

# **Syllabus**

## **CSCI 341 Database Systems**

### **Fall 2019**

#### **Teaching Staff**

Prof. Mona Rizvi

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TA TBD

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#### **Fall Term Schedule**

CSCI 341-1L MWF 15:00 – 15:50, 7e.429

#### **Course Overview**

This is a first course in database management systems, with coverage of database design, architectures, data manipulation and query languages, database normalization and integrity. This course emphasizes concepts and techniques related to the entity-relationship model and relational database systems. NoSQL systems are introduced.

#### **Course Aims**

The aims of the course are:

1. To introduce students to the basics concepts of database systems
2. To familiarize students with database development using relational and NoSQL database systems

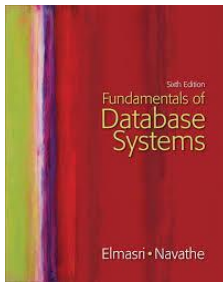
#### **Course Outcomes**

After taking and successfully passing this course, the students will be able to

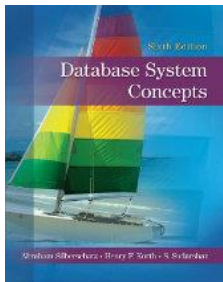
1. Define a database, and the characteristics and functions of a database management system
2. Model simple real world systems using (Enhanced) Entity Relationship Diagrams from a requirements specification
3. Understand the relational data model and relational model constraints
4. Understand, modify and create relational database schemas
5. Understand and illustrate functional dependencies and inference rules
6. Understand the normal forms and be able to apply normalization techniques to normalize a database up to third normal form
7. Understand physical database storage and indexing techniques.
8. Demonstrate the use of SQL for database creation and maintenance
9. Develop SQL queries for data aggregation, calculations, views, data manipulation, and report generation.
10. Understand transactions and their purpose, as well as the SQL syntax associated with them.
11. Design and implement a database application
12. Understand terms and concepts relating to NoSQL, and its differences from the relational model.

## Course Materials

A number of database books are available online, and the Elmasri textbook is available in the library:



Elmasri and Navathe (2011) Database Systems: Models, Languages, Design, and Application Programming – 6th Edition. Pearson (Global Edition). ISBN: 0-13-214498-0



Silberschatz, Korth and Sudarshan (2010). Database Concepts, Sixth edition.

- The MySQL DBMS and other required or useful software tools (modeling tools, client access tools, programming APIs, etc.) are available for free download.

## Class Structure

The model of instruction will emphasize a blend of lecture, presentation, demonstration, and hands-on exercises. The class meetings will be conducted in a lecture hall, so students will be required to bring their own laptops for lab exercises.

Attendance to class sessions is compulsory. In-class exercises will be given on a regular basis. Homework will be given weekly or bi-weekly, depending on the difficulty of the assignment. There will be two tests given on current material during the semester, as well as a cumulative final exam given during the official exam week.

Students who miss assignments or exams for medical reasons are required to submit a doctor's note and make individual arrangements for make-ups, if possible. Arrangements for make-ups for other types of emergencies or conflicts should be discussed with the instructor as early as possible.

In-class exercises are designed to help you practice the current material and may be done and submitted in pairs. Discussion with your other classmates, the instructor and the TAs is *encouraged* during these exercises. Homework assignments are intended to be *individual* work, unless you are instructed otherwise. Tests and exams are *always* individual work.

Materials will be disseminated to the students using moodle ([moodle.nu.edu.kz](http://moodle.nu.edu.kz)), and you will submit most assignments using moodle. Announcements will be posted in moodle and sent in email, so it is important to check your university email on a regular basis.

## Course Assessment

The final grade is calculated as follows:

- |                                  |     |
|----------------------------------|-----|
| • Homework:                      | 10% |
| • Final Project                  | 25% |
| • Tests/Quizzes:                 | 35% |
| • Final Exam:                    | 20% |
| • Attendance/In-class Exercises: | 10% |

**Reading:** Finish any assigned readings during the week they are assigned, preferably before the lecture to which they apply, so that you will be prepared to do the in-class exercises.

