

Objectives: The course aims to give students a theoretical foundation in Software Engineering and help them learn its principles and methods including emerging practices and support tools. It also familiarizes students with concepts of software testing and quality assurance and its various techniques.

Note :

- (i) The Question paper will consist of four units.
- (ii) Examiner will set total of **nine** questions comprising two questions from each unit and one compulsory question of short answer type covering whole syllabi.
- (iii) The students are required to attempt one question from each unit and the compulsory question.
- (iv) All questions carry equal marks.

UNIT I

1. Introduction:

Software Engineering goals, SDLC, Software Process Models : Waterfall, Prototyping, Spiral; S/w Inspection, Preview and Inspection Procedures, Communication skills for Software Engineer. Software requirements, Definition, Software requirements specifications (SRS); Components & Structure of SRS.

2. Software Project Planning:

Objectives, Decomposition techniques: Problem based estimation(LOC,FP); Empirical Estimation Models: COCOMO model; Risk in estimation.

UNIT II

3. Software Design:

Objectives, Principles, Concepts, Design Process, Design Strategies, Design Methods: Structured design, Object oriented design, User-interface design; Structured Analysis and Design Tools : DFD, DD & Decision tables.

4. Quality Assurance:

Overview of Software Quality, Software Quality Attributes, Factors Affecting Software Quality, Building Software Quality Assurance Plan, Components of SQAP. Quality Management Principles, Essence of International Standards: ISO 9000 Quality Standard, SEI Capability Maturity Model.

28

SYLLABUS FOR MASTER OF COMPUTER APPLICATIONS (M.C.A.)

UNIT III

5. Software Testing and Techniques:

Software Testing, Objectives of Software Testing, Software Testing Process, Static and Dynamic Analysis, Black-Box Testing & its Technique: Equivalence Class Partitioning, Boundary Value Analysis, Cause-Effect Graph, White-Box Testing & its Techniques: Basis Path Testing, Structural Testing, Logic Based Testing, Fault Based Testing.

6. Software Testing Strategies:

Characteristics, Types : Integration Testing, Functional Testing, Systems and Acceptance Testing, Object Oriented Testing; Debugging.

UNIT IV

7. Software Maintenance

Characteristics, Components of Software Maintenance Process, Types of software maintenance, Software maintenance process models, Reverse Engineering..

8. System Configuration Management (SCM) :

Basic requirements for SCM System, SCM principles, Planning and Organizing for SCM, Benefits of SCM, Change Management, Version and Release Management.

Suggested Readings:

Objectives: To understand the various concepts of Operating System like process management, synchronization, deadlocks, storage and memory management.

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UNIT I

1. Introduction to Operating System:

Introduction to operating system, its need and services; Operating system classification: Single user, Multi user, Simple batch processing, Multiprogramming, Multitasking, Parallel systems, Distributed system, Real time system;

2. Process Management:

Process: Process state, Process control block, Threads; Process scheduling: Scheduling queues, Schedulers, Context switch; Operations on process: Process creation and termination; Inter process communication: Shared memory systems, Message passing systems; Process scheduling: CPU-I/O burst cycle, CPU scheduler, Pre-emptive and non pre-emptive scheduling; Scheduling algorithms: FCFS, SJFS, RRS, Priority scheduling, Multilevel queue scheduling, Multilevel feedback queue scheduling.

UNIT II

3. Synchronization:

Critical section problem, Peterson's solution, Synchronization hardware, Semaphores: Mutual exclusion, Binary semaphores, Bounded concurrency, Producer-consumers, Reader-writers problem; Deadlocks & starvation, Problems of synchronization: Bounded buffer, Dining philosophers; Monitors.

4. Deadlocks:

System model, Deadlock characterization: Necessary conditions, Resource allocation graph, Method for handling deadlock; Deadlock prevention: Mutual exclusion, Hold and wait, No

30

SYLLABUS FOR MASTER OF COMPUTER APPLICATIONS (M.C.A.)

preemption, Circular wait, Deadlock avoidance: Safe state, Resource allocation graph algorithm, Banker's algorithm; Deadlock detection, Recovery from deadlock.

UNIT III

5. Memory Management-I:

Static and dynamic memory allocation, Memory allocation to process: Stacks, Heap, Memory allocation model; Reuse of memory: Performing fresh allocations using a free list, Memory fragmentation, Merging free areas; Contiguous memory allocation: Fragmentation, Swapping;

6. Memory Management-II:

Paging: Hardware support, Protection, shared pages, Techniques for structuring of page table, Memory mapped files; Segmentation, Demand paging, Page replacement Algorithms: FIFO, Optimal, LRU, Counting based page replacement; Thrashing.

