



CS 301 : Operating System

Unit 1

Definition, Components & types of Operating System, Operating System Services, System Calls, System Programs, System Structure, System Design & Implementation, System Generations. I/O Subsystem Overview, I/O H/R. Application I/O Interface, Kernel I/O Subsystem, Linux User & Program Interface.

Unit 2

Process Concepts, Process State & Process Control Block, Process Scheduling. Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real Time Scheduling, Threads Introduction, Multithreading Models, Example System – Process Management in Linux.

Unit 3

The Critical Sections Problem, Semaphores, Classical Problem of Synchronization, Example System-Inter Process, Communication in Linux, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined Approach to Deadlock.

Unit 4

Storage Management, Logical versus Physical Address Space, Swapping, Contiguous Allocating, Paging, Segmentation, Segmentation with Paging, Virtual Memory, Demand Paging, Performance of Demand Paging, Page Replacement, Page Replacement Algorithms, Allocation of Frames, Thrashing, Demand Segmentation, Example System Memory Management in Linux.

Unit 5

Disk Scheduling, Disk Management, Swap Space Management, Disk Reliability, Stable Storage Implementation, File Concepts, Directory Structure, Protection File System in Linux.

Text Books: -

- Operating System Principles by Silberschatz A. and Peterson J.L. Wiley.
- Operating Systems by Dhamdhare, TMH.

References: -

- Operating Systems by Deitel, Deitel & Choffnes.
- Operating System by Stalling, Pearson.

CS 302 : Computer Networks

Introduction to Computer Networks: Evolution of Computer Networks, Networks Goals, User & Applications, Network H/R and S/R; Protocol Hierarchies, Design Issues for the Layer, Reference Models, OSI & TCP/IP – Example Networks – Internal.

Fundamentals of Data Transmission: Data Transmission System & Operations, Encoding, Standard Encoding Schemes, Transmission Media, Magnetic Media, Twisted wire-pair, Co-axial Cables, Fibre Optics, Wireless Media-Ratio & Microwave Transmission, Switching Message, Circuit & Packet Switching, Serial & Parallel Transmission – Asynchronous and Synchronous Transmission.

The Data Link Layer: Need for Data Link Control, Service provided by the Data Link Layer. Frame Design Consideration. Flow Control Mechanism. Data Link Error Control, Error Control in Stop-and-Stop Mechanism & Sliding Windows Mechanism, Sequence Numbering. Piggybacking Acknowledgement. MAC layer & It's Different Protocols.

IEEE 802.3 Ethernet: Contention Access, CSMA, CSMA/CD, Physical Topology of Ethernet, Ethernet Repeater, Types of Ethernet.

Bridges & Switches: LAN Bridge, Transparent Bridges, Spanning Tree Algorithm, Ethernet Switches.

The Network layer: Network Layer Design Issue, Purpose of Network Layer, Functions of the Network Layer IP Address, Classful and Classless IP Address, NAT.

Introduction to Internet Protocol: IPv4 & IPv6 Format, ARP, RARP, DHCP, ICMP.

Routing Algorithms: Static Routing, Dynamic Routing, Distance Vector Routing Algorithm, Router Information Protocol, Link State Routing, OSPF Routing Protocol, Border Gateway Protocol, Congestion Control by Chock Packet, QoS, Leaky Bucket and Token Bucket.

Introduction to Application Layer: Difference between TCP & UDP, Port Number, TCP Connection – Three ways Handshaking, Connection Termination – Half Close, Half Open.

Introduction to Application Layer: Introduction of DNS, Email, SMTP, POP3 etc.

Congestion: Congestion Control Algorithms, General Principle of Congestion Control, Congestion Prevention Policies, Congestion Control in Virtual Circuit Subnet & Datagram, Techniques for achieving good quality of service (QoS).

Text Book: - Data Communications and Networks, by Forouzan, TMH.

Reference Books:-

- Computer Networks, by Tanenbaun, Pearson Education.
- Data & Computer Communication, by William Stallings, Pearson Education.
- Computer Networking, by Kurose & Ross, Pearson Education.
- Networking, All-in-one Desk Reference, 10 Books in 1 by Doug lowe, Wiley.

CS 303 : Design and Analysis of Algorithm

Introduction: Algorithm, Performance Evaluation of Algorithms, Space & Time Complexity, Nation of Optimality.

Divide & Conquer: Finding the Maximum & Minimum – Quick Sort – Selection – Stassen's Matrix Multiplication, etc.

Greedy Algorithm: Knapsack Problem, (1 Knapsack, Fractional Knapsack), Activity Section Problem. Huffman's Codes, Minimum Spanning Tree, Kruskal's Algorithm, Prim's Algorithm, Dijkstra's Algorithm, etc.

Dynamic Programming: Knapsack Problem DP Solution, Activity Selection Problem DP Solution, All Pairs Shortest Paths, Travelling Salesman Problem.

Randomized Algorithms & Amortized Analysis: Basic ideas of Randomized Algorithms (Las Vegas & Monte Carlo types). Simple examples (Randomized Quick Sort and its analysis, Min – Cut Algorithm and its Analysis), Amortized Analysis and its significance (Illustration through examples).

Graph Algorithms: Breadth First Search (BFS), Depth First Search (DFS), Strongly Connected Components, Euler Tour, Minimum Spanning Tree, Kruskal's Algorithm, Prim's Algorithm, Single Source Shortest Path.

