DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	**: 3 Periods / week**	**Session Marks**	**:**	**30 Marks**
Tutorial	**: 1 Periods / week**	**End Examination**	**:**	**70 Marks**
Credits	**: 3**	**End Exam Duration**	**:**	**3 Hours**

UNIT I - INTRODUCTION

Algorithm, Pseudo code for expressing algorithms, performance analysis,
Time complexity and space complexity, asymptotic notations- O notation, Omega notation and theta notation, little-o notation,Probabilistic Analysis, Amortized Analysis

UNIT II - SEARCHING AND TRAVERSAL TECHNIQUES

DISJOINT SETS: Disjoint set operations, union and find algorithms, AND/OR graphs, connected components, Identification of articulation points, Bi-connected components.

UNIT III - DIVIDE AND CONQUER

General method, Applications: solving recurrence relations,Binary search, merge sort, quick sort,
GREEDY METHOD: General method, Applications: job sequencing with deadlines, knapsack problem, minimum spanning tree, single source shortest path problem

UNIT IV - DYNAMIC PROGRAMMING

General method, application: Matrix chain multiplications, optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, reliability design problem, travelling sales person problem
BACK TRACKING: General method, applications: n-queens problem, Sum of subsets problem, graph coloring problem.

UNIT V - BRANCH and BOUND

General method, Applications: Travelling sales person problem, 0/1 knapsack problem, LC branch and bound solution,, FIFO branch and bound solution, Game tree

studies: **UNIX, Linux and Windows** – File system

V - I/O Systems, Protection and Security

systems: I/O hardware, application I/O interface, kernel I/O subsystem, transforming I/O
ests to hardware operations, STREAMS, performance.
ection: Protection, goals of protection, principles of protection, domain of protection access
ix, implementation of access matrix, access control, revocation of access rights, capability-
ed systems, language - based protection.
urity- The Security problem, program threats, system and network threats, cryptography as a
rity tool, user authentication, implementing security defenses, fire walling to protect systems
d networks, computer –security classifications.

se studies: **UNIX, Linux and Windows** – Security

XT BOOKS:

Operating System Concepts- Abraham Silberschatz, Peter B. Galvin and Greg Gagne, 8th Edition,
e Wiley,2008.

Operating Systems- A Concept Based Approach - D.M.Dhamdhere, 3rd Edition, TMH, 2009.

FERENCES:

Operating Systems, Internals and Design Principles, William Stallings, 6th Edition, Pearson
ducation, 2009.

Modern Operating Systems, Andrew S Tanenbaum, 2nd Edition, PHI, 2008.

Operating Systems, A.S. Godbole, 2nd Edition, TMH, 2008.

OPERATING SYSTEMS
(Common to CSE & IT)

Instruction : 3 Periods / week
Tutorial : 1
Credits : 3

Session Marks : 30 Marks
End Examination : 70 Marks
Exam Duration : 3 Hours

UNIT I – Operating System Overview and Process Management

Operating System Overview: Operating system functions and services, protection and security, overview of computer operating systems, distributed and special purpose systems, systems calls, system programs, operating system structure, operating systems generation. **Process Management** – Process concepts, threads, scheduling-criteria, scheduling algorithms, algorithm evaluation, thread scheduling.

Case studies: UNIX, Linux and Windows – Design principles, process scheduling.

UNIT II – Process Coordination

Synchronization: The critical- section problem, Peterson's solution, synchronization hardware, semaphores, classic problems of synchronization, monitors. **Deadlocks** – System model, deadlock characterization, deadlock prevention, detection and avoidance, recovery from deadlock.

Case studies: UNIX, Linux and Windows – Synchronization.

UNIT III – Memory Management

Memory-Management Strategies: Swapping, contiguous memory allocation, paging, structure of the page table, segmentation. **Virtual-Memory Management**: Virtual memory, demand paging, page-replacement algorithms, allocation of frames, thrashing.

Case studies: UNIX, Linux and Windows – Memory management.

UNIT IV – File System Management and Mass-Storage Management

File System: The concept of a file, access methods, directory structure, file system mounting, file sharing, protection. **File System Implementation**- File system structure, file system implementation, directory implementation, allocation methods, free-space management, efficiency and performance. **Mass-Storage Structure:** Overview of mass-storage structure, disk structure, disk attachment, disk scheduling, swap-space management, RAID structure, stable-storage implementation.

