Syllabus
INLS 523, Database Systems I, Stephanie W. Haas

Instructor

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Acknowledgements

The design, materials, and implementation of this online version of INLS 523 is the product of a collaborative effort of SILS database instructors: Joan Boone, Rob Capra, Arcot Rajasekar, and myself.

Syllabus Contents

Course Description

INLS 523: Database Systems I: Introduction to Databases (3 credits)
Prerequisite:

> Undergraduates: INLS 161 or equivalent.
> Graduates: Satisfactory completion of the SILS Information Technology Competency Requirement (https://sils.unc.edu/programs/graduate/msis/curriculum-new#Technology_Requirement).

Design and implementation of database systems. Semantic modeling, relational database theory, including normalization, query construction, and SQL.

This course will introduce the basic concepts and applications of relational database management systems, including semantic modeling and relational database theory. Topics include: user requirements and specifications, semantic data modeling, the relational model, SQL, normalization and data quality, and emerging technologies.

Course Outline

Introduction and Database Concepts
Entity-Relationship Models
Relational Theory and Concepts
SQL
Good Design
Functional Dependencies and Normalization
Data Quality

Learning Objectives

- Understand the basic concepts of databases, with emphasis on the relational model
- Gain experience with both the theoretical and practical aspects of database design and implementation.
- Develop proficiency with entity-relationship modeling.

- Be able to weigh, discuss, and justify database design decisions.
- Learn how to use SQL to create, manipulate and query databases
- Apply practical techniques for improving database design quality
- Gain an understanding of important ideas for databases in the future

Textbook
There is no required textbook for this course. Readings or links to readings will be included in the Sakai modules. The Tools and Resources document gives information about tools and resources you need for this course. I have suggested chapters from one textbook for those who would like to see additional examples or explanations of concepts and processes: Elmasri, R. & Navathe, S. (2011). *Fundamentals of Database Systems, Sixth Edition*, Addison-Wesley. We will use some examples from this textbook in the course.

The file E&NChapters.pdf in the Sakai/Resources/Official Documents folder contains suggestions for readings for each course module, as well as a crosswalk between chapters in the 4th, 5th, and 6th editions.

Policies on Academic Integrity and Diversity
Chapel Hill has had a student-administered honor system and judicial system for over 100 years. Because academic honesty and the development and nurturing of trust and trustworthiness are important to all of us as individuals, and are encouraged and promoted by the honor system, this is a most significant University tradition. More information is available at http://studentconduct.unc.edu/honor-system

The UNC Honor Code is in effect for all work in this course. Section II. B. of the "Instrument of Student Judicial Governance" gives examples of actions that constitute academic dishonesty: https://studentconduct.unc.edu/sites/studentconduct.unc.edu/files/documents/Instrument.pdf

Students often ask what is okay to talk about with other students and what is not. There are some specific guidelines for this course.

- I do encourage you to help each other learn the course material – your fellow students can often be a great resource for learning. For example, you could watch one of the videos together, and discuss the material it presents. However, you should not discuss the details of a solution to an ongoing assignment with other students, and should never copy or share answers for an assignment with other students. It is okay to talk about course material with other students, but you should not discuss solutions to pending assignments.
- All work you submit should be your own.
- You may give and receive assistance regarding the use of hardware and software. For example, you may ask or answer a question such as "how do I [fill in the blank] in SQLite?"). A question such as "Should I have a separate table to represent cats and their information?" should be addressed to me.
- Individual homework assignments are to be done **individually**. You may consult the course materials, your notes, and even other print or web sources. (Keep in mind, however, that what you find in other sources may not be consistent with what I want you to do.) You may not consult your classmates or other people; all questions should be addressed to me.
- You must sign (check) the honor statement when you submit each assignment. This confirms that you and the work conforms to the Honor Code.

