

CS 701

SOFTWARE ENGINEERING

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| Instruction | 4 Periods per week |
| Duration of University Examination | 3 Hours |
| University Examination | 80 Marks |
| Sessional | 20 Marks |

Unit I

The software Problem- Cost, Schedule and Quality , Scale and change
Software Processes - Process and project, Component Software Processes , Software Development Process Models , Project management Process .

Unit II

Software Requirements Analysis and Specification - Value of a good SRS , Requirements Process , Requirements Specification, Functional Specification with Use Cases, Other approaches for analysis.

Software Architecture – Role of Software Architecture, Architecture Views , Component and connector view , Architectural styles for C & C view , Documenting Architecture Design, evaluating Architectures

Unit III

Planning a Software Project – Effort Estimation, Project Schedule and staffing, Quality Planning, Risk Management Planning , Project Monitoring Plan, Detailed Scheduling

Design - Design concepts, Function oriented Design, Object Oriented Design , Detailed Design, Verification, Metrics

Unit IV

Coding and Unit Testing – Programming Principles and Guidelines , Incrementally developing code, managing evolving code, unit testing, code inspection, Metrics

Testing - Testing Concepts, Testing Process, Black Box testing, White box testing, Metrics.

Unit V

Maintenance and Reengineering - Software Maintenance, supportability, Reengineering, Business process Reengineering, Software reengineering, Reverse engineering, Restructuring, Forward engineering, Economics of Reengineering

Software Process Improvement – Introduction, SPI process, CMMI, PCMM, Other SPI Frameworks, SPI return on investment, SPI Trends.

Suggested Reading :

1. Pankaj Jalote, "Software Engineering- A Precise Approach", Wiley India, 2010.
2. Roger. S.Pressman , "Software Engineering - A Practitioner's approach", Seventh Edition, McGrawHill Higher Education, 2010.
3. Deepak Jain, "Software Engineering", Oxford University Press, 2009.
4. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI, 2009.
5. Sommerville, "Software Engineering", Seventh Edition, Pearson Education, 2007.

DATABASE MANAGEMENT SYSTEMS

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|------------------------------------|--------------------|
| Instruction | 4 Periods per week |
| Duration of University Examination | 3 Hours |
| University Examination | 80 Marks |
| Sessionals | 20 Marks |

UNIT-I

Introduction to DBMS and ER Model : File Systems versus DBMS, Advantages of a DBMS, Database Design and E-R Diagrams, Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model.

The Relational Model: Introduction to Relational Model, Integrity Constraints over Relations, Logical Database Design (ER to Relational), Introduction to Views, Destroying / Altering Tables & Views.

Schema Refinement and Normal Forms: Schema Refinement, Functional Dependencies, Normal Forms, Normalization, Schema Refinement in Database Design.

UNIT-II

Relational Algebra and Calculus: Preliminaries, Relational Algebra, Relational Calculus, Expressive Power of Algebra and Calculus.

SQL: Queries, Constraints, Triggers : The Form of Basic SQL Query, Set Operators, Nested Queries, Aggregate Operators, Null Values, Triggers and Active Databases, Designing Active Databases, Accessing Databases from Applications using Embedded SQL, Cursors, Dynamic SQL.

UNIT-III

Overview of Storage and Indexing : File Organizations and Indexing, Index Data Structures, Comparison of File Organizations.

Tree-Structured Indexing: Indexed Sequential Access Method (ISAM); B+ Trees, Search, Insert Delete, B+ Trees in Practice.

Hash-Based Indexing: Static Hashing, Extendible Hashing, Linear Hashing, Extendible versus Linear Hashing.

UNIT-IV

Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control.

Concurrency Control: 2PL, Serializability, and Recoverability, Introduction to Lock Management, Dealing with Deadlock, Specialized Locking Techniques, Concurrency Control without Locking.

UNIT-V

Crash Recovery: Introduction to ARIES, The Log, Other Recovery Related Structures, The WAL, Checkpointing, Recovering from a System Crash, Media Recovery.

Security and Authorization: Introduction to Database Security, Access Control, Discretionary Access Control, Mandatory Access Control, Additional Issues related to Security.

Suggested Reading :

1. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Third Edition, McGraw Hill, 2003.

