

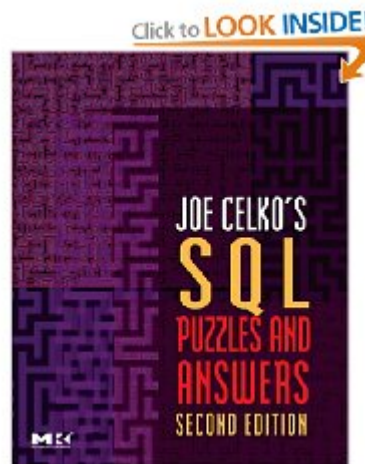
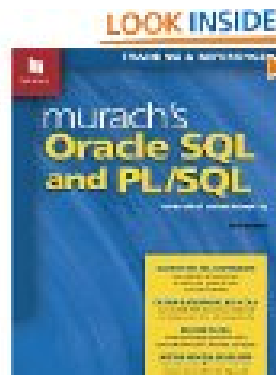
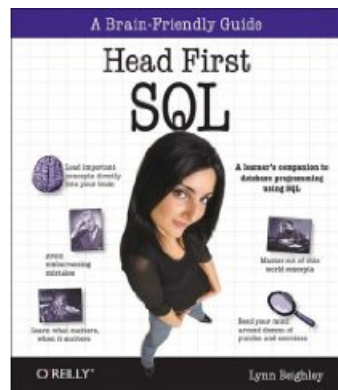
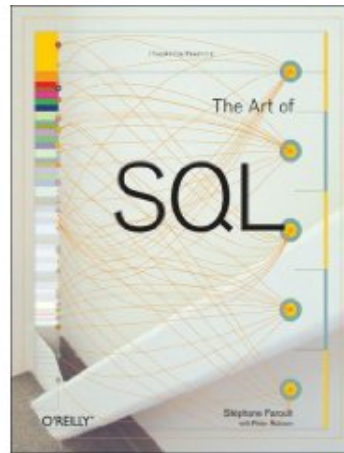
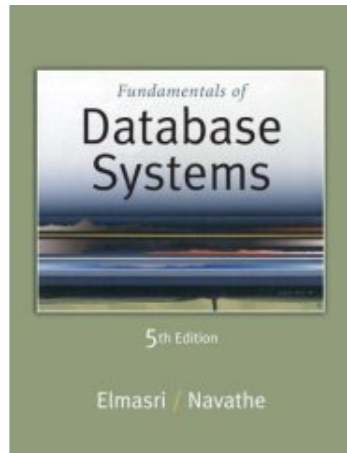
CS 350: Database Engineering

Marshall University, Spring 2009

January 13, 2009

Contents

1 Course description	3
2 Instructor information	3
3 Course schedule and office hours	3
4 Instructional materials	3
5 Course topics at a glance	4
6 Course objectives	4
7 Measurable student learning outcomes	5
8 Course assessment	6
8.1 Written assignments (10%)	7
8.2 Database labs (10%)	7
8.3 Pop quizzes (10%)	7
8.4 Project (10%)	7
8.5 Two midterm exams (40%)	8
8.6 Final exam (20%)	8
9 muOnline/Blackboard	8
10 Policy for students with disabilities	8



1 Course description

This course provides rigorous and comprehensive introduction to relational database theory and applications: data modeling, relational algebra, SQL, normalization, transaction processing, query optimization, database programming and Internet applications using Oracle and MySQL.

2 Instructor information

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

3 Course schedule and office hours

- This course meets on TuTh 3.30 PM - 4.45 PM in GH 206A.
- Office hours
 - Tuesdays and Thursdays: 2.00 PM - 3.30 PM.
 - Wednesday: 2.00 PM - 5.00 PM.
 - Other times by appointment.

4 Instructional materials

- *Required Textbook:*
 - [1] Ramez Elmasri and Shamkant Navathe. *Fundamentals of Database Systems*. Pearson Education, fifth edition, 2007. ISBN: 0-321-36957-2.
- *Reference Textbooks (no need to buy):*
 - [2] Lynn Beighley. *Head First SQL*. O'Reilly Media, 2007. ISBN: 0596526849.
 - [3] Joe Celko. *Joe Celko's SQL Puzzles and Answers*. Morgan Kaufmann, second edition, 2006. ISBN: 0123735963.

- [4] Andrew Cumming and Gordon Russell. *SQL Hacks*. O'Reilly Media, 2007. ISBN: 0-596-52799-3.
- [5] Stephane Faroult and Peter Robson. *The Art of SQL*. O'Reilly Media, 2006. ISBN: 0596008945.
- [6] Joel Murach. *Murach's Oracle SQL and PL/SQL*. Mike Murach & Associates, 2008. ISBN: 1890774502.

- Web resources
 - Animated database courseware (<http://coffee.kennesaw.edu/>).
 - RDF-based SQL Ontology (<http://www.sis.pitt.edu/paws/ont/sql.rdfs>).
- Additional resources: Course notes, other handouts, URLs for additional Web resources will be available on the muOnline/Blackboard system.

5 Course topics at a glance

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

6 Course objectives

- Provide a multi-faceted view of relational database systems; introduction to data-intensive distributed applications based on multi-tier ar-

chitectures; an overview of data integration and data distribution issues; a reference architecture for implementing relational database servers; and an introduction to database development tools.