In support of the University's diversity goals and the mission of the School of Information and Library Science, SILS embraces diversity as an ethical and societal value. We broadly define diversity to include race, gender, national origin, ethnicity, religion, social class, age, sexual orientation and physical and learning ability.
As an academic community committed to preparing our graduates to be leaders in an increasingly multicultural and global society we strive to:

- Ensure inclusive leadership, policies, and practices;
- Integrate diversity into the curriculum and research;
- Foster a mutually respectful intellectual environment in which diverse opinions are valued;
- Recruit traditionally underrepresented groups of students, faculty and staff; and
- Participate in outreach to underserved groups in the State.

The statement represents a commitment of resources to the development and maintenance of an academic environment that is open, representative, reflective and committed to the concepts of equity and fairness.

Grading Policies
The following grade scale will be used AS A GUIDELINE (subject to any curve) **for undergraduate** students:

Grade Range	Definition*
A 90-100%	Mastery of course content at the highest level of attainment that can reasonably be expected of students at a given stage of development. The A grade states clearly that the students have shown such outstanding promise in the aspect of the discipline under study that he/she may be strongly encouraged to continue.
B 80-89.9%	Strong performance demonstrating a high level of attainment for a student at a given stage of development. The B grade states that the student has shown solid promise in the aspect of the discipline under study.
C 70-79.9%	A totally acceptable performance demonstrating an adequate level of attainment for a student at a given stage of development. The C grade states that, while not yet showing unusual promise, the student may continue to study in the discipline with reasonable hope of intellectual development.
D 60-69.9%	A marginal performance in the required exercises demonstrating a minimal passing level of attainment. A student has given no evidence of prospective growth in the discipline; an accumulation of D grades should be taken to mean that the student would be well advised not to continue in the academic field.
F 0-59.9%	For whatever reason, an unacceptable performance. The F grade indicates that the student's performance in the required exercises has revealed almost no understanding of the course content. A grade of F should warrant an advisor's questioning whether the student may suitably register for further study in the discipline before remedial work is undertaken.

*Definitions are from: http://registrar.unc.edu/academic-services/grades/explanation-of-grading-system/ (underlining is my emphasis)

Plus and minus scores, when given, use the following range:

A A-	93 and higher 90-92
B+ B B-	88-89 83-87 80-82
C+ C C-	78-79 73-77 70-72
D+ D D-	68-69 63-67 60-62
F	59 and below

The following grade scale will be used AS A GUIDELINE (subject to any curve) for **graduate** students:

Grade Range	Definition*
H 95-99%	High Pass
P 80-94.9%	Pass
L 70-79.9%	Low Pass
F 0-69.9.9%	Fail

*Definitions are from: http://registrar.unc.edu/academic-services/grades/explanation-of-grading-system/

Due Dates and Late Work

Each assignment has a due date and time and includes instructions for submission. A late penalty of 5% per day will be applied unless prior arrangements have been made with the instructor. Assignments submitted more than 5 days after the due date will receive no credit and will not be graded.

Requests for Extensions

If you have a real problem submitting an assignment on time, please contact me *before* the due date. Getting a late start on an assignment does not count as a real problem. Any request for an extension must be made, preferably by email, at least 24 hours prior to the due date. If an emergency arises that prevents you from contacting me in advance, you must do so as soon as possible.

Grade Components

- Discussion contributions, 10% of final grade
- Tests, 30% of final grade
- Assignments, 30% of final grade

- Project, 30% of final grade

The Assignment Overview provides additional information about the work for this course.

Course Communications

Course announcements

Announcements will be posted on Sakai. Announcements may include information about the week's work, or other timely information.

Messages

I may use the message tool to send individual messages to you; I may also copy the message to your email address. You can also use the tool to send a message to me.

Email

Email is the best way to contact me.

Note that I receive a large amount of email and while I try to reply to student emails within 48 hours, there are times that it may take me 2-3 days to reply. Therefore, it is important that you get started on assignments early, so there is time for me to respond to any questions you may have. I cannot guarantee that I will be able to answer last-minute questions (e.g., within 2 days of the assignment due date).

Sakai

All enrolled students should have access to the UNC Sakai site for this course:
http://sakai.unc.edu/
We will use Sakai for almost all course activities.

Course Materials

All materials can be found in Sakai. The course syllabus, schedule, and information about tools and other resources will be there at the beginning of the semester.