References :

1. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts", Sixth Edition, McGraw-Hill International Edition, 2011.
2. Peter Rob, Carlos Coronel, "Database System Concepts", Cengage Learning, 2008.
3. Ramez Elmasri, Durvasul VLN Somayajulu, Shamkant B Navathe, Shyam K Gupta, "Fundamentals of Database Systems", Fourth Edition, Pearson Education, 2006.

CS 703

DESIGN AND ANALYSIS OF ALGORITHMS

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|------------------------------------|--------------------|
| Instruction | 4 Periods per week |
| Duration of University Examination | 3 Hours |
| University Examination | 80 Marks |
| Sessional | 20 Marks |

UNIT-I

Introduction : What is an algorithm. Algorithm Specification. Performance Analysis. Randomized Algorithms.

Elementary Data Structures : Stacks and Queues, Trees, Dictionaries, Priority Queues, Sets and Disjoint Set Union, Graphs.

UNIT-II

Divide and Conquer : Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Selection, Strassen's Matrix Multiplication, Convex Hull.

The Greedy Method : Knapsack Problem, Tree Vertex Splitting, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees, Optimal Storage on Tapes, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT-III

Dynamic Programming : General Method, Multistage Graphs, All-Pairs Shortest Paths, Single-Source Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack, Reliability Design, The Traveling Salesperson Problem.

Basic Traversal and Search Techniques : Techniques for Binary Trees, Techniques for Graphs, Connected Components and Spanning Trees, Biconnected Components and DFS.

UNIT-IV

Back Tracking : General Method, 8-Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles, Knapsack Problem.

Branch-Bound : The Method, 0/1 Knapsack Problem, Traveling Sales Person.

UNIT-V

NP-Hard and NP-Complete Problems : Basic Concepts, Cook's Theorem, NP-Hard Graph Problems, NP-Hard Scheduling Problems, NP-Hard Code Generation, Some Simplified NP-Hard Problems.

Suggested Reading :

1. E Horowitz, S Sahni, S Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, 2007.
2. R. Pannarselvam, "Design and Analysis of Algorithms", PHI, 2007.
3. Hari Mohan Pandey, "Design, Analysis and Algorithm", University Science Press, 2009.
4. Udit Agarwal, "Algorithm Design & Analysis", Dhanpat Rai, 2008.
5. TH Cormen, CE Leiserson, RL Rivert, C Stein, "Introduction to Algorithm", Third Edition, PHI, 2010.
6. PH Dave, HB Dave, "Design and Analysis of Algorithm", Pearson Education, 2008.

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2010-2011

WITH EFFECT FROM THE ACADEMIC YEAR 2007-2008

CS 704

OPERATING SYSTEMS

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|------------------------------------|--------------------|
| Instruction | 4 Periods per week |
| Duration of University Examination | 3 Hours |
| University Examination | 80 Marks |
| Sessional | 20 Marks |

UNIT-I

Introduction to operating systems: OS structure and strategies, Process concept, Interprocess communication, Threads, Multithreaded Programming.

Process Scheduling: Scheduling Criteria, Scheduling Algorithms, Multi Processor scheduling, Thread Scheduling.

UNIT-II

Memory Management, swapping, contiguous allocation, paging, Static and dynamic partition, demand paging, page replacement Algorithms, thrashing, segmentation, segmentation with Paging.

File System Interface: File Concept, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection.

File System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, and Free Space management, Efficiency and Performance, Recovery.

UNIT-III

Process synchronization: Critical Section problem, Semaphores, monitors.

Deadlocks: Necessary conditions, resource allocation graph, methods for handling deadlocks, preventions, avoidance, detection and recovery

Protection_ Goal, domain of protection, access matrix.

UNIT-IV

Device Management: Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap Space Management, RAID structure, Stable storage Implementation.

I/O System : I/O hardware , Application I/O Interface, Kernel I/O Subsystem, Transforming I/O request to hardware operation, STREAMS.

UNIT-V

Case Studies.

Linux System : Design Principles, Kernel Modules, Process Management, Scheduling Memory Management, File Systems, Input and Output, Inter-Process Communication, Network Structure, Security.

Windows XP : General Architecture. The NT Kernel, The NT Executive.

