Program Structure for
Master of Computer Application (MCA)
Mumbai University
(With Effect from 2012-2013)
Semester I

Object Oriented Programming

1 C++ Fundamentals:

Data types, Operators, Preprocessor directives, Declarations, Input & Output, control structures, structures, functions and arrays.

2 Functions:

Concept of function in C++, function prototypes in C++, functions with parameters, Returning values From Functions. Reference Arguments, Overloaded Function, Default Arguments. Returning By Reference.

3 Object oriented programming


4 Arrays and String:


5 Operator Overloading:


6 Inheritance:

Concept of Inheritance, Derived Class And Base Class, Derived Class Constructors, Overriding Member Function, Class Hierarchies, Public And Private Inheritance, Levels Of Inheritance, Multiple Inheritance, Ambiguity In Multiple Inheritance, Aggregation: Classes Within Classes, Inheritance And program Development.

7 Pointers.

Addresses And pointer, The Address-Of Operator “&”, Pointer And Arrays, Pointer And Function, Pointer And C- Types String, Memory Management: New And Delete operator, Pointers to Objects, Debugging pointers.
8 Virtual Functions and Polymorphism

Virtual Function, Assignment And Copy Initialization, this Pointer, Dynamic Type Information.

9 Streams and Files.

Streams Classes. Stream Errors. Disk File I/O with Streams, File Pointers, Error Handling In File I/O, File I/O With Member Function, Overloading the Extraction And Insertion Operators, Memory As A Stream Object, Command line Arguments, and Printer Output.

10 Templates And Exceptions

Function Templates, Class Templates Exceptions.

11 The Standard Template Library

Introduction Algorithms, Sequence Containers, Iterators, Specialized Iterators, Associative Containers, Storing User- Defined Object, Function Objects

Computer Organization and Architecture

1 DIGITAL LOGIC


2 THE COMPUTER SYSTEM

Computer function and Interconnection Computer functions Interconnection Structures Bus Interconnection Memory System Design Memory hierarchy and SRAM Advanced DRAM Organisation Interleaved and Associative memory Nonvolatile memory RAID Cache Memory Cache memory Principles Elements of Cache design Improving Cache Performance Input / Output Programmed I/O Interrupt-driven I/O Direct Memory Access I/O Channels and Processors

3 CENTRAL PROCESSING UNIT

Instruction Set: characteristics & functions Machine Instruction characteristics Type of Operands Types of Operations Instruction set : addressing modes & formats Addressing Instruction Formats CPU structure and Function Processor Organization Register Organization Instruction Organization Instruction Cycle Instruction Pipelining Instruction Level Parallelism and Superscalar Processors Superscalar versus super pipelined Limitations Instruction level parallelism and machine parallelism Instruction issue policy Register Renaming Branch Prediction Superscalar Execution Superscalar Implementation Example: 8086 and Pentium Processor

4 CONTROL UNIT

Control Unit Operation Micro-operations Control of the processors Hardwired Implementation Micro programmed Control (Basic concepts )
5 MULTIPROCESSOR ORGANISATIONS

Multiprocessor organizations UMA, NUMA NORMA, Distributed memory Types of Parallel Processor Systems Parallel organizations Symmetric Multiprocessors Organization Interconnection networks – Single bus, crossbar, mesh, tree & ring network Clusters Cluster Configurations Cluster Computer Architecture Cloud computing

6 Case Study:

Processor Specification & Design

Software Engineering

Software Engineering:

1. The evolving role of software
   What is Software engineering?
   Changing nature of software Myths.

2. Approaches to system development
   SDLC
   Different models their advantages and disadvantages
   o Waterfall approach
   o Iterative approach
   o Extreme programming
   o Rad model, JAD
   o Unified process
   o Evolutionary software process model
     Incremental model
     Spiral model
   Concurrent development model
   Agile Model

