



## **LIS 2680: Database Design and Applications**

**Summer 2012**

### **Instructor:**

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### **I. Course Description:**

This course offers an examination of characteristics and concepts of database design, which includes database development process, relational database models, entity-relationship model, normalization, structured query language (SQL), current web database technologies; database administration; and database applications in libraries and archives.

The course aims at helping students to develop a broad understanding of modern database design. The teaching method is a mixture of theoretical lectures and practical exercises. Besides weekly theoretical lectures, lab session is an essential part of the course. Lab sessions assigned before mid-term are designed to let students have hands-on experience with the concept and theories they have been taught. Lab sessions assigned after mid-term are designed to provide students with current web database technologies that could help them with the final term project. In the project, students will work in teams to design and develop a practical database system for library access, electronic commerce, information retrieval, or a similar application.

### **II. Course Goals**

Upon finishing this course, the students should be able

- to understand the basic concepts, models and components of modern database systems.
- to gain experience with both theoretical and practical aspects of database design.
- to be able to design and develop a simple database project using existing database management systems.
- to understand the current status and likely future directions of database applications in library science and information science in general.

### **III. Required textbook and Readings**

Carlos Coronel, Steven Morris, Peter Rob. Database Systems: Design, Implementation, & Management. 10th edition, Thomson Course Technology, 2012. ISBN: 1111969604.

Complementary materials will be distributed during the class when appropriate.

#### IV. Lectures and Lab activities

For on campus students, the class session on Wednesday 3pm-5:50pm is designed to have two parts: the first part is lecture and the second part is lab.

For online students, the slides and video for each week's lecture and lab activity will be available on CourseWeb every Wednesday. There will be an online collaboration sessions available each week on Mon. 8pm-9pm if there is a lab activity scheduled on the previous Wednesday. Students can join the session through the Collaboration tool on CourseWeb. The main purpose of collaboration sessions is for students to communicate experiences of lab activities with the instructor, TA or other students. Students are encouraged to participate the online session but the participation is not mandatory.

#### V. Course Schedule Summary

Week	Date	Theme	Topics
1	May 16	Introduction	Introduction to database and DBMS Introduction to the course Lab 1: Software preparation
2	May 23	Data Models, Relational DB	Data Models Relational Database Lab 2: Access Tutorial
3	May 30	ER Model	Entities and Relations ER Diagram Lab 3: Visio Tutorial
4	Jun 6	Normalization	Normalization and Normal forms Normalization and DB Design Lab 4: Normalization Exercise Team Formation Deadline
5	Jun 13	SQL	SQL Lab 5: SQL Exercise
6	Jun 20	SQL 2	Advanced SQL Lab 6: Advanced SQL Exercise
7	Jun 27	DB Design	Design Procedure Lab 7: Practice on DB Design
8	Jul 4		No class
9	<b>FastTrack Weekend Jul 7</b>	Midterm Exam Team Talks	Exam in the first 90 minutes Team Project Proposal Talks

10	Jul 18	XML	Internet-Related Language XML Lab 8: XML tutorial
11	Jul 25	Internet Database Environment	client/server architectures internet and database connection Lab 9: phpMyadmin
12	Aug 1	Final Project	Final project presentation

## VI. Assessment

### *Participation 10%*

Class attendance is required for success in this course, as material covered in class may not be included in the readings. Participation assessments are different for online and on campus students:

For online students, the participation is based on the following two activities:

1. Online discussion through the discussion board on CourseWeb. Throughout the semester, I will post five questions for discussion on CourseWeb. Response to each question will contribute to 1 participation point in the final grade.
2. Submissions of lab results. Five of the nine lab activities require a submission of results. A full mark in each submission will contribute to 1 participation point in the final grade.

For on campus students, the participation is based on the following two activities:

1. active participation in on-class discussions and lab activities (5 participation points)
2. in class 10-minute quiz. Throughout the semester, we will have total five quizzes. Each will last for about 10 minutes at the beginning of the class. A full mark in each quiz will contribute to 1 participation point in the final grade.

### *Assignment 20%*

There are total four assignments, each of which will count 5% in the final course score.

### *Exams 40%*

The exam will last 90 minutes, and covers all the topics taught in the weeks before it. Common exam questions include multiple choices, short definitions, and discussion questions.

### *Term Project 30%*

Please see section VIII for detail description of term project.