Introduction to NP - Completeness: Basic Concepts.

Text Book:

- Introduction to Algorithm, 2e, by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, PHI.

Reference Books:

- The Design & Analysis of Computer Algorithms by A.V.Aho, J.E.Hopcroft and J.D.Ullman, Pearson Edu
- Beginning Algorithms by Simen Harris, James Ross, Wiley India.
- Fundamentals of Computer Algorithms by E.Horowitz and S.Sahni, Galgotia.
- Algorithms by Richard Johansonbaugh and Marcus Schaefer, Pearson Algorithm.
- Algorithms – Introduction to Design and Analysis by S.Baase, Pearson Education.
- Algorithms and Complexity by H.S.Wiif, PHI.

CS 304 : Software Engineering

Software & Software Projects: Concept of Program, Concept of Software Product & Types of Software, Concept of Software based system, Evolution of Software Engineering, Software Process, People & project, System Development Life Cycle (SDLC).

Software Standards & Software Models: SEI – Capability Maturity Model, ISO, OMG, CORBA, IEEE, ANSI, Linear Sequential Model (Water Fall), Evolutionary model, Proto Typing Model, Spiral Model.

Software Project Management: Initial Requirement Analysis, System Modeling, Function Point Analysis, Project Scheduling Gantt Chart, Project Estimation COCOMO, Project Control PERT, Risk Management, Software Team, Life Cycle Model Selection.

Software Requirement Analysis: Functional Requirement, Non Functional Requirements, Requirement Gathering, Fact Finding Methods, Requirement Verification & Validation, Requirement Specification (SRS).

Software Design: Design tools- UML, DFD, VTOC, HIPO, ERD, System Architecture Design, Object Oriented Design using UML tools, Coupling & Cohesion, System structure/modular design, Data Design (ERD), Process Design, I/O Design, User Interface Design, System Interface Design.

Software Coding: Code Review, Code Documentation, Code Optimization.

Software Testing: Concept of Software Testing, Testing Strategies (Black Box & White Box), Testing methods (Coverage based Mutation Test), Test Cases (Test System), Alpha Test & Beta Test.

Software Implementation: Implementation Plan, Deployment Diagram, Implementation Method.

Software Quality Assurances: Software Reliability, Software Quality Standards, Software Quality Attributes.

Software Maintenance: Perfective Maintenance, Corrective Maintenance, Adaptive Maintenance.

Software Change Management: Software Configuration Item, Baseline, Software Change Implementation, Software Change Control, Software Re-Engineering, Clean Room Software Engineering.

Practical: Lab Based UML tools, CASE tools & Project Management tools.

Reference Books:

- Rajib Mall, Fundamentals of Software Engineering, PHI
- Waman Jawadekar, Principle & Project in Software Engineering, TMH.

CS 305 : Compiler Design

Introduction to Compilers: Compilers and Translators, The Phases of a Compiler, Compiler writing tools, The Lexical & Syntactic Structure of a language, Operators, Assignment Statements and Parameter Translation.

Lexical Analysis: The role of the Lexical Analyzer, Specification of Tokens, Lexical Analysis tools.

Syntax Analysis: Role of Parser, CFG, Top-Down parsing, Bottom-up Parser, Operator-Precedence Parsing,, LR Parsers, The Canonical Collection of LR (0) items, Constructing SLR, Canonical LR and LALR Parsing tables, Use of ambiguous grammars in LR Parsing, An Automatic Parser generator, Implementation of LR Parsing tables and Constructing LALR sets of items.

System Directed Translation: Syntax tree, Bottom – Up evolution of S-Attributed definition, L – Attributed definition, Top-Down translation, Bottom – Up evaluation of inherited attributed, Recursive Evaluators.

Type Checking: Static vs. Dynamic Checking, Type Expression, Type Checking, Type Equivalence, Type Conversion.

Symbol Tables: Structure of Symbol Table, Simple Symbol Tables (Linear Table Ordered List, Tree, Hash Table). Scoped Symbol Table (Nested Lexical Scoping, One Table per Scope, One Table for all Scopes).

Intermediate Code: Intermediate Language, Intermediate representation technique, Three-address code, Quadruples and Triples, Translation of assignment statements, Boolean Expressions, Control Flow, Case Assignment, DAG Representation, Code Generation using Dynamic Programming, Code-Generator generators.

Error Detection & Recover: Errors, Lexical Phase errors, Syntactic-Phase Errors, Semantic Errors.

Code Optimization: Need for Optimization, Optimization of Basic blocks, Loops in flow graph, Optimizing Transformation (Compile time evaluation, Common sub-expression elimination, Variable Propagation, Code Movement Optimization, Strength Reduction, Dead Code Optimization, Loop Optimization), Local Optimization, Global Optimization, Computing Global Data Flow Equation, Setting up data flow equation, Setting up data flow equations, Iterative Data flow Analysis.

Text Book:

- Compiler Principles Technique and Tools by Alfered V. Aho, Ravi Sethi, Jeffery D. Ullman, Pearson Education.

Reference Books:

- Modern Compiler Design by Dick Grune, E.Bal, Cerial J.H. Jacobs and Koen G. Langendoen, Wiley Dreamtech.