**Jahangirnagar University**

**Institute of Information Technology (IIT)**

**Advanced Database Management System (ADMS)**

Dr. RashedMazumder

*CCNA, MCP, MCSA, MCITP*

**B. Sc. in CSE, DU, MS (JAIST), Ph.D (JAIST)**

Assistant Professor

**Course Objective**

**The aim of the course is to**

1) Enhance the previous knowledge of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies, and showing the need for distributed database technology to tackle deficiencies of the centralized database systems.

2) Introduce basic principles and implementation techniques of distributed database systems.

3) Expose active and emerging research issues in distributed database systems and application development

4) Apply theory to practice by building and delivering a distributed database query engine, subject to remote Web service calls.

**After the completion of the course, the students are expected to-**

1) Get familiar with the currently available models, technologies for and approaches to building distributed database systems and services

2) Have developed practical skills in the use of these models and approaches to be able to select and apply the appropriate methods for a particular case

3) Be aware of the current research directions in the field and their possible outcomes

4) Be able to carry out research on a relevant topic, identify primary references, analyze them, and come up with meaningful conclusions

5) Be able to apply learned skills to solving practical database related tasks.

**Course Content**

**The course content consists of two parts:**

(1) Theoretical study of distributed database systems. It covers the core of principles of distributed database management systems, including distributed database design and architecture, query processing and optimization, transaction management, concurrency control, failure recovery, and reliability. Emerging data management issues including parallel and streaming data management, NoSQL and NewSQL data management on the cloud will also be covered.

***Conditional.***(2) Experimental DDBMS. Students are organized in teams to design and implement a distributed database query processing and optimization engine, capsulated into a web service to meet the requirements of the remote service call. The delivered service is subject to the benchmark testing of the course.

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| **ADBMS Road-Map** |
| **Lecture 1 (RM):**   * Course Overview   + Course Goal   + Course Content   + Course Structure   + Course Deliverables * Introduction   + What is a distributed database system (DDBS)?   + Promises of DDBSs   + Complicating Factors   + Problem Areas |
| **Lecture 2 (RM):**   * Date's 12 Rules for Distributed Database Systems * Group-Project Tutorial and Kick-Off ([slides](http://thu-cmu.cs.tsinghua.edu.cn/curriculum/ddb_website/ddb_files/Tutorial%20of%20Course%20Project.ppt)) |
| **Lecture 3 (RM):**   * Distributed Database Architecture   + To-Down DDBS Architecture Design - Schema and Distribution Transparency   + Bottom-up DDBS Architecture Design - Alternative Architectures (client/server, peer-to-peer distributed DBMS, multi-databases) |
| **Lecture 4 (RM):**   * Distributed Database Design   + Horizontal Fragmentation, Derived Horizontal Fragmentation, and Vertical Fragmentation   + Allocation Model |
| **Lecture 5 (RM):**   * Distributed Query Processing   + Query Decomposition and Localization |
| **Lecture 6 (RM):**   * Optimization of Distributed Queries   + Centralized Query Optimization (Ingres, System R)   + Distributed Query Optimization (Distributed Ingres, R\*, Hill Climbing and SDD-1 algorithm) |
| **Lecture 7 (RM):**   * Transaction Management   + Transaction Concepts and Models   + Properties of Transactions – ACID |
| **Lecture 8 (RM):**   * Distributed Concurrency Control   + Execution Schedule and Serializability Theory   + Pessimistic vs. Optimistic Distributed Concurrency Control Algorithms (locking and timestamp ordering) |
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*Textbook and supporting docs .....*

**1. Principles of Distributed Database Systems**

**M. Tame Özsu, Patrick Valduriez, Prentice-Hall, 2011**

**2.** [**http://aries.ektf.hu/~hz/pdf-tamop/pdf-xx/Radvanyi-hdbms-eng2.pdf**](http://aries.ektf.hu/~hz/pdf-tamop/pdf-xx/Radvanyi-hdbms-eng2.pdf)