### *Course Grading Scale:*

The final grade depends on the percentage of points you have earned, and the definition of letter grades is:

- $90 \leq A^- < 93$ ,  $93 < A \leq 97$ ,  $97 < A^+ \leq 100$
- $80 \leq B^- < 83$ ,  $83 < B \leq 87$ ,  $87 < B^+ < 90$
- $70 \leq C^- < 73$ ,  $73 < C \leq 77$ ,  $77 < C^+ < 80$
- $60 \leq D < 70$ ,
- $F < 60$

## VII. Detailed Course Schedule

### *Week 1 Introduction*

Objectives: After this class, you should be able to

- tell the difference between data and information
- understand what is database, database management
- articulate the reasons for having database systems
- tell the history of modern databases
- understand what you will learn from this course
- tell what you expected to achieve in this course

Required Readings

- Coronel, Chapter 1

Lab:

- Lab 1: Software preparation

Assignment:

- assignment 1
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### *Week 2 Data Models and Relational Databases*

Objectives: After this class, you should be able to

- tell and understand the different degrees of data abstraction
- tell the idea behind hierarchical and network models
- understand the logical view of data in relational model
- understand the characteristics of relational operators
- able to calculate the outcomes of relational operators

Required Readings:

- Coronel, Chapters 2 and 3

Lab:

- Lab 2: Access 2010 Tutorial
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### *Week 3 Entity-Relation Modeling*

Objectives: After this class, you should be able to

- tell how to define and refine relationships in database design
- understand how to develop a ER diagram for database design

Required Readings:

- Coronel, Chapter 4&5.

Lab:

- Lab 3: Visio Tutorial

Assignment:

- assignment 2
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### *Week 4 Normalization*

Objectives: After this class, you should be able to

- understanding what normalization is and its role in database design
- tell 1NF, 2NF, 3NF, BCNF, and 4NF
- able to transform tables from lower normal forms to higher normal forms
- understand that normalization and ER modeling are used concurrently to produce a good database design

Required Readings:

- Coronel, Chapter 6

Lab:

- Lab 4: Normalization Exercise
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### *Week 5 SQL 1*

Objectives: After this class, you should be able to

- understand the basic commands and functions of SQL
- able to use SQL for data administration (e.g. create tables, indexes)
- able to use SQL for data manipulation (e.g., add, modify, delete data)

Required Readings:

- Coronel, Chapter 7

Lab:

- Lab 5: SQL

Assignment:

- assignment 3
- 

### *Week 6 SQL-II*

Objectives: After this class, you should be able to

- understand the advanced commands and functions of SQL
- able to use SQL join operator and relational set operators
- able to use SQL subqueries and correlated queries

Required Readings:

- Coronel, Chapter 8

Lab:

- Lab 6: Advanced SQL
- 

### *Week 7 DB Design*

Objectives: After this class, you should be able to

- understand that a successful database design must reflect the information system of which the database is a part
- understand Systems Development Life Cycle (SDLC) and Database Life Cycle (DBLC)
- know how to conduct evaluation and revision within the SDLC and DBLC frameworks
- tell the pros and cons of database design strategies: top-down vs. bottom-up design, and centralized vs. decentralized design

Required Readings:

- Coronel, Chapter 9

Lab:

- Lab 7: DB design practice
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### *Week 10 XML*

Objectives: After this class, you should be able to

- Describe basic concepts of XML
- explain why XML is important to Web database development

Required Readings:

- Coronel, Chapters 14

Lab:

- Lab 8: XML

Assignment:

- Assignment 4
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### *Week 11 Internet Database Environment*

Objectives: After this class, you should be able to

- explain client/server architectures
- understand the internet and database connection
- list common internet architecture components

Required Readings:

- Coronel, Chapters 14

Lab:

- Lab 9: phpMyadmin
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## **VIII. Term Projects**

### Introduction:

The term project is designed for students to integrate and extend knowledge acquired throughout the course and to apply that knowledge to solve a problem of substantial scope. Students are required to work in groups of 3 people. It is suggested that successful teams require expertise in design, implementation, and project management.

Your task is to propose, plan and develop a prototype database system to handle a real problem that matters to real people, although there could be some degree of simplification to down scale the effort to solve the problem.

### Requirements to the Report

The final outcome of your term project should include two major components:

1. Database design. A report (about 10-15 pages) which includes:
  - a. Problem statement
  - b. Database overview and scope
  - c. User requirements
  - d. Conceptual schema
  - e. Logical schema
  - f. Data dictionary
  - g. Sample SQL queries
2. Database Implementation. You are free to use whatever techniques and database management systems to implement the database. The minimal requirements are that the database implementation should have functions such as data entry, update, querying, and simple report.

Milestones for the project:

Introduction of term project:	Week 1
Team formation deadline:	Week 4
Project proposal presentation:	Week 9
Final project report:	Week 12

When writing either your assignment essays or project reports, please follow one of the established styles for reference and citation (visit “Research, Writing, and Style Guides” (<http://www.aresearchguide.com/styleguides.html>) for various existing styles). However, you are highly recommended to adopt the American Psychological Association APA style (the fifth edition of the *Publication Manual of the American Psychological Association* published by the American Psychological Association (2001)). “A Guide for Writing Research Papers” (<http://webster.comnet.edu/apa/>) is a wonderful online place to obtain the guidance for this style.