

# **COURSE STRUCTURE & SYLLABUS OF BACHELOR OF TECHNOLOGY (B.TECH)**

*In*

## **Computer Engineering**

### **Course Structure**

#### **Third Year**

#### **Fifth Semester**

<b>Paper Code</b>	<b>Subject</b>
BTCO1	Operating System
BTCO2	Database Management System
BTCO3	Computer Graphics
BTCO4	Computer Organization
BTCO5	Software Engineering

#### **BTCO1 : OPERATING SYSTEM**

##### **1. COMPUTER ARCHITECTURE:**

4 GL Program , 3GL (HLL)Program,

##### **2. OPERATING SYSTEM FUNCTIONS:**

What is an Operating Systems ? , Different Services of the Operating System, Uses of System Calls, The Issue of Protability, The Kernel

##### **3. INFORMATION MANAGEMENT:**

The file System, Device Driver (DD), Terminal I/O.

##### **4. PROCESS MANAGEMENT:**

What is Process , Evolution of Multiprogramme, Process States, Process Control Block (PCB), Create, Kill, Dispatch a Process,

##### **5. INTER- PROCESS COMMUNICATION:**

The Producer –Consumer Problems.

##### **6. DEADLOCKS:**

Deadlock Prerequisites, Deadlock Strategies,

##### **7. MEMORY MANAGEMENT (MM):**

Paging, Segmentation, Virtual Memory Management Systems,

##### **8. OPERATING SYSTEMS: SECURITY AND PROTECTION:**

Security Threats, Security Design Principles, Protection Mechanisms, Encryption, Security in Distributed Environment.

## **9. PARALLEL PROCESSING:**

Operating Systems for Parallel Processes, Case Study: Mach

## **10. OPERATING SYSTEMS IN DISTRIBUTED PROCESSING:**

Lan Environment and Protocols,

## **11. UNIX: A CASE STUDY:**

Overview of UNIX, UNIX File System, Data Structure for Process / Memory Management, Executing and Terminating a Program in UNIX, Using the System (Booting and Login), Memory Management, Terms and Concepts Introduced, Test Questions.

## **BTCO2 : DATABASE MANAGEMENT SYSTEM**

### **1. INTRODUCTION**

Purpose Of Database Systems, Data Redundancy And Inconsistency, Difficulty Accessing Data

### **2. DATABASE SYSTEM ARCHITECTURE**

Data Abstraction, Instances And Schemas, Data Independence, The Object-Oriented Model, Record-Based Logical Models, Physical Data Models, Database Languages, Data-Definition Language, Transaction Management, Storage Management, Database Administrator, Database Users, Summary

### **3. DATA MODELS**

Using High-Level Conceptual Data Models For Database Design, Entities And Attributes, Network Model, Data-Structure Diagrams, Implementation Techniques, Relational Model, Keys Query Languages

### **4. INTEGRITY CONSTRAINTS**

Domain Constraints, Referential Integrity, Basic Concepts, Referential Integrity In The E-R Model, Database Modification, Referential Integrity In SQL, Assertions, Triggers, Functional Dependencies, Closure Of A Set Of Functional Dependencies, Closure Of Attribute Sets, Canonical Cover

### **5. RELATIONAL ALGEBRA AND DATA MANIPULATION OPERATIONS**

Introduction, Traditional Set Operations, Extended Cartesian Product, Attribute-Names For Derived Relations, Special Relational Operations, Projection, Join, Division, Summary

### **6. RELATIONAL QUERY LANGUAGES**

The Tuple Relational Calculus, Tuple Variables And Range Relations, Expressions And Formulas In Tuple Relational Calculus, The Existential And Universal Quantifiers, Example Queries Using The Existential Quantifier, Transforming The Universal And Existential Quantifiers, Safe Expressions, Quantifiers In Sql, The Domain Relational Calculus, Basic Retrievals In Qbe

### **7. SQL**

Introduction, Base Tables, Indexes, Retrieval Operations, Retrieval Of Computed Values, Built-In Functions, Update Operations