UNIT IV

7. Storage Management I:

File Concept: Attributes, Operations, Types, Structure; Access methods: Sequential and direct access, Index ; Directory structure: Single level, Two Level, Tree Structured, acyclic Graph directories; File System mounting, File sharing, Protection: Types of access, access Control.

8. Storage Management II:

File system structure, File system implementation, Directory implementation, Allocation methods, Free space management, Disk scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK; Disk management, Swap space management, RAID.

Suggested Readings:

Paper Title: ANALYSIS AND DESIGN OF ALGORITHMS

Paper Code: CS-67

Max. Marks: 80 Time: 3 Hrs.

Course Duration: 60 Lectures of one hour each.

Objective: The objective of the module is to create skills in students to design and analyze algorithms.

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UNIT I

1. Algorithms and Analysis :

Introduction, Algorithms specification, Recursive algorithms, space and time complexity, Asymptotic Notation (O , ω , and Θ , o) practical complexities, Best, average and worst case performance of algorithms, examples, Introduction to recurrence relations.

2. Divide and Conquer:

General method, Binary search, Merge sort, Quick sort, Selection problem, Strassen's matrix multiplication and analysis of these problems.

UNIT II

3. Greedy Method:

General Method, Knapsack problem, Job sequencing with deadlines, Minimum spanning Trees, Single source shortcut paths and analysis of these problems.

4. Dynamic Programming :

General method, Optimal binary search trees, 0/1 Knapsack, Travelling salesperson problem.

UNIT III

5. Back Tracking :

General method, 8 queen's problem, Graph coloring, Hamiltonian cycles and Analysis of these problems.

32

SYLLABUS FOR MASTER OF COMPUTER APPLICATIONS (M.C.A.)

6. Branch-And-Bound :

Method, 0/1 Knapsack and Travelling Salesperson problems, Efficiency considerations.

UNIT IV

7. Lower-Bound Theory:

Introduction to Algebraic problems, Introduction to lower bounds, Comparison Trees, Techniques for Algebraic problems, Some Lower Bounds on Parallel Computation.

8. NP-hard and NP-complete problems:

Basic concepts, Statement of Cook's Theorem, Examples of NP-hard graph and NP-scheduling problems, some simplified NP-hard problems.

Suggested Readings:

Course Duration: 60 Lectures of one hour each.

Objectives: The objective of the course is to enable a student to develop web based applications in ASP.NET using C# programming language.

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UNIT I

1. Introduction to .NET environment:

The .NET strategy, the origins of the .NET technology, the .NET framework, the common language runtime, framework base classes, user and programs interface, visual studio .NET, .NET languages, benefits of the .NET approach.

2. Introduction to C#:

Overview of C#: History, Structure of C# Program, Namespaces, Using Aliases, Multiple Main Methods; Literals, Variables, Data Types: Value types ,Reference types; Boxing and Unboxing; Operators and Expressions, Branching and Looping, Methods: Declaration, Method Parameters : value, ref, out and variable argument lists, Method Overloading; Arrays: Declaration, Initialisation, Overview of methods used in System.Array class; Strings : Creating mutable and immutable strings; Difference between C++ and C#, Difference between Java and C#.

UNIT II

3. C# programming concepts I :

Classes and Objects : Defining a class, Member Access Modifiers, Creating objects, Accessing class members and functions; Types of Constructors: Default, Parameterized, Copy, Static, Private; Working of Destructors, Constant and read only members, Overview of Properties : Read only and write only properties; Inheritance : Defining a base class and sub class, visibility control, defining subclass constructors, Types of inheritance, Overriding methods, Abstract classes and methods, Usage of Sealed; Implementing Dynamic Polymorphism;

4. C# programming concepts II :

Interfaces: Defining interface, Extending interface, implementing interface, explicit interface implementation; Delegates: Introduction, Steps for creating a delegate, Multicast Delegates, Covariance and Contra variance; Errors and Exceptions : Introduction, Types of Errors, Exceptions, Syntax of exception handling code, multiple catch statements, Exception Hierarchy,

34

SYLLABUS FOR MASTER OF COMPUTER APPLICATIONS (M.C.A.)

