UNITWISE SYLLABUS

1. **Introduction:** Definition and types of operating systems, Batch Systems, multi programming, time–sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, system programs, Virtual machines.
2. **Process Management, Synchronization and Deadlocks:** Process concept, Process scheduling, Cooperating processes, Threads, Inter process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation. The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.
3. **Storage management:** Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Recovery, Disk structure, disk scheduling methods, Disk management, Swap-Space management, Disk reliability.
4. **Threats and Security:** Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, language based protection, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Network structure security. Windows NT-Design principles, System components, Environmental subsystems, File concept, File system, Networking and program interface, Linux system-design principles, Kernel Modules, Process Management
5. **Concepts of Shell Programming:** Types of shells, Shell functionality, Environment, Writing script & executing basic script, Debugging script, Making interactive scripts, Variables (default variables), Functions & file manipulations, Processing file line by line, Functions, Regular Expression & Filters. Advanced Scripting Techniques: Providing command line options to scripts, Shell & sub shells, Exporting variables, Remote shell execution, Dialog boxes, SQL with Shell, Connecting to MySQL using shell, Running SQL queries from a shell script

UNITWISE SYLLABUS

1. **Introduction**: Programming Paradigms: Unstructured Programming, Structured Programming. Object Oriented Programming; Abstract Data Type (ADT); Class; Object; Message; Encapsulation; Polymorphism; Inheritance; Pros and Cons of Object Oriented Methodology; cin and cout Objects.
2. **Classes and Objects:** Classes; Friend Functions: Introduction, Benefits and Restrictions, Friends Classes; Inline Functions; Constructor: Introduction, Parameterized Constructor; Destructor and its usages; Static Data Member and Static Member Functions; Creating Object; Passing and Returning Object(s) to/from a Function; Object Assignment; Nested and Local Classes; Arrays of Objects; Pointer to Objects; this Pointer, Pointer to Derived Type; References; Reference vs Pointer; Reference Parameters; Dynamic Memory Allocation: new and delete Operators.
3. **Function and Operator overloading**: Function overloading: Introduction, Rules, Overloading Constructors, Copy Constructors; Default Function Arguments vs. Function Overloading. Operator Overloading: Introduction, Operators that cannot be Overloaded, Overloading Operators using Member Function and Friends Functions, Overloading different operators including prefix and postfix form of ++ and -- operators, Shorthand Operators, new, delete, [], (), -> and comma Operators.
4. **Inheritance & Virtual function**: Inheritance: Introduction, Types of Inheritances, Base-Class Access Control, Protected Members, Protected Base-class Inheritance, Multiple Inheritance, Problem in Multiple Inheritance, Solution to Multiple Inheritance Problem, Passing Parameters to Base Class Constructors; Virtual functions: Introduction, Calling a Virtual Function using Base Class Reference, Pure Virtual Function, Abstract Class.
5. **Generic Function, Exception and File Handling:** Generic Functions: Benefits, Functions with Two Generic Types, Explicitly Overloading a Generic Function, Overloading a Function Template, Restriction, Generic Sort, Generic Class. Exception Handling: Introduction, Using try and catch Blocks, Creating Exception Class, throwing Object. C++ Streams; C++ File Handling: Opening and Closing a File, Reading and Writing a Text File, Random Access, Reading and Writing Object to a File

Text Books

1. Herbert Schildt: Complete Reference C++, 3rd Ed., Tata Mc Graw Hill
2. BJarne Stroustrup: The C++ Programming Language, Pearson Education
3. E. Balagurusamy: Object Oriented Programming with C++ 6th Edition , Mc Graw Hill.
4. H.M. Deitel & P.J. Deitel: C++ How to Program, 4th Ed., Pearson Education.

