Second Semester

Course CT05 :Database Systems

Note: The practical aspects of the course must be taught as laboratory instructions using computers. Teacher is required to ensure that students carry out the computer implementation of the database concepts using MY SQL or MS Access in the laboratory as a part of this course

UNIT – I

Introduction : Database system applications, database systems versus file systems, views of data, data models, database languages, database users and administrators, transaction management, database system structure, application architecture.

Data modeling using the Entity Relationship Model:ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, unique key, generalization, aggregation, reduction of an ER diagram to tables.

UNIT – II

Relational model : Structure of relational databases, relational algebra, tuple relational calculus, domain relational calculus.

SQL : Characteristics of SQL, advantages of SQL, types of SQL commands, SQL operators and their procedure, tables, views and indexes, queries and sub-queries, aggregate functions, insert, update and delete operations, joins, union, intersection, minus, cursors in SQL. domain constraints, referential integrity, assertions, triggers, authorization and authentication.

UNIT - III

Relational database design &normalization : Functional dependencies, normal forms- First, second, third, BCNF, fourth and fifth normal forms, decomposition.
Indexing and Hashing: Basic concepts, ordered indices, B-tree, B+ tree, static hashing, dynamic hashing, comparison of ordered indexing and hashing, index definition in SQL, multiple-key access.

UNIT – IV

Query Processing &Optimization : Measure of query cost, selection operation, sorting, join operation, other operations, evaluation of expressions, estimating statistics of expression results, transformation of relational expression, evaluation plans, materialized views.

Transactions: Transaction concept, atomicity and durability, concurrent execution, serializability – conflict and view, testing of serializability.

UNIT - V

Concurrency Control : Concurrency Control, Locking Techniques for Concurrency control, Time stamping protocols for concurrency control, validation based protocols, multiple granularity, multi-version schemes, deadlock handling, insert and delete operations.

Recovery System : Failure classification, storage structure, recovery and atomicity, log based recovery, shadow paging, recovery with concurrent transactions, buffer management, backup systems.

Recommended Book :

1. Database Systems Concepts - Korth
2. Fundamental of database system - Elmasiri and Navathe

Course CT06 :Operating systems

Note: The practical aspects of the course must be taught as laboratory instructions using computers. Teacher is required to ensure that students are capable of setting up a Linux servercomputer , learn commands and server management during the course so that computer implementation of the some of the topics can be tested by them in the laboratory as a part of this course

Unit I

Introduction to Operating Systems: What is an operating system? Mainframe systems, desktop systems, multiprocessor systems, distributed systems, clustered systems, real-time systems, handheld systems. Feature migration and computing Environments.

Computer System Structures: Computer system operation. I/O structure, storage structure, storage hierarchy, hardware protection, network structure.

Operating System Structures: System components, operating system services. System calls, system programs, system structure, virtual machines.

Unit II

Processes: Process concept, process scheduling, operations on processes, cooperating processes, inter-process communication, communication in client-server systems.

Threads: Overview, multithreading models, threading issues.

Unit III

CPU Scheduling: Basic Concepts, scheduling criteria, scheduling algorithms, multiple-processor scheduling, real-time scheduling, algorithm evaluation.

Process Synchronization: The critical section problem, synchronization hardware, semaphores, classical problems of synchronization, monitors.

Deadlocks: System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Unit IV

Storage Management :-Memory Management: Swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.

Virtual Memory: Demand paging, process creation, page replacement, allocation of frames, thrashing.

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, free space management, efficiency and performance.

Unit V

Protection: Goals of protection, domain of protection, access matrix, implementation of access matrix, revocation of access rights.

Security: The security problem, user authentication, program threats, system threats, security systems and facilities, intrusion detection, cryptography.

Course CT-07 :Algorithms

Note: The practical aspects of the course must be taught as laboratory instructions using computers. Teacher is required to ensure that students carry out the computer implementation of the algorithm/program in the laboratory as a part of this course

UNIT-1

Algorithms Analysis:Algorithms and structured programming. Analysing algorithms, Asymptotic behavior of an algorithm, Order notations, time and space complexities (polynomial, logarithmic and exponential), average and worst case analysis, lower and upper bounds.

UNIT-2

Algorithm design strategies: Divide and conquer (Merge sort, Quick sort, matrix multiplication). Greedy method (knapsack problem, job sequencing with deadlines, minimum spanning trees).Basic search & Traversal Techniques (Breadth first and Depth first traversals of Graphs).