### **8. RELATIONAL DATABASE DESIGN**

Domains And Attributes, Functional Dependencies, Transitive Closure, Inference Rules For Functional Dependencies, Equivalence Of Sets Of Functional Dependencies, Minimal Sets Of Functional Dependencies, Normal Forms Based On Primary Keys, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Algorithms For Relational Database Schema Design, Decomposition And Lossless (Nonadditive) Joins

## **9. QUERY PROCESSING AND OPTIMIZATION**

Overview, Catalog Information For Cost Estimation, Sorting, Join Operation, Estimation Of The Size Of Joins, Nested-Loop Join, Block Nested-Loop Join, Indexed Nested-Loop Join, Merge-Join, Hash-Join, Recursive Partitioning, Handling Of Overflows, Cost Of Hash-Join, Hybrid Hash-Join, Complex Joins, Duplicate Elimination, Projection, Set Operations, Outer Join, Aggregation, Pipelining, Implementation Of Pipelining, Evaluation Algorithms For Pipelining, Transformation Of Relational Expressions, Equivalence Rules, Examples Of Transformations, Choice Of Evaluation Plans, Interaction Of Evaluation Techniques, Cost-Based Optimization, Heuristic Optimization, Structure Of Query Optimizers

## **10. STORAGE STRATEGIES**

Basic Concepts, Ordered Indices, Primary Index, Dense And Sparse Indices, Multilevel Indices, Index Update, Structure Of A B<sup>+</sup>-Tree, Queries On B<sup>+</sup>-Trees, Hash Functions, Hash Indices

## **11. TRANSACTION PROCESSING**

Single-user versus multiuser systems, transactions, read and write operations, and dbms buffers, why concurrency control is needed, why recovery is needed, concurrency control techniques, guaranteeing serializability by two phase locking, dealing with deadlock and starvation, concurrency control based on timestamp ordering, timestamps, the timestamp ordering algorithm, multiversion technique based on timestamp ordering, multiversion two-phase locking using certify locks, granularity level considerations for locking, write-ahead logging, steal/no-steal, and force/no-force, checkpoints in the system log and fuzzy checkpointing, transaction rollback, recovery techniques based on deferred update, recovery using deferred update in a single-user environment, deferred update with concurrent execution in a multiuser environment, transaction actions that do not affect the database, recovery techniques based on immediate update, Undo/redo recovery based on immediate update in a single-user environment, undo/redo recovery based on immediate update with concurrent execution, procedure riu\_m, shadow paging

## **12. ADVANCED TOPICS**

New Database Applications, The Object-Oriented, Data Model, Object Classes, Inheritance, Multiple Inheritance, Object Identity, Object Containment, Object-Oriented Languages, Persistent Programming Languages, Persistent Programming Languages, Object Identity And Pointers, Storage And Access Of Persistent Objects, Persistent C++ Systems, The Odmg C++ Object-Definition Language, The Odmg C++ Object Manipulation Language, Object – Relational Databases, Inheritance, Nesting And Unnesting, Creation Of Complex Values And Objects

## **13. LOGICAL DATABASES**

Introduction To Deductive Databases, Prolog/Datalog Notation, Datalog Notation, Clausal Form And Horn Clauses, Interpretation Of Rules, Basic Inference Mechanisms For Logic Programs, Bottom –Up Inference Mechanisms (Forward Chaining), Top- Down Inference Mechanisms (Backward Chaining), Deductive Database Systems, The LDL System

## **14. WEB DATABASES**

Databases On The World Wide Web, Providing Access To Databases On The World Wide Web, The Web Integration Option Of Informix, The Oracle Webserver, Open Problems With Web Databases

## **15. DISTRIBUTED DATABASES**

Distributed database concepts, parallel versus distributed technology, advantages of distributed databases, additional functions of distributed databases, data fragmentation, replication, and allocation techniques for distributed database design, types of distributed database systems,

## **16. DATA WAREHOUSING AND DATA MINING**

Data Warehousing, Terminology And Definitions, Characteristics Of Data Warehouses, Data Modeling For Data Warehouses, Building A Data Warehouse, Typical Functionality Of Data Warehouses, Difficulties Of Implementing Data Warehouses, Open Issues In Data Warehousing, Data Mining, An Overview Of Data Mining Technology, Approaches To Other Data Mining Problems, Applications Of Data Mining