- Provide a rigorous and comprehensive introduction to conceptual data modeling; and discuss entity-relationship data modeling, and data model patterns.
- Provide a formal introduction to the relational data model; illustrate techniques for mapping conceptual data models into the relational data model.
- Provide a formal introduction to relational algebra and calculus.
- 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.
- Introduce relational database programming models and associated industry standards for programmatic access to databases; illustrate stored procedure development in using PL/SQL and Java.
- Discuss logical database design based on functional dependencies and normal forms; and physical database design based on transaction types and access patterns.
- Discuss disk storage, file structures, and file indexing.
- Illustrate techniques for optimizing SQL queries.
- Discuss transaction processing and concurrency control concepts; explain transaction properties, interleaved execution, serializability, and transaction recovery.
- Discuss database recovery procedures.
- Promote student communication skills via written work and 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:

- **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.
- Given a problem of limited scope, **performs** conceptual database design, and documents the design using Entity-Relationship (ER) diagrams.
- **Demonstrates** an understanding of relational data model concepts; writes database queries using relational algebra; maps conceptual database design into the relational model.
- **Gained** good working knowledge of SQL, and writes database queries using SQL.
- **Understands** various models for programmatic access to databases; develops stored procedures in PL/SQL and Java.
- Given a relational data model and a set of functional dependencies, **performs logical database design** which conforms to a desired normal form.
- **Understands** disk storage and retrieval characteristics, file organizations, and file indexing schemes. **Explains** the relationship between the above topics and efficiency of query processing.
- **Demonstrates** an understanding of cost models for various relational algebra operations; and **uses** these models to improve query performance.
- **Explains** the notion of a transaction and its properties; issues in interleaved execution and serializability; and transaction recovery.
- **Articulates** the procedures required for recovering a database from various types of failures.

8 Course assessment

The course assessment components include: written assignments (10%), database labs (10%), pop quizzes (10%), project (10%), two midterm exams (40%), and a final exam (20%). Maximum possible score is 100. Course grade is awarded based on the following scheme:

<i>Score</i>	<i>Letter Grade</i>
≥ 90	A
$\geq 80 \ \& \ < 90$	B
$\geq 70 \ \& \ < 80$	C
$\geq 60 \ \& \ < 70$	D
< 60	F

8.1 Written assignments (10%)

There will be several (about 17) written assignments administered via muOnline/Blackboard system. Answers to these questions must be submitted via muOnline/Blackboard only. *No written assignments will be accepted late.* Written assignments will account for 10% of the course grade.

8.2 Database labs (10%)

There will be several lab exercises that require hands-on exploration, experimentation, and problem solving using Oracle and MySQL relational database systems. Class time will be allocated to get started with the labs. You need to complete any unfinished lab work outside the class before the next class period. All lab reports need to be submitted via muOnline/Blackboard only. *No lab reports will be accepted late.* Lab reports will account for 10% of the course grade.

8.3 Pop quizzes (10%)

There will be several pop quizzes (about 10) on the topics discussed in the class and reading assignments. All the quizzes will be administered using muOnline/Blackboard and start precisely at 3.30 PM and end sharply at 3.40 PM. Pop quizzes will account for 10% of the course grade.

8.4 Project (10%)

This will be a semester-long project. Students will work, individually, on a problem whose solution requires designing and developing a database. Essentially, students select a data repository from TheDataWeb: For DataFerret (<http://www.thedataweb.org/>). TheDataWeb is a network of online data libraries. You use the DataFerret application to access the data in TheDataWeb. Data repositories include, census data, economic data, health data, income and unemployment data, population data, labor data, cancer

8.5 Two midterm exams (40%) POLICY FOR STUDENTS WITH DISABILITIES

data, crime and transportation data, family dynamics, and vital statistics data. Additional 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). Students will present their project to the class towards the end of the semester. This project accounts for 10% of the course grade.

8.5 Two midterm exams (40%)

There will be two midterm exams, and each weighs 20% of the course grade. The first midterm exam will be held on [10 February 2009 \(Tuesday\)](#), and the second on [17 March 2009 \(Tuesday\)](#).

8.6 Final exam (20%)

The [final exam](#) will be a comprehensive one — includes topics those that we have studied during the entire semester. It will be held in [GH 206A on 5 May 2009 \(Tuesday\)](#), 3.30 PM - 5.30 PM.

9 muOnline/Blackboard

It is important to visit muOnline/Blackboard regularly 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 Blackboard for submitting your team project.

10 Policy for students with disabilities

Marshall University is committed to equal opportunity in education for all students, including those with physical, learning and psychological disabilities. University policy states that it is the responsibility of students with disabilities to contact the Office of Disabled Student Services (DSS) in Prichard Hall 117, phone 304 696-2271, to provide documentation of their disability. Following this, the DSS Coordinator will send a letter to each of the student's instructors outlining the academic accommodation he/she will need to ensure equality in classroom experiences, outside assignment, testing and grading. The instructor and student will meet to discuss how the accommodation(s) requested will be provided. For more information, please visit <http://www.marshall.edu/disabled> or contact Disabled Student Services Office at Prichard Hall 11, phone 304-696-2271.