

Syllabus – DATABASE I

Introduction to Database (INLS523)

Course Description

Databases are the backbones of modern scholarly, scientific, and commercial information systems. For example, NASA uses databases to manage voluminous quantities of data generated by its many missions, and large pharmaceutical companies use databases for drug-discovery. Use of databases in the humanities and social sciences is also growing. For example, the Library of Congress maintains an important database called Thomas for managing U.S. congressional records, legislations, and historical documents.

Establishment of rigorous standards and design principles has helped to broaden the applications of databases. However, experience has shown that careful attention to demands of users and particular contexts of use is absolutely crucial in achieving design effectiveness.

This course will provide instruction in both fundamental principles and user-centric methodologies for effective database design. The course will be driven by design activities conducted for a semester-long project. It will begin with a description of data flow through organizations based on tasks and operations. Then, abstraction of metadata using data modeling will be covered. Subsequently, requirements-specification will be taught, and students will generate their project descriptions based on in-depth analysis of design problems. This will be followed up with discussions on the relational model and translation of data models to schemata. Next, the focus will shift to hands-on design tasks involving queries, forms, and report generation. After a prototype design is implemented, students will perform small-scale evaluation of the system. Following this, students will learn about life-cycle issues and database maintenance. The final part of the course will concentrate on advanced database systems.

Course Objectives

- Understand DBMS system architecture and components
- Learn database design principles
 - Requirements specification
 - Data modeling
 - Schema transformation
 - User interaction
 - Evaluation
- Gain experience in current DB design tools
- Apply the above cumulative knowledge to create a DB prototype and evaluate it

Office Time

Tuesday, 1:30pm-3pm, Balcony, Armfield Atrium, Michael Hooker Research Center

Course Requirements

- Assignments
 - 10% Assignment 1: Complete a basic requirements specification and data model
 - 10% Assignment 2: Convert data model to schema
- Project (Group Effort)
 - 5% Part 1 of project: Requirements specification with logical data model
 - 5% Part 2 of project: Convert data model to schema
 - 10% Part 3 of project: Prototype & White-box and black-box test suite
 - 15% Part 4 of project: Final System, Usability Report and Presentation
- Oracle assignment
- 15% Assignment 3: SQL, table creation and report generation
- 20% Take-home final exam
- 10% Class participation: Activities in class, regular attendance, and contributions

Grading

Based on current UNC grading scales, the following grades and corresponding numeric ranges are applicable:

Graduate Students

Grad Grade	Range
H	95-100
P	80-94
L	70-79
F	69 or below

Undergraduate Students

UG Grade	Range
A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+, C, C-	70-79
D	60-69
F	59 or below

Required Text-book

Fundamentals of Database Systems (6th Edition)

Ramez Elmasri and Shamkant B. Navathe, Addison-Wesley, 2010.

The previous edition of the book is adequate to fulfill most of the requirements of this course.

Additional Useful Books

Significant number of hands-on activities will involve the use of Microsoft Access 2010. Below are recommended books (watch this space for additional recommendations).

Microsoft Access 2010 Bible, Michael R. Groh, Wiley, 2010.

Access 2013 Bible, Michael Alexander and Dick Kusleika, Wiley, 2013.

Outline and Calendar

Date / Time	Description
Tue Aug 19	Classes Begin
Wed Aug 20 6:00pm-8:45pm Manning 0014	<ul style="list-style-type: none"> Introduction to the class and distribution of the syllabus. Important dates, exam, and assignments described. Class project requirements discussed. Database systems overview and evolution: From file systems to modern database systems.
Mon Aug 25	Last Day of Late Registration
Wed Aug 27	<ul style="list-style-type: none"> Database planning and requirements specification Readings: Chapter 1 <ul style="list-style-type: none"> Data flow in operations and data abstraction.
Mon Sep 1	No Classes Held, Labor Day
Wed Sep 3	<ul style="list-style-type: none"> Data modeling continues. Readings: Chapters 7 and 8 <ul style="list-style-type: none"> Logical model of databases: Relational systems. Readings: Chapter 3 <p>Assignment 1 due 5PM: Given a general scope of system requirements, students must produce a requirements specification document and a conceptual data model.</p>
Wed Sep 10	<ul style="list-style-type: none"> Relational algebra and relational calculus. Readings: Chapters 6 <ul style="list-style-type: none"> Data model to schema conversion. Readings: Chapter 9
Wed Sep 17	<ul style="list-style-type: none"> Database design refinement. Database querying introduced. Readings: Chapter 4 <ul style="list-style-type: none"> Designing tables with appropriate constraints. Formulation and execution of structured query language (SQL) queries. Readings: Chapters 4 and 5
Web Sep 24	<ul style="list-style-type: none"> Advanced SQL and SQL Programming. Readings: Chapter 5 <ul style="list-style-type: none"> Hands-on SQL Example <p>Assignment 2 due 5PM: Convert the data model created in assignment 1 to a schema.</p>

Wed Oct 1	<ul style="list-style-type: none"> Physical DB systems <p>Reading: Chapter 17</p> <ul style="list-style-type: none"> Usability, life-cycle, and evaluation of DB system <p>Readings: Chapter 10</p> <p>Project Part 1 start: Form Project Groups, Discuss Ideas, Define Project Requirements.</p>
Wed Oct 8	<ul style="list-style-type: none"> Interface design principles for DB systems; Intro to MS Access <p>Project Part 1 due: Define Project Requirements.</p>
Wed Oct 15	Spring Break Begins – NO CLASS
Mon Oct 20	Classes resume
Wed Oct 22	<ul style="list-style-type: none"> Introduction to Oracle DB environment. <p>Readings: Chapter 18 plus to be assigned.</p> <ul style="list-style-type: none"> Oracle DB design continues. <p>Readings: Chapter 21 plus to be assigned.</p> <ul style="list-style-type: none"> Hands-on Project Review
Wed Oct 29	<ul style="list-style-type: none"> Overview of Data Warehousing and OLAP. <p>Reading: Chapter 29</p> <ul style="list-style-type: none"> Preparation Project Part 3 <p>Project Part 2 due: Convert project data model to schema.</p>
Wed Nov 5	CHIP Seminar – 4pm-5pm - http://chip.unc.edu/duke-unc-health-informatics-seminar-series/
Wed Nov 5	<ul style="list-style-type: none"> Transaction processing. Concurrency control. <p>Reading: Chapters 21 and 22</p> <ul style="list-style-type: none"> Database Performance <p>Reading: Chapters 24</p> <p>Assignment 3 due: Oracle SQL, table creation and report generation.</p>
Wed Nov 12	<ul style="list-style-type: none"> Database Security XML: Extensible Markup Language <p>Readings: Chapter 12</p> <p>Project Part 3 due: Project prototype, white-box, and black-box testing.</p>
Wed Nov 19	<ul style="list-style-type: none"> Guest Speaker – Trevor Elliott, Principal Architect, Allscripts Professional EMR Hands-on prototype Review
Wed Nov 26	Thanks Giving Break Begins – NO CLASS
Mon Dec 1	Classes resume
Wed Dec 3	<ul style="list-style-type: none"> Class presentations / Wrap-up <p>Project Part 4 due: Final project system and evaluation report. A brief presentation from each group will be expected (different groups will take turns). Class presentation requirements review.</p>
Wed Dec 3	Classes End
TBD	Final Exam Dec 5 – Dec 12