### **BTCO3 : COMPUTER GRAPHICS**

#### **1. INTRODUCTION**

Overview Of Computer Graphics, Representing Pictures, Preparing Pictures For Presentation, Presenting Previously Prepared Pictures

#### **2. GRAPHICS HARDWARE AND DISPLAY DEVICES**

Storage Tube Graphics Displays, Calligraphic Refresh Graphics Displays, Raster Refresh Graphics Displays, Cathode Ray Tube Basics, Color Crt Raster Scan Basics, Video Basics, Interactive Devices

#### **3. GRAPHIC PRIMITIVES – DRAWING LINES & CURVES**

Introduction, Scan-Converting A Point, Scan-Converting A Straight Line, Scan-Converting A Circle, Scan-Converting An Ellipse, Scan-Converting Arcs And Sectors , Scan-Converting A Rectangle, Boundary Block Transfer (Bitblt) Or Raster Operational Graphics , Side Effects Of Scan Conversion

#### **4. 2D AND 3D TRANSFORMATIONS**

2d Transformations, Homogeneous Coordinates And Matrix Representation Of 2d Transformations, Composition Of 2d Transformations, The Window-To-Viewport Transformation, Efficiency, Matrix Representation Of 3d Transformations

#### **5. SEGMENTS AND THEIR APPLICATIONS**

Polygon Surfaces, Polygon Tables, Curved Lines And Surfaces, Quadric Surfaces, Superquadrics, Blobby Objects, Spline Representations, Cubic Spline Interpolation Methods, Bezier Curves And Surfaces, B-Spline Curves And Surfaces, Beta-Splines, Rational Splines, Conversion Between Spline Representations, Displaying Spline Curves And Surfaces, Sweep Representations

#### **6. GEOMETRIC MODELLING**

Geometric Models, Hierarchy In Geometric Models, Interconnections, Characteristics Of Retained-Mode Graphics Packages, Defining And Displaying Structures

#### **7. BOUNDARY REPRESENTATIONS, CONSTRUCTIVE SOLID GEOMETRY AND SPATIAL DATA STRUCTURES**

Polyhedra And Euler's Formula, The Winged-Edge Representation, Boolean Set Operations, Spatial-Partitioning Representations, Constructive Solid Geometry, Comparison Of Representations, User Interfaces For Solid Modeling

#### **8. HIDDEN SURFACE AND LINE ELIMINATION**

Classification Of Visible-Surface Detection, Back-Face Detection, Depth-Buffer Method, A-Buffer Method, Scan-Line Method, Depth - Sorting Method, Bsp-Tree Method, Area-Subdivision Method, Octree Methods, Ray-Casting Method, Curved Surfaces, Wireframe Methods, Visibility-Detection Function

#### **9. RENDERING**

Light Sources, Basic Illumination Models, Displaying Light Intensities, Halftone Patterns And Dithering Techniques, Polygon-Rendering Method, Ray-Tracing Methods, Radiosity Lighting Model, Environment Mapping, Adding Surface Detail, Modeling Surface Detail Polygon

#### **10. VIDEO GAMES AND COMPUTER ANIMATION**

Conventional And Computer-Assisted Animation, Animation Languages, Methods Of Controlling Animation, Basic Rules Of Animation, Problems Peculiar To Animation

## **BTCO4 : COMPUTER ORGANIZATION**

### **1. INTRODUCTION**

The Nature Of Computing, The Elements Of Computers, A Turing Machine To Add Two Unary Numbers, The Evolution Of Computers, Electronic Computers, Organization Of A First-Generation Computer, A Nonstandard Architecture: Stack Computers, The Vlsi Era.