general catch handler, using finally, Nested try block, throwing own exceptions, Checked and Unchecked operators; I/O: System.IO Namespace, Streams, TextWriter, TextReader, BinaryWriter, BinaryReader, FileStream;

UNIT III

5. Developing ASP.NET web applications I :

Understanding ASP.NET: Adding an ASP.NET webpage, web.config file, ASP.NET standard controls : Label, Textbox, Checkbox, radiobutton, button, linkbutton, imagebutton, Image, ImageMap, Panel, Hyperlink ; Using Validation Controls : Overview, RequiredFieldValidator, RangeValidator, CompareValidator, RegularExpressionValidator, CustomValidator, ValidationSummary; Master Pages :Introduction and use, creating master pages , Creating default content, Using images and hyperlinks in master pages, Registering master pages in web configuration, Modifying master pages content;

6. Developing ASP.NET web applications II:

Creating and registering user controls in web.config file; Using Login Controls: Login control, CreateUserWizard control, LoginStatus, LoginName , ChangePassword, PasswordRecovery, Loginview; ASP.NET membership: Configuring authentication : windows, forms, .net passport ; Configuring authorization: By role, by location ,with images; Maintaining Application State : Introduction , Cookies: creation, reading, deletion, multivalued cookies ; Session state: Session Object, Handling session events; Using Profiles;

UNIT IV

7. Accessing data with ADO .NET:

ADO.NET: Architecture, Components, Steps for creating Database Connectivity, Overview, usage and Implementation of: Data Reader, Data Adapter, Dataset; Viewing data using DataGridView Control;

Objective: The course aims at providing the students through insight on few DBMS principles and practices. Students will learn and implement the operations for making and using databases with help of SQL and PL/SQL.

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UNIT I**1. Relational Design:**

Relation scheme , Codd's Rules for RDBMS , Anomalies in a database, Functional Dependency : Dependencies and logical implications, Closure set, Testing if FD is in closure, Covers ,Non redundant and minimum cover, Canonical cover, functional dependencies and keys.

2. Normalization:

Normal forms- 1NF, 2NF, 3NF, BCNF, Difference between 3NF and BCNF, Multivalued dependencies and joined dependencies, 4NF, 5NF, Difference between 4NF and 5NF.

UNIT II**3. SQL :**

Introduction to SQL, Oracle server and oracle database, Oracle products, Oracle data types, Starting SQL *Plus, Querying database tables, Conditional retrieval of rows, Working with null values, Matching a pattern from a table, Ordering the result of a query, Aggregate Functions, Grouping the result of a query, ROLLUP operation: Getting sub totals, CUBE operation : Getting cross tabs, Command summary of SQL *Plus editor, Querying multiple tables : Equi Joins, Cartesian Joins, Outer Joins, Self Joins; SET Operators :Union, Intersect, Minus; Functions : Arithmetic functions, Character functions, Date functions, Group functions.

36

SYLLABUS FOR MASTER OF COMPUTER APPLICATIONS (M.C.A.)**4. Data Manipulation and Control-I :**

Data Definition Language (DDL), Creating Tables, Creating a Table with data from another table, Inserting Values into a Table, Updating Column(s) of a Table, Deleting Row(s) from a Table, Dropping a Column; VIEW : Manipulating the Base table, Rules of DML Statements on Join Views, Dropping a VIEW, Inline Views, Materialized Views.

UNIT III**5. Data Manipulation and Control-II :**

Database security and privileges, GRANT command, REVOKE command, Application privileges management, Enhancing performance, Sequences, Maintaining database objects, COMMIT and ROLLBACK.

6. PL/SQL-I:

Introduction to PL/SQL, The Advantage of PL/SQL, PL/SQL block structure, PL/SQL Architecture, Fundamentals of PL/SQL, PL/SQL Data types, variables and constants, scope and visibility of a variable, assignments and expressions, operator precedence, referencing Non-PL/SQL variables, built-in-functions, conditional and iterative control, SQL within PL/SQL, writing PL/SQL code, composite data types.

UNIT IV**7. PL/SQL-II:**

Cursor management in PL/SQL, Cursor manipulation, Implicit cursor attributes, Exception handling in PL/SQL; Predefined exceptions, User defined exceptions.

8. Advanced PL/SQL:

Subprograms in PL/SQL, advantages of subprograms, procedure, functions, actual versus formal parameters, argument modes, stored packages, advantages of packages, dropping a procedure, dropping a function, dropping a package, using stored function in SQL statements, database trigger, types of triggers, dropping triggers.