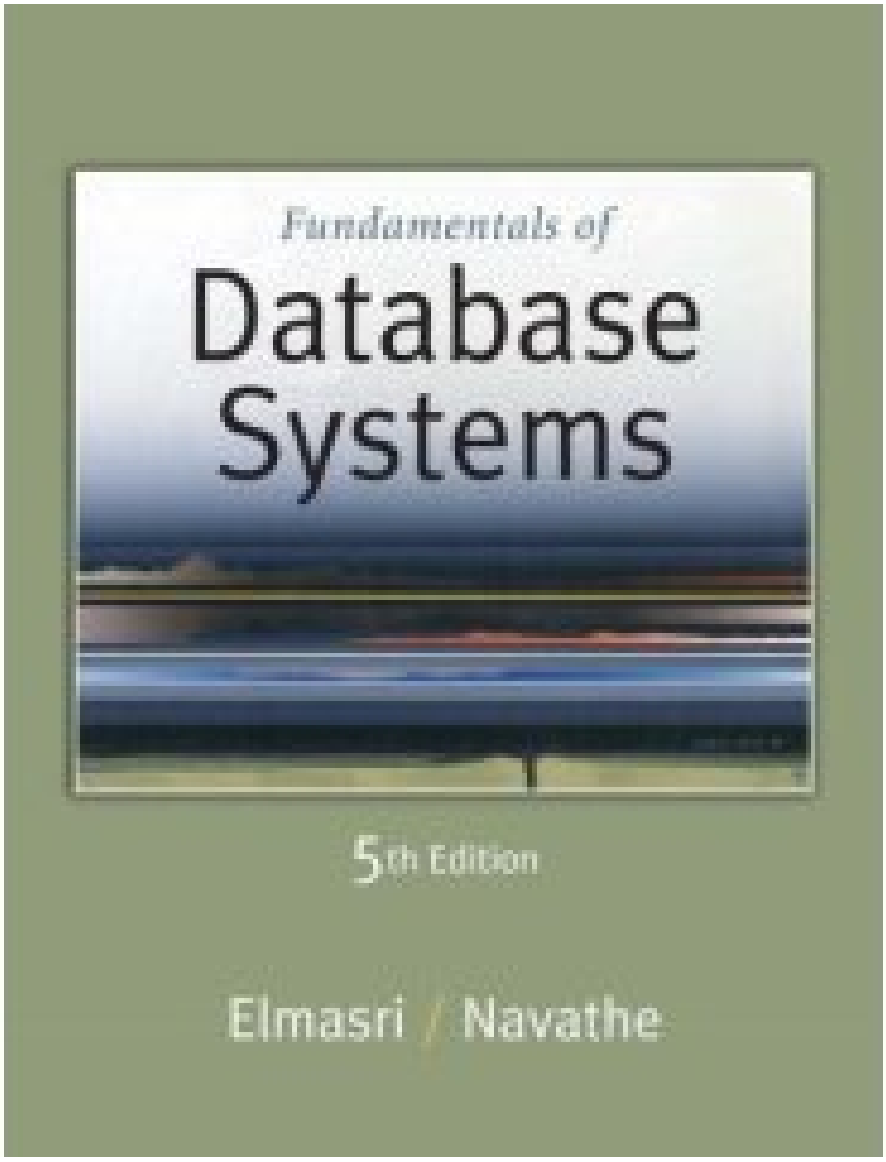
CS 350: Database Engineering (CRN: 2030)
Marshall University, Spring 2008

Contents


Fundamentals of
Database
Systems
5th Edition
Elmasri / Navathe

1 Course description

Rigorous and comprehensive introduction to relational database theory and applications: data modeling, normalization, transaction processing, relational algebra, SQL, data server internals, query optimization, database programming and Internet applications using Oracle.

2 Course schedule

This course meets on MW 3.30 PM - 4.45 PM in GH 206A.

3 Instructor information

4 Instructor information

- Dr. V.N. Gudivada, Gullickson Hall Room 205A, Phone: 304-696-5452, Email: gudivada@marshall.edu. Please use WebCT Vista email for course related inquiries.

  Office hours: TuTh 1.00 PM - 4.00 PM. Other times by appointment.

