5th Sem Syllabus B.Tech CSE

CO303: Computer Graphics (3+1)

Display Devices: Line and point plotting systems; raster, vector, pixel and plotters, Continual refresh and storage displays, Digital frame buffer, Plasma panel displays, Very high resolution devices, High-speed drawing, Display processors, Character generators, Color-display techniques (Shadow-mask and penetration CRT, analog false colors, hard-copy color printers).

Display description: Screen co-ordinates, user co-ordinates; Graphical data structures (compressed incremental list, vector list, use of homogeneous co-ordinates); Display code generation; Graphical functions.

Output Primitives: Line drawing algorithms, Circle and Ellipse generating algorithms, Other curves & Conic sections, Polynomials and spline curves.

Filled area primitives: Scan-line polygon fill algorithm, Inside-outside tests, Boundary fill algorithm, Flood fill algorithm, Character generation.

Attributes of output primitives: Line attributes, Curve attributes, Color and grayscale levels, color tables, Area fill attributes: fill styles, Character attributes, Antialiasing.

2D geometric transformations: Basic transformation: translation, rotation, scaling, Composite transformations, Reflection and shearing, Transformations between coordinate systems, Affine transformations.

2D viewing: Viewing pipeline, window-to-viewport coordinate transformation, Clipping operations, Point clipping, Line clipping algorithms, Polygon clipping algorithms, Curve clipping, Text clipping

Interactive Graphics: Pointing and positioning devices (cursor, light pen, digitizing tablet, the mouse, track balls). Interactive graphical techniques; Positioning, Elastic Lines, Inking, Zooming, Panning, Clipping, Windowing, Scissoring. Basic positioning methods.

3D Concepts: 3D display methods: Parallel & perspective projection, Depth cueing, Visible line and surface, identification, Exploded and cutaway views, 3D and stereoscopic views, Polygon surfaces, tables, equations, meshes, Curved lines and surfaces. Quadric surfaces, sphere, ellipsoid, torus, superellipse, superellipsoid, Spine representations, Bezier, cubic Bezier curves and surfaces, Sweep representations, Octrees & BSP trees, Fractals.

3D transformations and Viewing: 3D transformations & composite transformations, Viewing pipeline, viewing coordinates, Wire-frame perspective display, Perspective depth, Projective transformations

Visible surface detection methods: Back-face detection, A-buffer method, Scan-line method, Depth-sorting method, BSP-tree method, Octree methods, Ray casting and wireframe methods

Illumination models and surface rendering: Basic illumination models, specular reflection and Phong model, Hidden line and surface elimination, Transparent solids, Shading, halftone patterns and dithering, Ray tracing, Texture mapping

Animation: Animation sequence designing, key framing, morphing, simulated accelerations, motion specifications.

Computer Graphics using OpenGL: An introduction to OpenGL basic graphics primitives, Transformations using OpenGL, Drawing 3D scenes with OpenGL, Introduction to Rendering methods (with various shaders - vertex shader, fragment shader).

CO309: Operating SystemS (3)

Overview: Evolution of Operating Systems, current status and future trends. Structural overview, system calls, functions of OS, Hardware requirements: protection, context switching, privileged mode

Concept of a process: states, operations with examples from UNIX/Linux (fork, exec) and/or Windows. Process scheduling, interprocess communication (shared memory and message passing), UNIX/Linux signals, cooperating and concurrent processes, tools, and constructs for concurrency,

Threads: thread management, multithreaded model, scheduler activations, examples of threaded programs and applications.

Scheduling: multi-programming and time sharing, scheduling algorithms, multiprocessor scheduling, thread scheduling (examples using POSIX threads).

Process synchronization: mutual exclusion, shared data, critical sections, classical two process and n-process solutions, hardware primitives for synchronization, lock, semaphores, monitors, block and wakeup, classical problems in synchronization (producer-consumer, readers-writer, dining philosophers, etc.).

Deadlocks: modeling, characterization, prevention and avoidance, detection, and recovery.

Memory management: with and without swapping, MMU, Contiguous and non-contiguous allocation, paging and segmentation, demand paging, virtual memory, page replacement algorithms, working set model, thrashing, and implementations from operating systems such as UNIX, Windows. Current Hardware support for paging: e.g., Pentium/ MIPS processor etc.

Secondary storage and Input/Output: device controllers and device drivers, disks, scheduling algorithms, file systems, directory structure, device controllers and device drivers, disks, disk space management, disk scheduling, NFS, RAID, other devices and operations on them, UNIX FS, UFS protection and security.

Virtualization: Virtual Machine (VM), concept of hypervisor and virtual machine manager (VMM), types of hypervisor: kernel-based and hosted hypervisor, open source virtual machine design in Linux: Kernel-based Virtual Machine (KVM).

Protection and security: Illustrations of security model of UNIX and other OSs. Examples of attacks.

Pointers to advanced topics (distributed OS, multimedia OS, embedded OS, real-time OS, OS for multiprocessor machines, mobile OS, cluster OS).