3 Software Analysis and Design

   Activities of the analysis phase
   Fact finding methods
   o Review existing reports forms and procedure descriptions
   o Conduct interviews
   o Observe & document business processes
   o Build prototypes
   o Questionnaires
   o Conduct jad sessions
   Validate the requirements
   o Structured walkthroughs
   Feasibility Analysis: Types of feasibilities, Cost- benefit analysis, Payback analysis, ROI analysis, cash flow analysis.
Requirement Engineering
  Software engineering task
  Requirement elicitation techniques
  Software Requirements Specification (SRS)
  Software requirements: functional and non-functional domain
  Requirement characteristics and characterization
  Requirement qualities, requirement specification, requirement traceability,
  Requirement prioritization

4 Software Project Planning:
  Size Estimation
  Cost Estimation
  Models
  COCOMO, COCOMO-II

5 Software Scheduling and Tracking
  Relationship between people and Effort: Staffing Levci Estimation, Effect of schedule Change on
  Cost Selecting Software Engineering Tasks: Degree of Rigor, Task set selector, Task Network
  Schedules: Work breakdown Structure, Task Network/Activity Networks, Gantt Charts, PERT

6 Design phase activities
  Develop system flowchart
  Structure chart
    o Transaction analysis
    o Transform analysis
  Software design and documentation tools
    Hipo chart
    Warnier orr diagram
    Designing databases
    Entities
    Relationships
    Attributes
    Normalization

7 Software Quality
  Software Quality Management Systems
  Software Quality Assurance
  Software reviews
  Formal Technical Reviews
  Overview of ISO 9001, SEI Capability Maturity Model, Mc Calls Quality Model

8 Software Reliability and Maintenance
  • Software Reliability
  • Reliability Metrics
  • Reliability Growth Modeling
  • Software Reveres Engineering
  • Software Maintenance Costs
  • Estimation of Maintenance Costs
Discrete Mathematics

1 Mathematical logic

- Propositions and logical operations
- Conditional Statements
- Methods of Proof
- Mathematical Induction
- Mathematical Statements
- Logic and Problem Solving
- Normal Forms
- Theory of Inference of statement calculus and predicate calculus

2 Relations

- Product sets and partitions
- Relations and digraphs
- Paths in Relations and Digraphs
- Properties of Relations
- Equivalence Relations
- Operations on Relations
- Partially Orders Sets, Hasse diagram

3 Semigroups and Groups

- Semigroups, Monoids
- Products and Quotients of Semigroups
- Groups
- Products and Quotients of Groups

4 Groups and Coding

- Coding of Binary Information and Error Detection
- Decoding and Error Correction

5 Recurrence Relations

- Tower of Hanoi
- Iterations
- Homogenous linear equations with constant coefficients
- Particular Solution, Total Solution, Generating function
- Line in a plane in general position
- Divide and Conquer Recurrence Relations (Fast Multiplication of Integers, Fast matrix Multiplication)

6 Graphs

- Graph
- Representation of Graph
- Adjacency matrix, Adjacency list
- Euler paths and Circuits
- Hamiltonian Paths and Circuits

7 Language and Finite State Machines

- Languages
- Finite-State Machines
Principles and Perspective of Management

1 Nature and functions of management: importance of management, definition of management, management functions, development of management thought, contribution of F. W. Taylor, Henri Fayol, Elton Mayo, system contingency approaches to management

2 Planning: nature of planning, importance, forms, types of planning, steps in planning, making planning effective, planning skills, strategic planning in the Indian industry

3 Decision-making: meaning, types, steps in rational decision-making, environment of decision-making, common difficulties in decision-making

4 Organization & authority delegation and decentralization: meaning, process of organizing, span of management, principles of organizing, organization structure, authority, responsibility. Role and Importance of Control Process, Budgeting and Variance Analysis.

5 Motivation & Leadership: meaning and Maslow, Herzberg and Macgregor’s theory of motivation, meaning of leadership, characteristics of leadership, approaches to leadership, theories of leadership

6 Staffing & training and development: importance and need for proper staffing, recruitment, selection, placement, induction, types of training programmes, methods and selection of training method, training practices in India

7 Performance appraisal & compensation plan: purpose of appraisal, criteria of PA, PA methods, primary compensation, incentive compensation, pay-for performance, non-monetary incentives.

8 Marketing: Understanding the concept of marketing, marketing mix, Product Policy, New product development, Product life cycle, Channels of distribution, Marketing research.