UNIT-3

Dynamic programming: 0/1 knapsack, Travelling salesman problem

Backtracking: 8-queen problem, sum of subsets, Graph coloring, 0/1 Knapsack **Branch & Bound**: 0/1 knapsack, Travelling salesman.

Algorithms on Graphs: Minimum cost spanning trees, depth-first search, bi-connectivity, strong connectivity, path finding problem, transitive closure algorithm

UNIT-4

Matrix algorithms: Basics, Strassen's matrix-multiplication algorithm, LU and LUP decomposition, inversion of matrices

Data structures for set manipulation problems: Fundamental operation on sets, a simple disjoint-set union algorithm, tree structures for UNION-FIND problem, applications and extensions of the UNION-FIND algorithm.

UNIT-5

Pattern matching algorithms: Finite automata and regular expression, recognition of regular expression, patterns, recognition of substrings, Conversion from NFA to DFA

Taxonomy of Classes: Problem classes P, NP, NP-hard and NP-complete, Theorems for some NP-complete problems

Text/Reference Books:

1. Fundamentals of Computer Algorithms, E. Horowitz, S. Sahni, Galgotia Publications,1985.
2. Design & Analysis of Computer Algorithms, Av. Aho, J.E. Hopcroft, & J.D. Ullman, Addition Wesley, 1974.
3. Design and Analysis of algorithms, S.K. Basu, PHI Publications

Course CT-08 :Object Oriented Programming using C++

Note: The practical aspects of the course must be taught as laboratory instructions using computers. Teacher is required to ensure that students carry out the computer implementation of the algorithm/program in the laboratory as a part of this course

UNIT – I

Different paradigms for problem solving, need for OOP, differences between OOP and procedure oriented programming, abstraction, overview of OOP principles- encapsulation, inheritance and data binding polymorphism. abstraction.

C++ basics: structure of a C++ program, data types, declaration of variables, expressions, operators, type conversions, pointers and arrays, strings, structures, references, flow control statement, functions-scope of variables, parameter passing, recursive functions, default arguments, inline functions, dynamic memory allocation and deallocation operators.

UNIT – II

C++ classes and data abstraction: class definition, class structure, class objects, class scope, this pointer, static class members, constant member functions, constructors and destructors, dynamic creation and destruction of objects, friend function and class, static class member.
Overloading : function overloading, operator overloading – unary, binary operators.

UNIT - III

Inheritance: defining a class hierarchy, different forms of inheritance, defining the base and derived classes, access to the base class members, base and derived class construction, destructors, virtual base class.

Polymorphism: static and dynamic bindings, base and derived class virtual functions, dynamic binding through virtual functions, virtual function call mechanism, pure virtual functions, abstract classes, implications of polymorphic use of classes, virtual destructors.

UNIT - IV

Templates - function templates and class templates, overloading of function template, static class member in class template.

Exception handling: benefits of exception handling, throwing an exception, the try block, catching an exception, exception objects, exception specifications, re-throwing an exception, catching all exceptions.

UNIT-V

File handling : stream classes hierarchy, stream I/O, file streams, opening and closing data file, creating a data file, read and write functions, error handling during file operations, formatted I/O, sequential and random file processing.
Standard template library (STL): component of STL, containers, iterartors, algorithms, application of container classes.

Recommended book : Object Oriented Programming with C++ : E. Balagurusamy

Course CP-03 :Practical-I: Algorithm Implementations

Practical exercise to implement various algorithm using C++. List of practical will be made available on web site

Course EP-01X : Elective Technology Lab-I
Web Application Development Laboratory courses

Students will be required to select one course from following

EP-01A. Web Development using Dot NET
EP-01B. Web Development using PHP& MYSQL

These courses will be taught through practical training to develop web applications using thetechnologies. Each student will be required to select independent applications and web contents. List of practical will be available on course web site.

Course EP-02X

Minor Project, Elective Skill Enhancement Course I.
Note : Since this list is common for Semester II and III, it should be noted that a course cannot be repeated from semester to another. The student will have to opt for different courses in different semesters.

A. Minor Project
B. Communication and Presentation Skill
C. Scientific Writing Skill
D. Statistical Analysis of data
E. Numerical Analysis Techniques using MATLAB
F. Campus Network Configuration & Management
G. Big Data Analytics
H. Cloud Computing
I. Data Mining
J. Financial and Accounting Tools
K. Computer Animation