting: fitting of straight line, parabola and related curves, Correlation and
Regression, Reliability of Regression Estimates.

Probability and Probability Distributions

Probability, Theorems on Probability, Bayes theorem, Random variables, Mathematical Expectation,
Probability density function, Probability distributions: Binomial, Poisson, Normal and
Hypergeometric, Sampling distributions, Test of Hypothesis: Chi-Square test, t-test.

Numerical Methods

Numerical Solution of Algebraic and Transcendental equations: Bisection, Secant, Regula-Falsi,
Newton–Raphson and Successive Approximation Methods, Convergence and Stability.
Numerical Solutions of System of linear equations: Gauss elimination,

LU Decomposition, Cholesky,
Jacobi and Gauss-Seidel Methods.

Numerical Methods

Interpolation: Finite Differences, Newton's and Lagrange's Interpolation formulae, Numerical
Differentiation. Numerical Integration: Trapezoidal and Simpson's rules, Bound of truncation error.
Solution of Ordinary differential equations: Euler's, Modified Euler's, Runge-Kutta 4th order methods
and Predictor-Corrector methods.

Database Management System

Module 1
Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).
Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Module 2
Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.
Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.
Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Module 3
Storage strategies: Indices, B-trees, hashing.

Module 4
Transaction processing: Concurrency control, ACID property,

Serializability of scheduling, Locking and timestamp-based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Module 5
Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Module 6
Advanced topics: Object-oriented and object-relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

Automata Theory

Automata Theory

Regular Languages and Finite Automata

Proofs,RecursiveDefinitions,Regularexpressionsandregularlanguages,F
Automata,unions,intersection&complementsofregularlanguages,Applic
of FA

Nondeterminism and Kleene's Theorem
Nondeterministic finite automata, NFA with null transition, Equivalence of FA's,
Kleene's Theorem (Part I & Part II), Minimal Finite Automata

Context free Grammars
Definition, Union, Concatenation and Kleene *'s of CFLs, Derivation trees and
ambiguity, Simplified forms and normal forms

Parsing andPushdownAutomata
Definition of Pushdown Automata, Deterministic PDA, Equivalence of CFG's&
PDA's, Top down parsing, bottom up parsing.

Context free languages
CFL's and non CFL's, Pumping Lemma, intersections and complementsof CFLs

Turing Machines
Definition,TMaslanguageacceptors,combiningTuringMachines,Computi
partial function with a TM, Multi-tape TMs, and Universal TM

Computer Organization and Architecture

Unit-1 Computer Evolution and performance
Evolution of computer – Mechanical Era: Babbage's Difference Engine, Electronic Era:
First-generation, IAS Computers, Instruction Set and Instruction Execution, Second
generation, Input-Output Operation, Programming Language, Third generation and VLSI
Era – IC Circuits, Performance Consideration, and Measures, Speed up Techniques,
Difference between RICS and CISC.

Unit-2 Input and OutputOrganization
Accessing I/O devices, Direct Memory Access (DMA), Buses: SynchronousBusand
Asynchronous Bus, Interface Circuits, Standard IO Interface.

Unit-3 Arithmetic
Addition and Subtraction of Signed Numbers, Design of fast Adders, Multiplication of
Positive numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division,
Floating Point Number Operations: IEEE 754 Floating Point Format, Arithmetic Operations
The Processing Unit

Unit-4 Some fundamental Concepts Execution of complete Instruction, Multiple bus
the organization, Hardwired Control, Micro programmed Control Pipelining

Unit-5 Basic Concepts: Role of Cache Memory, Pipeline Performance. DataHazards: Operand
Forwarding, Handling Data Hazards in Software and Side Effects and Instruction Hazards:
Unconditional Branches and Conditional Branches and Branch Prediction
Computer Memory System

Unit-6 Some Basic Concepts, Types of Memories: ROM and RAM, SemiconductorRAMmemory,
Cache Memories: Mapping functions, Replacement Algorithms, Example of Mapping
Techniques

Microprocessors

Module 1: Fundamentals of Microprocessors
Fundamentals of Microprocessor Architecture. 8-bit microprocessor and Microcontroller architecture, Comparison of 8-bit microcontrollers, 16-bit and 32-bit microcontrollers.
Definition of embedded system and its characteristics, Role of microcontrollers in
embedded systems. Overview of the 8051 families.

Module 2: The 8051 Architecture
Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers,
SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

Module 3: Instruction Set and Programming
Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instructions. Assembly language programs, C language programs.
Assemblers and compilers. Programming and debugging tools.

Module 4: Memory and I/O Interfacing
Memory and I/O expansion buses, control signals, memory wait states. Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC, timers, counters, memory devices.

Module 5: External Communication Interface

Synchronous and Asynchronous Communication. RS232, SPI, I2C. Introduction and interfacing to protocols like Blue-tooth and Zig-bee.

Module 6: Applications
LED, LCD, and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor
interfacing.

Design & Analysis of Algorithms

Module 1
Introduction: Characteristics of the algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average, and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

Module 2
Introduction to Divide and Conquer paradigm: Binary Search, Quick and Merge sorting techniques, linear time selection algorithm, Strassen's Matrix Multiplication, Karatsuba Algorithm for fast multiplication etc. Introduction to Heap: Min and Max Heap, Build Heap, Heap Sort

Module 3
Overview of Brute-Force, Greedy Programming, Dynamic Programming, Branch-and-Bound and Backtracking methodologies. Greedy paradigm examples of exact optimization solution: Minimum Cost Spanning Tree, Knapsack problem, Job Sequencing Problem, Huffman Coding, Single source shortest path problem.
Dynamic Programming, the difference between dynamic programming and divide and conquer, Applications: Fibonacci Series, Matrix Chain Multiplication, 0-1 Knapsack Problem, Longest Common Subsequence, Travelling Salesman Problem, Rod Cutting, Bin Packing.
Heuristics – characteristics and their application domains.

Module 4
Graph and Tree Algorithms: Representational issues in graphs,

Traversal algorithms: Depth First Search (DFS) and Breadth-First Search (BFS); Shortest path algorithms: Bellman-Ford algorithm, Dijkstra's algorithm & Analysis of Dijkstra's algorithm using heaps, Floyd-Warshall's all-pairs shortest path algorithm. Transitive closure, Topological sorting, Network Flow Algorithm, Connected Component

Module 5

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete, and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.Approximation algorithms, Randomized algorithms