Unit V - Recovery System

Recovery and Atomicity, Log based Recovery, Recovery with concurrent transaction, Buffer Management, Failure with Loss of Nonvolatile Storage, Remote Backup Systems.

Storage and Indexing

Data on External storage, File Organization and Indexing, Cluster Indexes, Primary and secondary indexes, Index data structures, Hash based indexing – Static hashing and Extensible Hashing, Tree based indexing – Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index structure.

Text books

1. A.Silberschatz,H.F. Korth, S.Sudarshan, Database System Concepts, 6th Edition, McGraw hill, 2006.
2. RamezElmasri, ShamkantB.Navathe, Fundamentals of Database Systems, 7th Edition, PearsonEducation,2008.
3. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3rdEdition, TMH,2003.

References

1. Hector Garcia-Molina, Jeffery D.Ullman, Jennifer Wisdom, Database Systems: The Complete Book (2nd Edition) , 2ndEdition,Pearson Education, 2008.
2. P.K.Das Gupta, Database Management System Oracle SQL and PL/SQL, PHI, 2nd Edition.

DATABASE MANAGEMENT SYSTEM

(Common to CSE and IT)

Instruction : 3 Periods / Week
Tutorial : 1 Period / Week
Credits : 3

Sessional Marks : 30 Marks
End Examination : 70 Marks
End Exam Duration : 3 Hours

Unit I – Introduction to DBMS

History of DBMS, Concepts and overview of DBMS, Data models – ER model, Relational, ... Levels of Abstraction in DBMS, Data base Languages, Architecture of DBMS, Data Base User, ... Administrators

ER-Model (UML Notations) Data base design and ER model, ER modeling Constructs, Adv... features of ER Model, Class Hierarchies, Aggregation, and Conceptual Design with ER model... study: ER design for Large Enterprises

Unit II – Relational Algebra and Calculus

Introduction to relational model, Relational Algebra – Selection and Projection, Set opera... Renaming, joins, Examples of Relational Algebra Relational Calculus- Tuple relational Cal... Domain relational calculus.

Introduction to Query Language
Form of Basic SQl Query, Examples of Basic SQL Queries, Introduction to Nested Que... Correlated Nested Queries, Set Comparison Operator-Aggregate Operators, NULL values, ... Comparison using Null values Logical connectivity's – AND, OR and NOT, OUTER Jo... Disallowing NULL Values

Unit III – Schema Refinement

Introduction to schema refinement, Problems caused by decomposition, Functional dependen... (FDs) and reasoning about FDs, Normal Forms (NF), Properties of Decomposition, Sch... Refinement in Data Base Design, Case studies using Normal Forms

Unit IV – Transaction Management:

Transaction concept & state, Implementation of atomicity and durability, Concurrent execution... transaction, Serializability and Recoverability, Implementation of Isolation, Testing for serializ... Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based, Protocols, Multiple...

DATA STRUCTURES THROUGH JAVA

(Common to CSE and IT)

Instruction: 3 Periods / Week
Tutorial : 1 Period / Week
Credits :3

Sessional Marks: 30 Marks
End Examination : 70 Marks
End Exam Duration: 3 Hours

UNIT I-Generics:

Introduction to Generics, simple Generics example, Generic Types, Generic methods, Bounded Type Parameters and Wild cards. Inheritance& Sub Types, Generic super class and sub class, TypeInference, Restriction on Generics

UNIT II - 1D and 2D Collections:

1D Collection Interfaces, Set, List, Sorted Set, 1D Collection Classes, Hash Set, Linked HashSet, Tree Set, ArrayList, LinkedList, 2D Collection Interfaces, Map, SortedMap, 2D Collection Interface, HashMap, LinkedHashMap, TreeMap

UNIT III - Dictionaries:

Introduction and their implementation – I: Sorted Lists, introduction, insertion and searching, deletion, Hashing, hash table representation, hashfunctions, Collision resolution strategies, separate chaining, open addressing – linear probing, quadratic probing, double hashing, rehashing, extendible hashing