### **2. BASIC ORGANIZATION AT THE COMPUTER**

Logic gates, cpu organization

### **3. ROLE OF OPERATING SYSTEMS AND COMPILERS**

Opening remarks, what is an operating system, early history: the 1940s and the 1950s, the 1960s, the emergence of a new field: software engineering , distributed computing, the key architectural trend: parallel computation, input-output trends, open systems, unix, ethical issues, application bases, the key operating systems for the 1990s, compilers, target-language choice

### **4. INSIDE A CPU**

Data representation, fixed-point numbers, floating-point numbers, Number represented, instruction sets, instruction types, risc versus cisc, programming considerations, registers and storage, common bus system

### **5. COMPUTER ARITHMETIC AND THEIR IMPLEMENTATION**

Fixed-point arithmetic, multiplication, twos-complement multipliers, division, division by repeated multiplication, arithmetic-logic units, combinational alus, controller design, introduction, hardwired control, microprogrammed control, the amd 2909 bit-sliced microprogram sequencer , Microinstruction addressing.

### **6. MEMORY AND IO ACCESS**

Ascii alphanumeric characters, input-output interface, i/o bus and interface modules, i/o versus memory bus, asynchronous data transfer, handshaking, asynchronous serial transfer, asynchronous communication interface, first-in, first-out buffer, modes of transfer, interrupt-initiated i/o, priority interrupt, daisy-chaining priority, priority encoder, interrupt cycle, software routines, initial and final operations, direct memory access (dma), dma controller, dma transfer, input—output processor (iop), keyboard devices, mouse, output devices, sequential and direct-access devices, magnetic disk, types of hard disks, optical disk, optical disk drive

### **7. INSIDE THE MEMORY**

Hierarchical Memory Technology, Random Access Memories (Rams), Bipolar Rams, Static Mos Rams, Dynamic Mos Rams, Inclusion, Coherence, And Locality, Memory Capacity Planning, Virtual Memory Technology, Memory Replacement Policies, Cache Addressing Models, Direct Mapping And Associative Caches, Set-Associative And Sector Caches, Cache Performance Issues

### **8. INTRODUCTION TO PIPELINED OPERATION AND ARCHITECTURE**

General Considerations, Instruction Execution Phases, Mechanisms For Instruction Pipelining, Branch Handling Techniques, Computer Arithmetic Principles, Superscalar And Superpipeline Design, Superscalar Pipeline Design, Superpipelined Design, Supersymmetry And Design Tradeoffs, The Vliw Architecture, Vector And Symbolic Processors, Pipelining Hazards

### **9. INTRODUCTION TO MULTIPROGRAMMING AND MULTIPROCESSING**

Characteristics Of Multiprocessors, Interconnection Structures, Parallel Processing, Multiprocessors, Cluster Computers

## **10. NON VON NEUMANN ARCHITECTURES**

Data flow computers, the genesis of data-flow, interpreting data-flow graphs, static and dynamic data-flow architectures, criticisms of data flow, reduction computer architectures, multiple instruction, single data (systolic architectures)

## **BTC05 : SOFTWARE ENGINEERING**

### **1. INTRODUCTION**

Objects, The Evolving Role Of Software, Software, Software: A Crisis On The Horizon ?, Software Myths, Brooks , The Process, Object, Software Engineering: A Layered Technology, The Software Process

### **2. SOFTWARE LIFE-CYCLE MODELS**

The Linear Sequential Model, The Prototyping Model, The Rad Model, Evolutionary Software Process Models, Component-Based Development, The Formal Methods Model, Fourth Generation Techniques, Process Technology, Product And Process

### **3. SOFTWARE REQUIREMENTS SPECIFICATION**

Requirements Definition, Requirements Specification, Structured Language Specifications, Summary

### **4. FORMAL REQUIREMENTS SPECIFICATION – AXIOMATIC AND ALGEBRAIC SPECIFICATION.**

Formal Specification On Trial, The Verdict, Transformational Development, Specifying Functional Abstractions, Primitive Constructor Operations, Structured Specification, Specification Instantiation, Incremental Development, Specification Enrichment

Axiomatic Specification, Summary

### **5. FUNCTION-ORIENTED SOFTWARE DESIGN**

Data-Flow Design, Structural Decomposition, Detailed Design, A Comparison Of Design Strategies