Materials for each unit are located in the **Lesson** for that unit on the Sakai site. You should work through each unit's materials in the order they are listed. Unit materials, including videos and slides, exercises, and discussion topics will be published Tuesday mornings at 8:30 a.m. Once published, they will be available for you to study through the end of the semester.

Discussion Forum

We will use the Sakai discussion forum for discussions about a variety of database-related topics.. The Discussion Overview provides additional information about the discussions for this course.

Assignments

All Assignments, and Project Deliverables must be submitted using the Sakai Assignments tool. In my experience, Sakai is a reliable method for submitting assignments. It is the responsibility of each student to make sure they have access to Sakai and can submit assignments when they are due.

If for some reason you are unable to submit an assignment to Sakai, as a last resort you may email it to me along with a note about the problem you encountered. Then, as soon as you are able to, it is your responsibility to submit the exact same assignment to Sakai. The email serves as a record that you tried to submit the assignment on time, but to receive credit, your assignment must be uploaded to Sakai.

Drop Box

You each have a drop box in Sakai that is accessible only to you and me. You may store work in progress here. If you have a question about an assignment, and it would be helpful for me to see your work, you may store the draft in your drop box, and refer to it in your emailed question. I will look at only that file to respond to your question.

Do NOT submit homework by putting it into your drop box; all assignments should be submitted in the assignment.

Tests

Tests will be administered using the Tests & Quizzes Tool. Each of the 5 tests covers material from 1 major topic area:

1. Database Concepts
2. Entity-Relationship Models
3. Relational Concepts and Mapping
4. SQL
5. Design, Functional Dependencies, and Normalization.

Tests will be published Saturday at 8:00 a.m. and must be completed by Tuesday 11:55 p.m. You may take the test at any time during that period, but once you have started, you must complete it in one sitting. To help your planning, I will post the approximate amount of time I expect each test to require, but remember that this is only a rough estimate – everyone works at a different pace.

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This tentative schedule outlines the major topics and events planned for the semester. See the Unit Lessons in the Sakai site for details.

General recommendations:

- Units open on Tuesday at 8:30 am: you will be able to see the list of all materials, exercises, and assignments at that time.
- Complete materials and exercises in the order shown in each unit. (Sakai will enforce the sequence – you will not be able to skip over any items.)
- You will be able to read assignment and project specifications when the Unit opens, but you should learn the Unit's material before completing them.
- You may work at your own speed during each unit. I have marked what I would consider to be a week's worth of work within each unit, to serve as a rough guideline.
- Discussions, Assignments, and Project Deliverables have specific due dates; be sure you submit your work by the deadline. (Of course, you are welcome to submit them earlier!)
- Tests have specific opening and closing dates; be sure you are ready to take each test during the testing window.

Unit 1, Tuesday 2019-08-20 - Monday 2019-09-02 Database Concepts (2 weeks)

Welcome and Introduction

Assignment 1: Official course documents, introductions, survey of DB experience. Due Monday 2019-08-26 11:55 pm

Videos: Orientation, Movie DB

Exercise: Movie DB Exercise

------ end of week ------

Videos: DB Concepts Part 1, DB Concepts Part 2

Discussion: What's in CC? Complete any time before 2019-09-02, 11:55 p.m.

Slides: DB Environment

Exercises: DB Concepts Exercises 1, DB Concepts Exercises 2

Test 1, Database Concepts: opens Saturday 2019-08-31 8:00 a.m., due by Tuesday 2019-09-03, 11:55 pm.

Unit 2, Tuesday 2019-09-03 – Monday 2019-09-23. ER Models (3 weeks)

Introduction to the Unit

Videos and documentation: How to draw an ER model, Entities and Attributes,

Composite Attributes, Keys, Relationships: Degree and Cardinality, Relationships: Participation and Practice, Meet the Grants Database: Overview of the Grants DB, Reading the Grants ER

Exercises: Entity Relationship (1), Entity Relationship (2)

Start Project 1: Select database problem, read requirements, draw ER. Due Monday 2019-09-30, 11:55 pm

------ end of week ------

Videos: Ternary Relationships, Weak Entities,

Exercises: Entity Relationship (3), Entity Relationship (4

Assignment 2, ER Models. Due Monday 2019-09-23, 11:55 pm.