UNITWISE SYLLABUS

1. **List and Matrices:** Data Structure, Linear Data Structure, Array, Address Calculation, Single Linked List, Circular Linked List, Doubly Linked List, Circular Doubly Linked List, Applications of Arrays and Linked List, Matrix, Mapping of Matrix elements to One Dimensional (1D) Array, Special Matrices, Triangular, Diagonal, Tri-Diagonal, Representation in Row Major and Column Major Order, Mapping of non-null Elements in 1D Array, Sparse Matrix, Applications of Linked Lists: Bin Sort, Radix Sort, Convex Hull.
2. **Stack and Queues:** Stack Data Structure, Push & Pop Operations, Representation and Implementation of Stack using Array and Linked List, Applications of Stack: Conversion of Infix to Postfix Expressions, Parenthesis Matching, Towers of Hanoi, Rat in a Maze, Implementation of Recursive Functions, Queue Data Structure, Various Queue Operations, Circular Queue, Representation and implementation of queues using Array and Linked List, Deque, Applications of Queue Railroad Car Rearrangement, Machine Shop Simulation, Image-Component Labeling, Priority Queues: Priority Queue Using Heap; Max and Min Heap; Insertion into Heap; Deletion from a Heap; Applications of Priority Queue: Heap Sort, Huffman Codes.
3. **Trees**: Basic Concepts, Binary Trees and their Properties; Representation of Binary Trees: Array-Based and Linked Representations; Binary Tree Traversals; Binary Search Trees (BST); Operations on BST: Search, Insertion and Deletion; BST with Duplicates; Indexed BST; Applications of BST: Histogramming, Best-Fit Bin Packing. B-Trees and their Representation; Operations on B-Tree: Search, Insertion and Deletion; B+-Trees; AVL Trees; AVL Tree Representation; Operations on AVL Trees: Search, Insertion and Deletion; Introduction to Red-Black and Splay Trees.
4. **Sorting and Searching**: Insertion Sort, Bubble Sorting, Quick Sort, Merge Sort, Shell sort, Sequential search, binary search, Introduction to Hashing, Hash Table Representation, Hash Functions, Collision and Overflows, Linear Probing, Random Probing, Double Hashing, and Open Hashing.
5. **Graphs and File Structure:** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Representations of Graphs, Weighted Graph

Representations; Graph Traversal Methods: Breadth-First Search and Depth-First Search; Spanning Tree and Shortest Path Finding Problems, Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.

Text Books

1. Y. Langsam, M. Augenstin and A. Tannenbaum, Data Structures using C and C++, Pearson Education Asia, 2nd Edition, 2002
2. Sahni: Data Structures, Algorithms and Applications, Galgotia.
3. S. Lipschutz, Data Structures Mc-Graw Hill International Editions, 1986.

Reference Books

1. Jean-Paul Tremblay, Paul. G. Soresan, An introduction to data structures with Applications, Tata Mc-Graw Hill International Editions, 2nd edition 1984.
2. A. Michael Berman, Data structures via C++, Oxford University Press, 2002.
3. M. Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education, 2002, 2nd edition.
4. D. Samanta, Classic Data Structure.

c) **Outline**

Weeks:	**Topics:**
Week 1:	Basic Terminology of Data Structure.
Week 2:	Representation and Implementation of Array & Stack.
Week 3:	Conversion of Infix to Prefix and Postfix Expressions.
Week 4:	Representation and implementation of queues.
Week 5:	Representation and Implementation of Linked List & their types.
Week 6:	Tower of Hanoi Problem, Backtracking, recursive algorithms.

Course Plan and Detail Syllabi for

Microprocessor & Computer Architecture

Course Code	:	**CSCC24**
LTP	:	3-1-4
Credit	:	4
Course Prerequisite	:	CSCC/CBCS11 / CSCC/CBSE12/csss13
Course Status	:	Core course
Instructor's name	:	
Tel. No.	:	
Office Location	:	
Office Hours	:	
Class Location	:	
Class Time	:	

a) **Course Description:** This course is an introduction to computer architecture, in which the basic architecture of computer shall be described. The details of CPU and computer arithmetic will be the core areas to focus on. Besides this, machine programming, memory organization and I/O organization will also be covered in this course.

b) **Objectives:** Subject-specific skills: By the end of this course, the student must be able to:

1. Understand basic architecture of computer.
2. Use machine programming like machine 0 to machine 3.
3. Understand the concepts of I/O and memory organization.
4. Gain awareness about parallel processing, vector processing and array processing.