### **6. OBJECT-ORIENTED DESIGN**

The Object-Oriented Paradigm, Object Orientation And Autonomy, Object-Oriented Implementations, Object Orientation And Development, Object Structure, Object Features, Classes And Objects, Notation, Links And Composition, Developing Object Models, Inheritance, Polymorphism, Multiple Inheritance, Object Analysis In The Development Cycle, Designing Objects, Including Object Orientation In Life Cycles, Object Libraries, Problem Domain Analysis, Continual Refinement

### **7. UML**

Origin, Modeling Techniques On UML, What Is A Model?, Why Construct A Model?, UML Diagrams, Use Case Model, Representation Of Use Cases, Text Description, Why Develop The Use Case Diagram?, How To Identify The Use Cases Of A System?, Essential Vs. Real Use Case, Factoring Of Commonality Among Use Cases, Generalization, Includes, Extends, Organization Of Use Cases, Use Case Packaging, Class Diagrams, Classes, Attributes, Operation, Association, Aggregation, Composition, Inheritance, Dependency, Constraints, Object Diagrams, Interaction Diagrams, Sequence Diagram, Collaboration Diagram, Activity Diagrams, State Chart Diagram

### **8. USER INTERFACE DESIGN**

Introduction, What Makes A Good Interface?, Workspaces, Robustness, Usability, Measuring Usability, Designing For Usability, Interactive Interfaces, User Dialog For Transactions, Menus, Commands And Prompts, Templates, Comparing Dialog Methods For Transaction Processing, Controls For Interactive Transaction Input, Interaction For Problem Solving, Multi-Window Displays, Multimedia Displays, Interfaces For Personal Support, Interfaces For Workgroups, Interface Design Tools, Off-Line Processing, Off-Line Input Interface, Controls With Off-Line Input, Off-Line Output

### **9. CODING**

Coding, Coding Standards And Guidelines, Representative Coding Standards, Representative Coding Guidelines, Code Review, Code Walk-Throughs, Code Inspection, Clean Room Testing, Software Documentation

### **10. UNIT TESTING, INTEGRATION AND SYSTEM TESTING.**

Objects, A Strategic Approach To Software Testing, Strategic Issues, Unit Testing, Integration Testing, Validation Testing, System Testing, The Art Of Debugging

### **11. SOFTWARE QUALITY- SEI CMM AND ISO-9001**

ISO 9000, ISO 9001, ISO 9002, software quality, software quality, management system, SEI capability maturity model, comparison between ISO 9000 certification and SEI/CMM, is SEI CMM applicable to small organizations?, personal software process (PSP)

### **12. SOFTWARE RELIABILITY AND FAULT-TOLERANCE**

Software Reliability Metrics, Software Reliability Specification, Fault Tolerance , Exception Handling

### **13. SOFTWARE PROJECT PLANNING, MONITORING AND CONTROL**

Objects, Observation On Estimating, Project Planning Objective, Software Scope, Resources, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Staffing Level Estimation, Defining A Task Network, Scheduling, Earned Value Analysis, Error Tracking, The Project Plan

### **14. SOFTWARE MAINTENANCE**

The Maintenance Process, Program Evolution Dynamics, Maintenance Costs, Maintenance Cost Estimation, Maintainability Measurement, Summary

### **15. COMPUTER-AIDED SOFTWARE ENGINEERING**

Integration, Intelligent Design Support, User-Friendliness, Tool Integration, Using Tools In System Development, Developing A Methodology, Structred Systems Analysis – A Data Flow- Oriented Methodology, Ssadm- A Methodology Combining Data Alysis And Data Flows, Ssadm Techniques, Ssadm Documentation, Flexible Use Of Tools , Exceleator, Tools For Information Engineerin A Flexible Workbench, Planning Workstation, The Designer's Workstation, The Information Engineering Facility- Another Method For Implementing Information Engineering, Using Packages, Workflow Languages

### **16. SOFTWARE REUSE**

Software Development With Reuse, Software Development For Reuse, Reuse And Inheritance, Generator-Based Reuse, Application System Portability, Portability Problems, Standards, Summary

### **17. COMPONENT MODEL OF SOFTWARE DEVELOPMENT**

Engineering Of Component-Based Systems, The Case Process, Domain Engineering, Component-Based Development, Classifying And Retrieving Components, The Reuse Environment