------ end of week ------

Videos: Extended ER Concepts, Extended ER Design

Exercise: More Design Practice

Test 2, ER & EER: opens Saturday 2019-02-9 8:30 a.m., due Tuesday 2019-09-24, 11:55 pm

Note: Diagrams in Extended ER Concepts and Extended ER Design are from Elmasri & Navathe, 2011: (8.1, 8.3 8.4, 8.5)

Unit 3, Tuesday 2019-09-24 -- Monday 2019-10-07. Relational Concepts & Mapping (2 weeks)

Introduction to the Unit

Videos: Relational Concepts (Capra), The Nursery, or What does a PK Identify?

Exercises: Relational concepts (1), Relational concepts (2)

Discussion: Implications of Design Decisions: Contributions and responses due Monday 2019/09/30, 11:55 pm

------ end of week ------

Read Elmasri & Navathe, (2011) Fundamentals of Database Design, Addison Wesley. Ch. 9, Relational DB Design by ER and EER to Relational Mapping, 285-299

Videos: ER-DB Mapping: The Grants DB, Mapping the Movie ER

Exercises: ER to Schema, Schema to ER, ER-DB

Assignment 3: Mapping. Due Monday 2019-10-07, 11:55 pm.

Test 3, Relational concepts and mapping: opens Saturday 2019-10-05 8:00 a.m., due Tuesday 2019-10-08, 11:55 pm.

Unit 4, Tuesday 2019-10-08 -- Monday 2019-10-28. SQL Part 1 (3 weeks, includes Fall Break)

Introduction to the Unit

Videos and documentation: Introduction to SQL, Creating Tables, Inserting Records, Download Instructions: DB Browser for SQLite, DB Browser for SQLite Demo, Using SQLite with the Grants Database

Exercises: Mapping Practice, SQL (1), Exercise: SQL (2)

DB Practice Assignment: Due Monday 2019-10-21, 11:55 pm.

------ end of week ------

Videos and : Basic Queries, Joining Tables, More about Queries, Aggregate Queries,

Exercises: SQL (3), Schema Practice, Exercise: SQL (4)

Project 2: schema, data dictionary, create statements. Expect to revise P1 based on my comments and suggestions, before you start P2. Due Monday 2019-11-04, 11:55 pm

Unit 5, Tuesday 2019-10-29 -- Monday 2019-11-11. SQL Part 2 (2 weeks)

Introduction to the Unit

Videos: More About Joins,

Exercises: SQL (5), SQL (6)

------ end of week ------

Videos: Set Operators, Nested and Correlated Queries, Views and Triggers, Anatomy of a Query

Exercises: SQL (7) Query Practice, SQL (8): More SQL Practice

Assignment 4, SQL: Due Monday 2019-11-11, 11:55 pm.

Test 4, SQL: opens Saturday 2019-11-09 8:00 a.m., due Tuesday 2019-11-12, 11:55 pm.

Unit 6, Tuesday 2019-11-12 -- Monday 2019-11-25. Design, Normalization, and Data Quality (2 weeks)

Introduction to the Unit

Videos: Good Design, Introduction to Functional Dependencies,

Introduction to Normalization

Exercises: SQL (9) Even more SQL Practice, SQL (10) The final SQL, FDs & Normalization (1), FDs & Normalization (2)

------ end of week ------

Videos: Normalization: 1NF & 2NF, Normalization: 3NF & Summary, Data Quality, Reverse Engineering the Tour Company

Exercises: Normalization (1), Normalization (2), Reverse Engineering

Assignment 5, due 2019-04-15 requires Normalization

Discussion: Databases in you/our/society's future. Contributions and responses due Monday 2019-11-25, 11:55 pm

Assignment 5, FDs and Normalization: Due 2019-11-25, 11:55 pm.

Test 5, Good Design, Functional Dependencies, and Normalization: opens Saturday 2019-11-23 8:00 a.m., due by Tuesday 2019-11-26, 11:55 pm.