**In-class exercises:** Will be given regularly on the current topic. No late (or make-up) work will be accepted for in-class assignments because the solutions will be discussed in-class or be posted soon after class. Students with official excused absences will be exempted from in-class work that is missed.

**Final Project:** A final project will be assigned on the middle of the semester. It can be done alone or in a team of two people. It will involve the design, implementation and documentation of a full database application. The implementation may be done in C/C++, Java, or another approved language, depending on your skill set. The final project will be subject to “live” grading, where you must present and explain your work to one of the instructors or teaching assistants in person. The project may also include multiple interim submissions, and a presentation.

**Homework:** Homework will be assigned on an intermittent basis, and you will be given one or two weeks to complete it, depending on the length and difficulty of the assignment.

**Tests and Exams:** Tests will be given on the most recent material, but the final exam will be cumulative.

**Grading Scale:**

<b>A</b>	95 - 100
<b>A-</b>	90 - 94
<b>B+</b>	85 - 89
<b>B</b>	80 - 84
<b>B-</b>	75 - 79
<b>C+</b>	70 - 74
<b>C</b>	65 - 69
<b>C-</b>	60 - 64
<b>D+</b>	55 - 59
<b>D</b>	50 - 54
<b>F</b>	49 or below

## Course Outline

	Week of	Topics
1	Aug 12	Introduction Database System Concepts
2	Aug 19	ER Model
3	Aug 26	EER Model <b>August 30 - holiday</b>
4	Sep 2	Relational Model
5	Sep 9	<b>Test #1</b> SQL
6	Sep 16	SQL Database Programming Techniques
7	Sep 23	Complex SQL
	Sep 30	Fall Break
8	Oct 7	Complex SQL
9	Oct 14	Physical models of databases
10	Oct 21	<b>Test #2</b> Physical models of databases
11	Oct 28	Functional Dependencies & Normalization
12	Nov 4	Transactions
13	Nov 11	NoSQL Databases
14	Nov 18	NoSQL Databases
	Nov 24 – Dec 4	<b>FINAL EXAMS</b>

**Add deadline is Aug 16, drop deadline is Aug 23, and withdraw deadline is Oct 9.**

**Topic, assignment, and test schedule is subject to change.**

## **Academic Integrity**

Nazarbayev University and the School of Science and Technology have established high standards for academic integrity, using an approach in which students are trained to produce original work according to professional standards, and to properly cite and reference the work of others when it is appropriate to do so.

The specific guidelines are published in the NU Student Handbook. In particular,

- The assignments in this class are designed to introduce important concepts and techniques and enable you to explore the material independently so as to gain insight and comprehension of the subject. Doing the work is much more important than getting the right answer.
- The course is designed such that each new week's material builds on the skills developed in the preceding week, thus, any action that interferes with this process (missing class, skipping the assignment, copying) will seriously impede your progress.
- You are welcome—and encouraged—to talk through concepts and ideas with your fellow students and to study with them, but do not give or receive direct help from your classmates on a graded assignment.
- Homework should be completed individually. If you distribute your work to others, even if you are not intending them to copy it, this is still considered academic misconduct.
- Even the appearance of cheating or inappropriate copying should be avoided.
- Students should be aware that the homework submission process incorporates an automated plagiarism detector.
- You may only get help on graded assignments from designated people—the professors or TAs for the course. If you are struggling with an assignment, by all means, please seek help from them.

In the event that academic misconduct such as plagiarism or cheating is discovered, the student will receive no credit for the work, and the event will be reported to the Senior Administrator for Students. Egregious cases, or a second offense, will result in failure of the course and potential suspension or expulsion from the university.

When a student suspects that another student has violated the academic honesty policy, a report should be made to the appropriate faculty member.

## **Behavior**

Students are expected to maintain respectful decorum in the classroom and laboratories, and in all interactions with fellow classmates, Teaching Assistants, Research Assistants and NU faculty and staff. Class time is short, and valuable, and thus should be used effectively; students are expected to refrain from such distractions as texting, phone calls, on-line chats, personal web browsing, the use of social networking sites, and excessive chatting or greetings during class time.

Students should come to class well-prepared, having completed the background reading and related assignments, and possessing proper resources for the class meeting (books, paper, writing implements, computers, etc.), as needed.