

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of Congress maintains an important database called Thomas for managing U.S. congressional records, legislations, and historical documents.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

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 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 and evaluation report
- 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 to class list

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
Wed Jan 8	Classes Begin
Thu Jan 9 6:00pm-8:45pm Manning 304	<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. <hr/> <ul style="list-style-type: none"> Database systems overview. Database system evolution: From file systems to object oriented systems.
Tue Jan 14	Last Day of Late Registration
Thu Jan 16 6:00pm-8:45pm Manning 304	<ul style="list-style-type: none"> Database planning and requirements specification Readings: Chapter 1 <hr/> <ul style="list-style-type: none"> Data flow in operations and data abstraction. Assignment 1: Given a general scope of system requirements, students must produce a requirements specification document and a data model.
Mon Jan 20	No Classes Held, Holiday
Thu Jan 23 6:00pm-8:45pm Manning 304	<ul style="list-style-type: none"> Data modeling continues. Readings: Chapters 7 and 8 <hr/> <ul style="list-style-type: none"> Logical model of databases: Relational systems. Readings: Chapter 3
Thu Jan 30 6:00pm-8:45pm Manning 304	<ul style="list-style-type: none"> Relational algebra and relational calculus. Readings: Chapters 6 <hr/> <ul style="list-style-type: none"> Data model to schema conversion. Readings: Chapter 9
Thu Feb 6 6:00pm-8:45pm Manning 304	<ul style="list-style-type: none"> Database design refinement. Database querying introduced. Readings: Chapter 4 <hr/> <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 Assignment 2: Convert the data model created in assignment 1 to a schema.

Thu Feb 13 6:00pm-8:45pm Manning 304	<ul style="list-style-type: none"> Advanced SQL and SQL Programming. Readings: Chapter 5
	<ul style="list-style-type: none"> Usability, life-cycle, and evaluation of DB systems. Readings: To be assigned.
Thu Feb 20 6:00pm-8:45pm Manning 304	<ul style="list-style-type: none"> Usability, life-cycle, and evaluation of DB systems (Contd.). Readings: Chapter 10
	<ul style="list-style-type: none"> Interface design principles for DB systems. Basic screen, form, and interaction design. Practical database design methodology and UML diagrams. Readings: To be assigned.
Thu Feb 27 6:00pm-8:45pm Manning 304	<ul style="list-style-type: none"> Physical DB system: Disks, files, and hashing I Reading: Chapter 17
	<ul style="list-style-type: none"> Physical DB systems II Reading: Chapter 17
Thu Mar 6 6:00pm-8:45pm Manning 304	<ul style="list-style-type: none"> Hands-on Project Review and Intro to MS Access Project part 1: returned and next project part distributed Project Part 2: Convert project data model to schema.
Fri Mar 7	Spring Break
Fri Mar 17	Classes resume
Thu Mar 20 6:00pm-8:45pm Manning 304	<ul style="list-style-type: none"> Indexing structure of files Introduction to Oracle DB environment. Readings: Chapter 18 plus to be assigned.
	<ul style="list-style-type: none"> Oracle DB design continues. Distributed DBs and Client-Server Systems Readings: Chapter 21 plus to be assigned.
Thu Mar 27 6:00pm-8:45pm Manning 304	<ul style="list-style-type: none"> Advanced topics: Data analysis and mining. Domain focus: Biomedicine. Reading: To be assigned.
	Assignment 3: Oracle SQL, table creation and report generation.
	<ul style="list-style-type: none"> Overview of Data Warehousing and OLAP. Reading: Chapter 29
	Project Part 3: Project prototype, white-box, and black-box testing.
Thu Apr 3 6:00pm-8:45pm Manning 304	<ul style="list-style-type: none"> Guest Speaker Transaction processing. Concurrency control. Reading: Chapters 21 and 22
	A preliminary review of the project prototype will be conducted during this day.
Thu Apr 10 6:00pm-8:45pm Manning 304	<ul style="list-style-type: none"> XML: Extensible Markup Language Reading: Chapter 12
	<ul style="list-style-type: none"> Non-structured and textual data management Readings: Chapter 27

<p>Thu Apr 17 6:00pm-8:45pm Manning 304</p>	<ul style="list-style-type: none"> • Database security. <p>Reading: Chapter 24</p> <hr/> <ul style="list-style-type: none"> • Beyond structured data management. Temporal, Spatial, and Multimedia data. Exam review. <p>Readings: Chapter 26</p> <p>Reminder: Project Part3: Develop white-box and black-box test suite.</p> <p>Project Part 4: 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>
<p>Fri Apr 18</p>	<p>Holiday</p>
<p>Thu Apr 24 6:00pm-8:45pm Manning 304</p>	<ul style="list-style-type: none"> • Class presentations • Wrap-up
<p>Fri Apr 25</p>	<p>Classes End</p>