# CS-211 Distributed Database Systems

**Credit Hours 3 (3-0)**

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| **Program:** BSCS | | **Semester:** IV |
| **Pre Requisite:** Database Systems | | **Follow Up:** None |
| **Course Description**  This course is an advanced and specialized course based on the knowledge learned in database system course. The database management systems (DBMS) can be classified into centralized or distributed approach, and specifically the focus of the course would be toward distributed approach toward database development. | | |
| **Course Objectives**  To clearly describe the difference of Centralized database and Distributed database and enable the students to design/model a distributed database. | | |
| **Learning Outcomes**  After studying this course, the students would be able to distinguish clearly between centralized and distributed approaches to database management system (DBMS). The students can analyze the DMBS requirement distinct to every application type and business domain, and can work on distributed DBMS systems. | | |
| **Textbooks**   * Principals of Distributed Database Systems by Ozsu Tamer. | | |
| **Reference Books / Material**   * Database Systems by Thomas Connolly. | | |
| **Course Distribution** | Theory: 75%  Problem Analysis: 10%  Solution Design: 10%  Social and Ethical Issues: 5% | |
| **Marks Distribution** | ***Mid Term*** Test 1: 10 Marks; Test 2: 10 Marks; Assignment: 05 Marks; Quiz: 05 Marks  ***End Term*** Paper: No Choice, 65 Marks, 03 hours; Attendance: 05 Marks | |
| **Technology Involved** (Multimedia, Overhead Projector, Web, etc.) | | |
| **Practiced Techniques** (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.) | | |

**Theory**

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| **Week** | **Topic** | **Learning Activities** (Assignments, Quizzes, Presentations, etc.) |
| 1 | Introduction to Distributed Database Systems: Distributed Data Processing, Distributed Database System, Data Delivery Alternatives |  |
| 2 | Promises of DDBS, Design Issues, Additional Issues |  |
| 3 | Overview of relational DBMS, Relational Database Concepts, Normalization, Relational Data Languages: Relational Algebra, Relational Calculus |  |
| 4 | Distributed DBMS architecture, ANSI / SPARC Architecture, Generic Centralized DBMS Architecture, Architectural Models for Distributed DBMSs, Autonomy, Distribution, Heterogeneity, Client / Server Systems, Peer to Peer Systems, Multidatabase System Architecture | Quiz 1 |
| 5 | Distributed database design, Top-Down Design Process, Distributed Design Issues: Reasons for Fragmentation, Fragmentation Alternatives, Degree of Fragmentation, Correctness Rules of Fragmentation, Allocation Alternatives | Assignment 1 |
| 6 | Fragmentation: Horizontal Fragmentation, Vertical Fragmentation, Hybrid Fragmentation |  |
| 7 | Data and Access Control: View Management, Data Security: Discretionary Access Control, Multilevel Access Control, Distributed Access Control, Semantic Integrity Control |  |
| 8 | Revision |  |

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| 9 | Distributed Query Processing: Query Processing Problem, Objectives of Query Processing, Complexity of Relational Algebra Operations |  |
| 10 | Characteristics of Query Processors: Languages, Types of Optimization, Optimization Timing, Statistics, Decision Sites, Exploitation of the Network Topology, Exploitation of Replicated Fragments, Use of Semijoins, Layers of Query Processing: Query Decomposition, Data Localization, Global Query Optimization, Distributed Query Execution |  |
| 11 | Query Decomposition and Data Localization |  |
| 12 | Optimization of Distributed Queries: Query optimization, Centralize and Distributed Query Optimization, Join ordering in Distributed Queries | Assignment 2 |
| 13 | Distributed Transaction Management: Definition of a Transaction, Properties of Transactions |  |
| 14 | Types of Transactions, Architecture Revision | Quiz 2 |
| 15 | Consistency of Replicated Databases, Update Management Strategies, Replication Protocols, Group Communication, Replication and Failures |  |
| 16 | Revision of Course Contents |  |
| **End Term Exam** | | |