Project 3: records, queries, lessons learned. Expect to revise P2 based on my comments and suggestions, before you start P3. Due Thursday 2019-12-12, 8:00 am

Unit 7, Tuesday 2019-11-26 – Thursday 2019-12-12, 8:00 AM. Project Completion (3 weeks)

Introduction to the Unit

Project 3 due Thursday 2019-12-12, 8:00 AM

Assignment Overview
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Assignments for this course are intended to provide opportunities for:

- practice working with database concepts and skills,
- experience building a database from initial conception to final testing,
- interaction with your student colleagues to discuss issues in database design and implementation,
- assessment of your learning.

There is no final exam for this course.

Exercises (ungraded)

Each Unit includes several exercises. These are opportunities for you to practice the material that has just been presented. It is important that you really work on the exercises – they will reinforce what you have learned, and help you be ready for the tests, assignments, and project.

- Very short exercises are embedded in the videos. I will present a question or set a problem. You should then pause the video and do the exercise, then resume the video and compare your answer to the one provided.
- Longer exercises are listed in the Unit in the order in which you should do them. After you complete the exercise, you will be able to compare your answer to the solution.
- You are welcome to consult the videos, slides, or transcripts while you are working on them.
- Please ask me if you have any questions about the problem or the solution.
- If you think your answer is correct, even though it is different from the one in the solution, you may upload your solution into your Sakai Dropbox, and send me an email asking me to review it.

Discussion topics (10% of final grade)

You must contribute to 3 discussion topics during the semester. Unit 1 and Unit 3 discussions are worth 4% of your final grade, Unit 6 discussion is worth 2%. See the Discussion Overview in the Official Course Documents (Unit 1) for details.

- Unit 1: What's in Connect Carolina?
- Unit 3: Implications of design decisions
- Unit 6: Databases in my/our/society's future

Tests (30% of final grade)

Each of the 5 tests covers material from 1 major topic area:

1. Database Concepts
2. Entity-Relationship Models
3. Relational Concepts and Mapping
4. SQL
5. Good Design, Functional Dependencies, and Normalization

The Schedule lists the start and end dates/times for each test. Tests will be published in the Sakai test tool Saturday at 8:00 a.m. and must be completed and submitted no later than Tuesday 11:55 p.m. You may take the test at any time during that period, but once you have started, you must complete it in one sitting. To help your planning, I will post the approximate amount of time I expect each test to require, but remember that this is only a rough estimate – everyone works at a different pace.

Assignments (30% of final grade, 7.5% each, except A1)
There are 5 assignments. The first assignment lets you practice submitting assignments through Sakai, and is ungraded. The other 4 assignments each cover a major topic/skill in database design and development.

Assignments are available at the beginning of the Unit in which they're assigned, and you are welcome to look at them. However, you will need to learn material in the Unit before you can complete them. The schedule lists the due dates for each assignment.

- Assignment 1, Start-up (ungraded)
- Assignment 2, Entity-Relationship Model
- Assignment 3, DB Mapping
- Assignment 4, SQL
- Assignment 5, Functional Dependencies and Normalization

Database Project (30% of final grade: P1 10%, P2 10%, P3 10%)
The semester-long database project covers the whole process of database design and development, from initial conceptualization to running queries. The Schedule lists the due dates for each project deliverable.

P1: Read the description and requirements for two databases: Database A is for an interior design company, and Database B is for a historical estate's tours and activities. Choose which database you want to design and build this semester. Draw the ER model for the database you have chosen, and document any additional assumptions you have made.

P2: Revise the ER based on instructor feedback. Then map the ER to the database schema, and create a data dictionary for the DB. Based on the schema and data dictionary, write and execute the SQL create statements to build the database tables. Write at least 10 specific questions that you will pose as queries to the database in P3. The questions should reflect the information needs of the database users, and demonstrate that your database supports their needs. The questions should be different from those given in the initial description.

P3: Revise the database structure (schema, data dictionary, tables) based on instructor feedback. Populate the database with records, and write and run the queries. Reflect on your "lessons learned".

The Project is worth 30% of your final grade: 10% for each deliverable.