UNIT IV - Dictionaries Implementation – II

Binary Search Tree, definition, implementation of operations: searching, traversals implementation of operations: insertion and deletion, AVL Tree definition, height of an AVL tree, representation, operations rotations, insertion, deletion and searching. B-Tree, B-Tree of order m, height of a B-Tree, searching, insertion, deletion

UNIT V - Priority Queues and Pattern Matching:

Priority Queue, definition, max and min heaps, realizing priority queues using heaps, definition, insertion, deletion, heap sort, Pattern Matching, Introduction, Brute Force algorithm, Boyer Moore algorithm, Knuth-Morris-Pratt algorithm, Tries, Standard Tries, Compressed Tries, Suffix trees

UNIT II – REGISTER TRANSFER LANGUAGE AND MICROOPERATIONS

Register Transfer language. Register Transfer Bus and memory transfers, Arithmetic Micro operations, shift micro operations, Arithmetic logic shift unit, Instruction codes. Computer Registers ,Computer instructions – Instruction cycle. I/P-O/P and Interrupt.
INSTRUCTION SETS: STACK organization, Instruction formats, Addressing modes, DATA Transfer and manipulation, Program control, IA-32 Architecture and instruction set.

UNIT III – MICRO PROGRAMMED CONTROL.

Control memory, Address sequencing, micro program example, design of control unit. Mic programmed control.
THE MEMORY SYSTEM: Basic concepts of semiconductor RAM memories, Read – on memories, Cache memories, performance considerations, virtual memories, secondary storage.

UNIT IV – INPUT-OUTPUT ORGANIZATION

Peripheral Devices, DMA, Input – Output Interface, Asynchronous data transfer, Modes Transfer, Priority Interrupt, PCI Bus.

PIPELINE AND PARALLEL PROCESSING: Parallel processing, Flynn's classifica Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline.

UNIT V – MULTIPROCESSORS

Characteristics of Multiprocessors, Vector Processing, Array Processors, Interconnection Structures, Inter processor Arbitration, Inter Processor Communication and Synchronizatio ,Cache Coherence, Shared Memory Multiprocessors.

AUTOMATA AND COMPILER DESIGN

Instruction	:	3 Periods / week	Session Marks	:	30 Marks
Tutorial	:	1 Periods / week	End Examination	:	70 Marks
Credits	:	3	End Exam Duration	:	3 Hours

UNIT I - Automata and Lexical Analyzer

Languages, regular expressions, finite automate and state diagram-DFA, NFA, conversion of regular expression to NFA-ε, NFA to DFA, NFA-ε to DFA , Phases of the Compiler, lexical analysis, LEX tool.

UNIT II – Parsing

Context free grammars and parsing-Context free grammars, derivation, parse trees, ambiguity LL (k) grammars, LL (1) parsing. Bottom-up parsing and handle pruning, LR (k) grammar parsing and LALR (k) grammars, parsing ambiguous grammars, YACC programming specification.

UNIT III - Semantic Analysis

Syntax directed definition and translation, s-attributed and l-attributed grammars, type checking, type conversion, equivalence of type expressions, Overloading of functions and operators, Chomsky hierarchy of languages and recognizers.

UNIT IV - Intermediate Code Generation and Runtime Storage

Intermediate code- abstract syntax tree, translation of simple statements and control flow statements, storage organizations, storage allocation strategies, access to non local names, parameter passing techniques, language facilities for dynamic storage allocation, symbol table and implementation.

UNIT V - Code Optimization and Code Generation

Principle sources of optimization, optimization of basic blocks, flow graphs, data flow analysis. Machine dependent code generation, object code forms, generic code generation algorithm, register allocation and assignment, using DAG representation of Blocks, Peephole optimization.

TEXT BOOKS

1. Michael Sipser, Introduction to the theory of computation, 2nd Edition, Thomson
2. Aho,Ullman & Ravisetty "Compilers Principles, technique and tools" , Pearson Education

REFERENCES

1. Andrew W. Appel, Modern compiler implementation in C, Cambridge University Press.
2. LOUDEN,Compiler construction, Thomson
3. A.V Aho , Ullman, Principles of Compiler Design, Pearson Education