UNITWISE SYLLABUS

1 **Microprocessor:** Microprocessor, Survey of Microprocessor, Evolution of Microprocessor, Microprocessor Generations, Microprocessor Architecture, Architecture Tree, Functional Block Diagram of 8085, Register Section, Timing and Control Unit, Addressing Modes (General).

2 **Assembly Programming 8085:** Addressing Modes of 8085, Instruction Sets, Instruction

Classification, Instruction Format, Data Format, Opcode Format, Writing Assembly Programs, Timing Diagram and Machine Cycle.

3 **Input-Output Organization:** Peripheral Devices; Input Output Interface; I/O vs. Memory Bus; Isolated vs. Memory Mapped I/O; Asynchronous Data Transfer – Strobe Control, Handshaking; Mode of Data Transfer; Priority Interrupt – Daisy Chaining Priority, Parallel Priority Interrupt, Priority Encoder, Interrupt Cycle, Software Routines; Direct Memory Access (DMA) – DMA Controller, DMA Transfer; Input-Output Processor (IOP), Architecture of 8086, Register set of 8086, 8086 Operational Modes.

4 **Central Processing Unit (CPU) and Some Arithmetic Operations:** Introduction; General Register Organization; Control Word; Stack Organization – Register Stack, Memory Stack, Reverse Polish Notation, Evaluation of Arithmetic Expression. Instruction Format – Three Address Instructions, Two Address Instructions, One Address Instructions, Zero Address Instructions. Addressing Modes; Program Control - Status Bit Conditions, Conditional Branch Instructions, Subroutine Call; Program Interrupt – Types of Interrupts; RISC and CISC Characteristics, Addition, Subtraction, Booth's Multiplication, Division Algorithm.

5 **Memory Organization and Pipeline:** Memory Hierarchy; Associative Memory – Hardware Organization, Match Logic, Read Operation, Write Operation; Cache Memory – Associative Mapping, Direct Mapping, Set-Associative Mapping, Writing into Cache, Cache Initialization, Parallel Processing; Pipelining – Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline; Vector Processing – Vector Operations, Matrix Multiplication, Memory Interleaving; Array Processor – Attached Array Processor, SIMD Array Processor.

Text Books

1. M. Morris Mano: Computer System Architecture, 3rd Ed., PHI
2. Gaonkar: Microprocessor Architecture, Programming and Applications with 8085, PRI
3. D.V. Hall: Microprocessing and Interfacing, TMH
4. B. Ram: Fundamental of Microprocessor and Micro-Controller, DRP.
5. Willian Stallings: Computer Organization and Architecture: Design for Performance, Pearson.

Reference Books

1. Rafiquzzaman & Chandra: Modern Computer Architecture, 2003.
2. William Stalling,: Computer Organization and Architecture, Pearson Education
3. Rajaraman & T. Radhakrishnan: Computer Organization and Architecture, PHI.

UNITWISE SYLLABUS

1. **System and System Analyst:** System Concepts; Information and Management; Information Architecture in the Organizations; Management Triangle; Computer-Based Information System – Need & Significance; Types of Information System, Factors Affecting the Information Systems; Drivers of Information system; System Stakeholders System Analyst – Roles and Responsibilities, Skills and Characteristics.

2. **System Development Life Cycle:** Methodologies of System Development, System Analysis – Identifying Problems and Objectives, Systems Proposal, Questionnaires, Interviewing, Brain-Storming, Prototyping, Determining Information Requirements, Analyzing System Needs, System Specifications, Ascertaining Hardware and Software Needs and Selection; Feasibility Study; Cost-Benefit Analysis; Planning and Scheduling of Projects.

