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**CSX437 Distributed Database Systems**

**L-T-P-Cr: 3-0-0-3**

**Pre-requisites:** Basic RDBMS skills.

**Objectives/Overview:**

* To learn principles of distributed database systems including design and architecture, security, integrity, processing of query and optimization, transaction management, and concurrency control.
* Fundamental issues in distributed database systems that are motivated by the computer networking and distribution of processors and databases will also be addressed.

**Course Outcomes:**

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| **S.NO** | **Course outcomes ( Distributed Database Systems) (CSX437)** | **Level of Attainment** |
| CO-1 | Learn broad understanding of distributed database concepts and architecture. Learn and understand the promises of Distributed databases. | PO-1 |
| CO-2 | Learn about distributed database architecture, will also learn about client – server architecture and other models which form the basics of distributed database systems. | PO-3, PO-5 |
| CO-3 | Learn about different design strategies and design issues, and also learn about fragmentation and other basic strategies which will aid in designing DDBMs.  | PO-3, PO-4 |
| CO-4 | Learn commands and queries of distributed databases. Learn about algebra relational distributed operators and will also learns methodologies to optimize queries.  | PO-3, PO-5 |
| CO-5 | Learn the basics of transactions, its properties which will ensure data integrity. | PO-3, PO-1 |
| CO-6 | Learn locking and concurrency control mechanisms and learn about deadlock prevention and removal. | PO-3 |
| CO-7 | Learn about failures in DDBMs and learning reliability concepts.  | PO-5, PO-2 |
| CO-8 | Learn about current industry problems in distributed database design and ways to solve them. | PO-12, PO-4 |

**UNIT I: Introduction Lectures: 5**

Distributed data processing, what is Distributed Database System (DDBS), resembling setups which are not DDBS, examples of DDBS’s, Promises of DDBs, case studies such as airline/railway reservation system, banking sector, e-commerce etc.

**UNIT II: Distributed Database Architecture Lectures: 5**

DDBMS Standardization, DDBS reference model, Architectural Model – Client Server Architecture and its variants, Multi-database model (MDBMs) Architecture.

**UNIT III: Distributed Database Design Lectures: 6**

Design Strategies, Distribution Design Issues, Fragmentation – Primary Horizontal fragmentation (PHF) Derived Horizontal Fragmentation (DHF), Vertical Fragmentation, Mixed/Hybrid Fragmentation, Access Frequencies and patterns, Replication and Allocation – concepts and strategies.

**UNIT IV: Overview of Query Processing & Optimization Lectures: 6**

Query processing Problem, Objectives, Complexities of Relation Algebra Operators, Distributed query processing operators, Characterization of Query Processor, and Layers of Query Processing. Query Optimization, Centralized Query Optimization.

**UNIT V: Transaction Management & Concurrency Control Lectures: 10**

Transaction management: Definition of Transaction, Properties, Types (Flat Tx’s, Nested Tx’s, and Workflows), Architectures.

Concurrency control: Serializability Theory, Taxonomy, Locking Based Algorithm, Timestamp Based Algorithm, Optimistic Concurrency Control algorithm, Deadlock Management.

**UNIT VI: Distributed DBMS Reliability & Current Issues Lectures: 10**

Reliability Concepts, Failures in DDBMs, Local reliability Protocol, Distributed Reliability Protocols, Dealing with site failures, Network Partitioning.

Current issues: Push-Based technology, Mobile Databases, soft computing applications in distributed database system design.

**Text/Reference Books:**

1. M. Tamer Oezsu, Patrick Valduriez “Principles of Distributed Database Systems'', Prentice Hall.
2. Coulouris, Dollimore and Kindberg, “Distributed Systems: Concepts and Designs”, Addisson-Wesley
3. Ceri, Pellagati, “Distributed Database Systems”, McGraw Hill
4. M. Stonebraker, “Readings in Database Systems”, San Mateo, California: Morgan Kaufmann.
5. Ray, “Distributed Database Systems”, Pearson.