Case study: Design of UNIX, Linux, Windows, Android

CO310: Operating Systems Lab (1)

- Shell scripting primer using Bourne shell, Bash scripting for beginner, use of awk etc.
- Create process (use of fork(), exec() etc. system calls), implement a process ownselves
- Use system calls signal(), kill(), creating POSIX threads, using thread library Pthread library using system calls pthread_create() and pthread_exit()
- Implementation of file locks using fcntl for basic file access synchronization
- Use of basic IPC mechanism with pipe(), mknod(), using message queue, shared memory.
- Learn to use synchronization of processes with semaphore and other tools,
- Dynamic memory allocation, LKM programming, Device driver for char and block devices
- Open source Linux kernel source code browsing and understanding.
- Android based application development.
- Open source hypervisor development

CO311: Software Engineering (3)

Module I: Introduction to software engineering Evolution and Impacts of Software Engineering, Software life cycle models and their comparative study

Module II: Requirements analysis and specification Software requirements, Software requirements engineering, Requirements specifications techniques. Formal requirements specification and verification - axiomatic and algebraic specifications

Module III: Software design Basic Issues in software design- modularity, cohesion, coupling and layering. Design approaches- top-down & bottom-up, Function-oriented software design, data flow diagram and structured charts, Object-oriented design, Object modelling using UML, Use case model development, Design specification and notations

Module IV: Software implementation Structured coding techniques, coding styles, and standards; Guidelines for coding and documentation, automatic code generation.

Module V: Software verification, validation, and maintenance Theoretical foundation; black box and white box approaches; Integration and system testing, Static and Dynamic Analysis tools, Software Maintenance – Types, maintenance models, reverse and forward Engineering, Maintenance Cost models, Computer Aided Software Engineering (CASE)

Module VI: Software reliability Definition and concept of reliability; software faults, errors, repair, and availability;
reliability and availability models.

Module VII: Software Project Management Project Management, Project planning and control, Cost estimation and evaluation techniques, cost estimation based on COCOMO model and Raleigh model; Project Scheduling using PERT and GANTT charts, Organizational structure planning, project formats and team structures; Risk analysis and planning, Software configuration management

CO313: Database Systems Lab (1+1)

● Introduction: Introduction to a RDBMS like Oracle
● SQL: data types, DDL, DML
● SQL functions, PL/SQL and user-defined function, triggers
● DBA commands
● Role-based authorization
● Development of database applications using tools/languages like Forms & Reports, PHP, Java, JavaScript etc.

Laboratory works / experiments:
● Basic commands of SQL and SQL Plus
● Creating and modifying database tables, inserting, deleting and updating data in database tables using SQL
● SQL commands for retrieving data from database tables
● Creating and updating database triggers
● Writing and executing SQL scripts
● SQL scripts for building simple reports
● Basics of PL/SQL
● User-defined functions and procedures
● DBA commands and database authorization
● Developing GUIs using Oracle Forms & reports/PHP/Java etc.
● Developing reports using Oracle Forms & reports/PHP/Java etc.

CO318: Cryptography (3)

● Overview of cryptography. Cryptanalysis, Brief history. Classical and modern cryptography
● Number Theory: gcd, divisibility, euclidean algorithm, extended euclidean algorithm, congruences, modular arithmetic, Chinese Remainder Theorem residue classes, reduced residue systems, Groups, quadratic residues, and finite fields, congruences, modular arithmetic, Computing with large numbers, Algorithms for finding gcd, primality testing and factoring.
● Basic symmetric-key encryption, perfect secrecy, Shannon's definition of perfect secrecy, Shannon's Theorem, One-time pad, stream ciphers - LFSR based stream ciphers, RC4, block ciphers – DES, AES, Different modes of operation of Block Cipher – CBC, CFB, Counter Mode, OFB
● Pseudorandom Generators (PRG); Pseudo Random Functions (PRF); Pseudo Random Permutations (PRP); security against Ciphertext Only Attacks (COA); Known Plaintext Attacks (KPA), chosen plaintext attacks (CPA), chosen ciphertext attacks (CCA)
● Message integrity: definition and applications, MAC, Collision resistant hashing, SHA, HMAC, Authenticated encryption: security against active attacks, session setup using a key distribution center (KDC)
● Public key cryptography, Cryptography using arithmetic modulo primes, Diffie-Hellman key exchange protocol, CDH and discrete-log assumptions, Public key encryption, RSA, ElGamal encryption, limitations of RSA and ElGamal PKCs and various attacks; CCA security
● Digital signatures: Digital signatures: definitions and applications, signature using RSA, Hash based signatures. certificates, certificate transparency, certificate revocation.
● Security Protocols: Identification protocols, Password protocols, salts; one-time passwords (S/Key and SecurID); challenge response authentication, Authenticated key exchange and SSL/TLS session setup, HTTPs, SSH, Zero knowledge protocols,
● Secure Multi-party computation, Cryptography in the age of quantum computers

CO312: Database systems (3)

● Introduction & Overview: Concept of database, Characteristics of database, Advantages, data independence, redundancy Control; Database architecture - ANSI model.
● Modelling of real-world situation (data models): ER model, EER model
● Relational data model: relational model concepts, relational algebra and calculus, SQL, ER/EER to relational model mapping,
● Functional dependencies and normalization: functional dependencies, normal forms, decomposition, multi-valued functional dependency, and higher normal forms
● Database Indexing and hashing: B-Tree, B+ Tree, static and dynamic hashing
● Database Transaction concepts, query evaluation overview, security, and recovery
● Distributed Database
● Brief introduction to emerging database applications (like Hadoop, NoSQL etc.)

LW301: Indian Constitution (0)

Unit I : Introduction :
Constitution' meaning of the term,, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

Unit II : Union Government and its Administration Structure of the Indian Union:
Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha

Unit III : State Government and its Administration Governor: Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Unit IV: Local Administration District's Administration head:
Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit V Election Commission Election Commission:
Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women