3. **Structured Analysis:** Tools used for Structured Analysis, Data Flow Diagram (DFD), Logical and Physical DFDs, Data Dictionary and Process Specification, Structured English, Decision Tables, Decision Trees.

4. **Systems Design:** Designing the Recommended System, Structured Design, Tools for Structured Design, Modular Decomposition, Top-Down and Bottom-Up Designs, Using Structure Charts to Design Systems, Designing Effective Input, Designing Effective Output, Form Design, Designing Databases, Designing User-Interfaces.

5. **Object-Oriented Analysis:** Software Complexity; S/W Crisis & Related Issues; Object-Oriented Approach, Features & Significance; Object Oriented Methodologies; Modeling Concepts; Object Modeling – Objects and Classes, Links & Associations, Generalization & Inheritance, Grouping Constructs, Aggregation, Abstract Classes, Multiple Inheritance, Meta Data, Candidate Keys and Constraints. Dynamic Modeling – Events and States, Operations; Functional Modeling – DFDs, Specifying Operations and Constraints.

Text Books

1 J. L. Witten & L. D. Bentley: Systems Analysis and Design Methods, 7th Ed., McGraw-Hill

2 Kendall & Kendall: Systems Analysis and Design, 5th Ed., Pearson Education

3 Roger S. Pressman: Software Engineering: A Practitioner's Approach, 6th Edition Mc Graw Hill Publication.

4 Ian sommerville:, Software Engineering, 9th Edition, 2010, Pearson Education.

UNITWISE SYLLABUS

1. **Introduction:** Finite Automata, Formal Proofs, Deductive Proofs, Contrapositive, Proof by Contradiction, Proof by Counter Example, Proof by Induction, Concept of Automata Theory, Finite Automata: Deterministic Finite Automata (DFA), Languages of DFA; Non Deterministic Finite Automata (NFA), Language of NFA, Equivalence of Deterministic and Non-deterministic Automata, Application of Automata: Finding String in Text, Recognizing a Set of Keywords, Finite Automata with Epsilon Transition.
2. **Regular Languages and Regular Grammars:** Regular Expressions, Finite Automata and Regular Expressions, Conversion from DFA to Regular Expression, Conversion from Regular Expression to Automata, Languages Associated with Regular Expressions, Connection between Regular Expressions and Regular languages, Regular Grammar, Properties of Regular Languages, Closure properties of Regular Languages. Identifying Non-regular Languages.
3. **Context Free Languages:** Context Free Grammars; Examples of Context Free Languages, Left most and Right most Derivations, Derivation Trees, Relationship between Derivation and Derivation Trees, Ambiguity in Grammars and Languages, Ambiguous Grammar, Methods for transforming Grammars; An useful Substitution Rule, Removing Useless productions, Removing λ- productions, Removing unit productions, Two important Normal Forms: Chomsky Normal Forms and Greibach Normal Form; Pumping Lemma for CFLs.
4. **Pushdown Automata:** Push Down Automata (PDA), Informal and Formal Definition of a Push Down Automata, Descriptions of a PDA, the Language Accepted by a Push Down Automata, Push Down Automata and Context Free Languages, Context Free Grammar for Push Down Automata; Deterministic Push Down Automata.
5. **Turing Machines and their Languages:** The Standard Turing Machine, Definition of a Turing Machine, Turing Machine Language Accepters, Other Models of the Turing Machine, Multi-tape Turing Machines, Multidimensional Turing Machines, Nondeterministic Turing Machines, The Universal Turing Machine; Recursive and Recursively Enumerable languages, Some Problems that cannot be Solved by Turing Machines- Computability and Decidability.

Text Books

1. Linz: Theory of Automata and Formal Languages, JBL.
2. Hopcroft et al: Introduction to Automata Theory, Languages and Computation, Pearson.
3. J. Hopcroft, R. Motwani, and J. Ullman: Introduction to Automata Theory, Languages, and Computation, 3rd edition, 2007, Pearson/Addison-Wesley.
4. Daniel I.A. Cohen: Introduction to Computer Theory, John Wiley.