Suggested Reading :

1. Abraham Silberschatz, Peter B Galvin, Greg Gagne, "Operating System Concepts", Wiley India, 2006.
2. Andres S Tanenbaum, "Modern Operating Systems", 3rd Edition, PHI, 2009.
3. Robert Love, "Linux Kernel Development", Pearson Education, 2004.
4. William Stallings, "Operating Systems", Sixth Edition, PHI, 2009.

With effect from Academic year 2010-2011

CS 705

OPERATIONS RESEARCH

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|------------------------------------|--------------------|
| Instruction | 4 Periods per week |
| Duration of University Examination | 3 Hours |
| University Examination | 80 Marks |
| Sessional | 20 Marks |

UNIT-I

Linear Programming : Introduction, Concept of Linear Programming Model, Development of LP models, Graphical Method, Linear Programming Methods, Special cases of Linear Programming, Duality, Sensitivity Analysis,

UNIT-II

Transportation Problem : Introduction, Mathematical Model for Transportation Problem, Types of Transportation Problem, Methods to solve Transportation Problem, Transshipment Model.

UNIT-III

Assignment Problem : Introduction, Zero-One Programming Model, Types of Assignment Problem, Hungarian Method., Branch-and-Bound Technique for Assignment Problem.

Integer Programming : Introduction, Integer Programming Formulations, The Cutting-Plane Algorithm, Branch-and-Bound Technique, Zero-One Implicit Enumeration Algorithm.

UNIT-IV

Dynamic Programming : Introduction, Applications of Dynamic Programming, Solution of Linear Programming Problem through Dynamic Programming.

UNIT-V

Game Theory : Introduction, Game with Pure Strategies, Game with Mixed Strategies, Dominance Property, Graphical Method for $2 \times n$ or $m \times 2$ Games, Linear Programming Approach for Game Theory.

Suggested Reading :

1. Pannarselvam, "Operations Research", Second Edition, PHI, 2006.
2. Prem Kumar Gupta, DS Hira, "Operations Research", S.Chand, 2010.
3. Rathindra P Sen, "Operations Research – Algorithm and Application", PHI, 2010.
4. JK Sharma, "Operations Research", Fourth Edition, MacMillan, 2009.

With effect from Academic year 2010-2011

CS 731

PROGRAMMING LAB - V
(DBMS Programming Lab)

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|------------------------------------|--------------------|
| Instruction | 3 Periods per week |
| Duration of University Examination | 3 Hours |
| University Examination | 50 Marks |
| Sessional | 25 Marks |

I. SQL/PL-SQL :

1. Creation of database (exercising the commands for creation)
2. Simple to complex condition query creation using SQL plus
3. Demonstration of blocks, cursors & database triggers.

II. Forms/Reports :

4. Creation of forms for the case study assigned.
5. Creation of Reports based on different queries.
6. Crating password and security features for applications.
7. Usage of file locking and table locking facilities in applications.
8. Creation of Small full fledged database application spreading over to 3 sessions.

Note :

- (i) Use Case Studies as Library Information Studies, Pay roll System, Bank Information System, Reservation System, Inventory System, etc.
- (ii) The creation of Sample database for the purpose of the experiments is expected To pre-decided by the instructor based on the case study assigned to the students.
- (iii) Preferable Oracle DBMS package should be used to carry the Lab experiments.

With effect from Academic year 2010-2011

CS 732

PROGRAMMING LAB - VI
(OPERATING SYSTEMS LAB)

Instruction

3 Periods per week

Duration of University Examination

3 Hours

University Examination

50 Marks

Sessional

25 Marks

1. Printing file flags for specified descriptor.
2. Print type of file for each command line arguments.
3. Recursively descends a director hierarchy counting file types.
4. Program using process related system calls.
5. Programs to create threads.

6. Program using Signals.
7. Echo Server-using pipes.
8. Echo Server-using messages.
9. Producer & Consumer Problem using Semaphores and Shared Memory
10. Producer & Consumer Problem using message passing.

11. Readers and Writers Problem using message passing.
12. Dining Philosopher's problem using semaphores.
13. Program using File Locking.
14. Understanding and submitting and assignment on RC scripts.
15. Programs using linux shell script (Note 2 shell programs covering the salient features of Shell)