



COURSE SYLLABUS

Course Code:	TH107
Title:	Introduction to Database Systems
Credits:	4
Workload:	Lecture hours: 3 periods * 15 weeks = 45 periods Laboratory hours: 2 periods * 15 weeks = 30 periods Preparative hours: 2 periods * 15 weeks = 30 periods

Prerequisites: TH105 - Data structure 2

Course Objectives:

This course provides students with a solid background in database management systems, particularly relational database management systems. Upon completion of this course, students will have gained a basic understanding of database system technology in general, and a theoretical knowledge and practical experience of relational database systems in particular. It seeks to equip the students with the skills to design and implement a database system, and to prepare them for more advanced database courses in the final year.

Main Text:

The following textbooks are highly recommended for TH107:

1. Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Widom, *Database Systems -The Complete Book*, Prentice Hall, ISBN: 0-13-031995-32002.
2. Ramez Elmasri and Shamkant B. Navathe, *Fundamentals of Database Systems*. Fourth Edition, Addison-Wesley, 2004. ISBN 0-321-12226-7.

References:

- Raghu Ramakrishnan and Johannes Gehrke. *Database Management Systems*. Third Edition, McGraw Hill, 2003. ISBN: 0-07-246563-8.
- C. J. Date, *An Introduction to Database Systems*, Eighth Edition, Addison-Wesley, 2003. ISBN 0-321-19784-4.
- Abraham Silberschatz, Henry F. Korth and S. Sudarshan. *Database System Concepts* . Fourth Edition. McGraw Hill, 2004. ISBN 0-07-255481-9.

Course Outline:

Week	Topic	Lecture
1	Database System Concepts and Architecture	<p>Chapter 1 Databases and Database Users</p> <p>1.1 Introduction: Why do we need a database system?</p> <p>1.2 Characteristics of Database Approach</p> <p>1.3 Who uses database systems?</p> <p>1.4 Advantages of Using the DBMS Approach</p> <p>1.5 A Brief History of Database Applications</p> <p>Chapter 2 Database System Concepts</p> <p>2.1 Data Models, Schemas, and Instances</p> <p>2.2 Three-schema Architecture and Data Independence</p> <p>2.3 Database Languages and Interfaces</p> <p>2.4 The Database System Environment</p> <p>2.5 Centralized and Client-Server Architectures for DBMSs</p> <p>2.6 Classification of Database Management Systems</p>
2	Data Modeling Using the Entity-Relationship Model	<p>Chapter 3 Data Modeling Using the Entity-Relationship Model</p> <p>3.1 Using High-Level Conceptual Data Models for Database Design</p> <p>3.2 Elements of the E/R Model</p> <p>3.3 Design Principles</p> <p>3.4 The Modeling of Constraints</p> <p>3.5 Weak Entity Sets</p>
3	Relational Database Model : Concepts	<p>Chapter 4 Relational Database Model</p> <p>4.1 Basics of the Relational Models</p> <p>4.1.1 Attributes</p> <p>4.1.2 Schemas</p> <p>4.1.3 Tuples</p> <p>4.1.4 Domains</p> <p>4.1.5 Equivalent Representations of a Relation</p> <p>4.1.6 Relation Instances</p>
4	E/R to Relational model	<p>4.2 From E/R Diagrams to Relational Design</p> <p>4.2.1 From Entity Sets to Relations</p> <p>4.2.2 From E/R Relationships to Relations</p> <p>4.2.3 Combining Relations</p> <p>4.2.4 Handling Weak Entity Sets</p>

5	Functional Dependencies	4.3 Functional Dependencies 4.3.1 Definition of Functional Dependency 4.3.2 Keys of Relations 4.3.3 Superkeys 4.3.4 Discovering Keys for Relations 4.4 Rules About Functional Dependency 4.4.1 The Splitting/Combining Rules 4.4.2 Trivial Functional Dependencies 4.4.3 Computing the Closure of Attributes 4.4.4 Why the Closure Algorithm Works 4.4.5 The Transitive Rule 4.4.6 Closing Sets of Functional Dependencies 4.4.7 Projecting Functional Dependencies
6	Relational Algebra: Basics	Chapter 5 Relational Algebra 5.1 An Algebra of Relational Operations 5.1.1 Basics of Relational Algebra 5.1.2 Set Operations on Relations 5.1.3 Projection 5.1.4 Selection 5.1.5 Cartesian Product 5.1.6 Natural Joins 5.1.7 Theta-Joins 5.1.8 Combining Operations to Form Queries 5.1.9 Renaming
7	Extended Operators Of Relational Algebra	5.2 Extended Operators Of Relational Algebra 5.2.1 Duplicate Elimination 5.2.2 Aggregation Operators 5.2.3 Grouping 5.2.4 The Grouping Operator 5.2.5 Extending the Projection Operator 5.2.6 The Sorting Operator 5.2.7 Outerjoins
8	Relational Calculus	Chapter 6 The Relational Calculus 6.1 Logic and its application in Databases 6.1.1 Review some concepts 6.1.2 Application of logic in databases 6.2 Tuple Relational Calculus 6.2.1 Syntax 6.2.2 Safe Expression 6.3 Domain Relational Calculus

9	SQL (1)	Chapter 7 The Database Language SQL 7.1 Simple Queries in SQL 7.1.1 Projection in SQL 7.1.2 Selection in SQL 7.1.3 Null Values and Comparisons Involving NULL 7.1.4 The Truth-Value UNKNOWN 7.1.5 Ordering the Output 7.2 Queries Involving More Than One Relation 7.2.1 Products and Joins in SQL 7.2.2 Disambiguating Attributes 7.2.3 Tuple Variables 7.2.4 Interpreting Multirelation Queries 7.2.5 Union, Intersection, and Difference of Queries
10	SQL (2)	7.3 Subqueries 7.3.1 Subqueries that Produce Scalar Values 7.3.2 Conditions Involving Relations 7.3.3 Conditions Involving Tuples 7.3.4 Correlated Subqueries 7.3.5 Subqueries in FROM Clauses 7.3.6 SQL Join Expressions 7.3.7 Natural Joins 7.3.8 Outer Joins
11	SQL (3)	7.4 Full-Relation Operations 7.4.1 Eliminating Duplicates 7.4.2 Duplicates in Unions, Intersections, and Differences 7.4.3 Grouping and Aggregation in SQL 7.4.4 Aggregation Operators 7.4.5 Grouping 7.4.6 HAVING Clauses
12	SQL (4)	7.5 Database modifications 7.5.1 Insertion 7.5.2 Deletion 7.5.3 Updates 7.6 Definitioning a Relation Schema in SQL 7.6.1 Data Types 7.6.2 Sample Table Declarations 7.6.3 Modifying Relation Schemas 7.6.4 Default Values 7.6.5 Indexes 7.6.6 Introduction to Selection of Indexes 7.7 View Definitions

13	Integrity Constraint	Chapter 8 Integrity Constraint in a Relational Database 8.1 Definition 8.1.1 Definition of integrity constraint 8.1.2 Characteristics of integrity constraint 8.1.3 Relational Algebra as a Constraint Language 8.2 Types of Integrity Constraint 8.2.1 Single-relation integrity constraint 8.2.2 Multi-relation integrity constraint
14	Constraints and Triggers	8.3 Schema-Level Constraints and Triggers 8.3.1 Assertions 8.3.2 Event-Condition-Action Rules 8.3.3 Triggers in SQL 8.3.4 Instead-Of Triggers
15	Review Session	

Grading

Homework Assignments	20%
Mid-term Practice	10%
Final Practice	20%
Final Exam	50%