IS 331
Database Design, Management and Applications
Fall 2015

Course Syllabus

Instructor: Chris Markson
Class Times: MW 11:30a-12:55pm
Office Hours: Wednesday 1:00-2:30pm, Thursday 10:30a-12:00pm, or by appointment

E-Mail: crm23@njit.edu
Office: 4th floor GITC, Co-Lab

Prerequisites: Completion of a 100-level GUR course in computing, such as IS118 or CS101 or CS104 or CS113. (It is also assumed that students have some basic familiarity with Microsoft Office (2007 or 2010), particularly Microsoft Access.)

Required Texts:


Class URL: We will be using Moodle, an open source Learning Management System at NJIT, for the posting of projects and class resources and other class announcements. Important information regarding assignments, lectures, exams, etc. will be made on Moodle in addition to being announced and/or distributed in class. All students will be held accountable for items posted on the site whether or not it is announced in class, and whether or not they attended any particular class. Students are obligated to log into Moodle on a near-daily basis, and to keep current.

Course Description: “We are drowning in data!” - CIO of a fortune 100 company
Modern organizations generate huge amount of data on a daily basis and are in constant need for the database technology to organize, store, retrieve, share and analyze large-scale data. Hiding behind the scene, database technology serves as the backbone for many “hot” technologies such as ERP, CRM, Web-based systems, Dashboard & Scorecard, and Data Warehouses. Since database plays such a crucial role in business operations of any modern organizations, an IS professional must understand how to plan, design, implement and manage database systems.

This course gives students extensive, pragmatic experience in designing, building, querying, updating, maintaining and managing relational databases, using the Structured Query Language (SQL). We will start our journey by analyzing what database is and why it is superior to other data management methods. We will then conduct logical and physical database design. SQL will be extensively covered, and students will design and implement sophisticated SQL queries invoking self-joins, outer joins, correlated sub queries and related concepts. Hands-on experience will be gained by working with actual databases using industry-standard database management systems such as Oracle.

**Expected Course Competencies:** By the end of this course, students should be able to:

1. Analyze information needs that ought to be supported by database management systems.

2. Identify, analyze, and propose solutions to organizational issues involved in data management.

3. Apply the fundamentals of database design, including conceptual, logical, and physical design.

4. Understand the structure of a relational database management system.

5. Normalize (& de-normalize) data.

6. Use SQL to implement, manage and query a database

7. Design and implement a modern relational database system using Oracle DBMS

8. Know the basics of advanced DB topics such as non-relational database, ERP and data warehouse

**Course Structure:** The structure of the course will be mostly lectures. Discussion during the lecture portion is strongly encouraged and will be reflected in your class participation grade. Hands-on lessons may be part of the lecture. Students are encouraged to bring their laptops to class.
Assignments: We will have weekly assignments. They will be posted on Moodle with a due date.

Grades for late assignments will be reduced by an additional 10% for each day beyond the deadline. Assignments that are more than 2 days late will receive no credit.

Grade:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>30%</td>
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<tr>
<td>Midterm Exam</td>
<td>30%</td>
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<td>Final Exam</td>
<td>35%</td>
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<td>Class Participation</td>
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Policy on Collaboration/ Cheating:

Every assignment is a 'home-mini-exam.' The NJIT Honor Code will be strictly upheld. Students found cheating/collaborating/plagiarizing will be immediately referred to the Dean of Students and the NJIT Committee on Professional Conduct and subject to possible Disciplinary Probation, a permanent marking on the record, possible dismissal and a grade of 'F' in the course. All submitted assignments are carefully checked for similarities, and plagiarism and guilty students will be identified and referred to the Dean of Students for disciplinary action.

TENTATIVE CLASS SCHEDULE

Below are the TOPICs covered in the course. Remember one of the keys to success in IS331 is your own self-discipline - your goal should be to maintain currency each week, and NEVER fall behind! (Note: this is the topical curriculum model for the course, though we reserve the privilege to modify and adjust attributes of this table (topics, dates, etc.) for the benefit of the course.)

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>You Will Know:</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Introduction:</td>
<td>Who am I, who are you, and</td>
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<td></td>
<td>Database Intro.</td>
<td>What am I, who are you, and what are we going to do?</td>
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<tr>
<td></td>
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<td>What is data?</td>
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<td>A Brief History of</td>
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<td>Data Management</td>
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<td>Week 2</td>
<td>Database Development</td>
<td>Why Database?</td>
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<td>Process</td>
<td>How to build a database?</td>
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<td>A look ahead</td>
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<td></td>
<td>Conceptual Design (I)</td>
<td>What is conceptual design?</td>
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<td></td>
<td></td>
<td>ERD Terminology</td>
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<tr>
<td>Week 3</td>
<td>Conceptual Design(II)</td>
<td>Advanced Concepts in ERD</td>
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Week 4

The Relational Model: Data Structure
What is a relation?
Relational Model Terminology
[HANDS-ON] How to create & Store relations in MS Access

The Relational Model: Data Integrity
What’s all this fuss about “keys”? [HANDS-ON] linking tables in MS Access

Week 5

Logical Design: From ER to Relational Model
How to turn my ER Model into tables?

Normalization
How to design GOOD databases?

Week 6

Relational Algebra (I)
Why “Algebra” is not really as scary as it sounds

Relational Algebra (II)

Week 7

Relational Algebra (III) [HANDS-ON] Query-by-Design in MS Access

Intro to SQL
[HANDS-ON] Use SQL in Oracle to create tables

Week 8

SQL Basics [HANDS-ON] Single table Queries & aggregation

SQL: More Advanced Commands [HANDS-ON] Query using multiple tables, Cross Join

Week 9

Oracle PL/SQL [HANDS-ON] PL/SQL

Week 10

Non-relational database

Week 11

Non-relational database

Week 12

Data Warehouse Dashboard
Why data warehouse?
How to visualize your data to best understand it?
[HANDS-ON] Use Tableau to build Dashboards

Final Exam Period
Final Exam