5 Course topics at a glance

- Multi-faceted view of relational database systems
- Conceptual data modeling
- Relational data model
- Relational algebra
- Structured query language (SQL)
- Database programming
- Logical and physical database design
- Disk storage and file structures
- Indexing structures for files
- Query optimization
- Transaction processing
- Concurrency control
- Database recovery
- Oracle DBMS

6 Course objectives

1. Provide a multi-faceted view of the relational database systems; introduction to data-intensive distributed applications based on multi-tier architectures; an overview of data integration and data distribution issues; a reference architecture for implementing relational database servers; and an introduction to database development tool.
2. Provide a rigorous and comprehensive introduction to conceptual data modeling; and discuss entity-relationship data modeling, and data model patterns.
3. Provide a formal introduction to the relational data model and relational algebra; illustrate techniques for mapping conceptual data models into the relational data model.
4. Provide a formal introduction to relational algebra and calculus.
5. Explain SQL — the query language for relational databases. Discuss SQL constructs for creating, manipulating, and retrieving database objects; introduce general and special-purpose SQL functions.
6. Introduce relational database programming models and associated industry standards for programmatic access to databases; illustrate stored procedure development in using PL/SQL and Java.
7. Discuss logical database design based on functional dependencies and normal forms; and physical database design based on transaction types and access patterns.
8. Discuss disk storage, file structures, and file indexing.
9. Illustrate techniques for optimizing SQL queries.
10. Discuss transaction processing and concurrency control concepts; explain transaction properties, interleaved execution, serializability, and transaction recovery.
11. Discuss database recovery procedures.
12. Promote student communication skills via student project presentations.

7 Measurable student learning outcomes

A high course grade in CS 350: Database Engineering requires that the student demonstrate most or all of the following:

1. Articulates the features of modern relational database systems, their role in multi-tier application architectures, and the importance of and the distinction between logical and physical data independence.
2. Given a problem of limited scope, performs conceptual database design, and documents the design using Entity-Relationship (ER) diagrams.
3. Demonstrates an understanding of relational data model concepts; writes database queries using relational algebra; maps conceptual database design into the relational model.
4. Gained good working knowledge of SQL, and writes database queries using SQL.
5. Understands various models for programmatic access to databases; develops stored procedures in multiple languages.
6. Given a relational data model and a set of functional dependencies, performs logical database design which conforms to a desired normal form.
7. Understands disk storage and retrieval characteristics, file organizations, and file indexing schemes. Explains the relationship between the above topics and efficiency of query processing.
8. Given transaction rates and their types, and database access patterns, performs physical database design which meets the desired transaction throughput rates and query response times.
9. Demonstrates an understanding of cost models for various relational algebra operations; and uses these models to improve query performance.
10. Explains the notion of a transaction and its properties; issues in interleaved execution and serializability; and transaction recovery.
11. Articulates the procedures required for recovering a database from various types of failures.

8 Course assessment

The course assessment components include: written assignments (20%), team project (20%), two midterm exams (40%), and a final (20%). Maximum possible score is 100. Course grade is awarded based on the following scheme:

Score	*Letter Grade*
$>= 90$	A
$>= 80$ & < 90	B
$>= 70$ & < 80	C
$>= 60$ & < 70	D
< 60	F

8.1 Written assignments

There will be several (about 17) written assignments administered via WebCT Vista. Answers to these questions must be submitted via WebCT Vista only. Written assignments will account for 20% of your course grade.

8.2 Team project

There will be a semester-long team project. Typically a team consists of 2 to 3 students. Teams will work on a database oriented real-world applications. Details will be provided in a separate handout.

There will be a few intermediate deliverables and a final deliverable (which is an integration of intermediate deliverables with proper revision). The teams need to present their project to the class towards the end of the semester. The team project accounts for 20% of your course grade.

9 Instructional materials

Required Textbook Ramez Elmasri and Shamkant Navathe, *Fundamentals of Database Systems* (5^{th} edition), ISBN: 0-321-36957-2, Pearson Education, 2007.

Additional Resources Course notes and other handouts will be available on WebCT Vista. URLs for additional resources will also be listed on the Vista.

10 WebCT Vista

It is important to visit WebCT Vista for up-to-date information about the course. It hosts all the course materials including assignments, handouts, lecture notes, and reading materials. Also, you will use the Vista for submitting your team project.

References

[1] R. Elmasri and S. Navathe. *Fundamentals of Database Systems*. 5^{th} edition. Pearson education, 2007. ISBN: 0-321-36957-2.

[2] Stephane Faroult. *The Art of SQL*. O'Reilly, 2006. ISBN: 0-596-00894-5.

[3] Andrew Cumming and Gordon Russell. *SQL Hacks*. O'Reilly, 2007. ISBN: 0-596-52799-3.

[4] Sanjay Mishra and Alan Beaulieu. *Mastering Oracle SQL*. O'Reilly, 2004. ISBN: 0-596-00632-2.