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**MSIS-DL 317 Syllabus**  
**Faisal Akkawi, Ph.D.**  
**Database Systems Design & Implementation**  
**Summer 2012**

**Contact Information**

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Office Hours: available by appointment

**Course Description**

This course covers the fundamentals of database design and management. Topics include the principles and methodologies of database design, database application development, normalization, referential integrity, security, relational database models, and database languages. Principles are applied by performing written assignments and a project using a Structured Query Language (SQL) database system.

**Text**

Connolly, T. and C. Begg (2010). *DataBase Systems: A Practical Approach to Design, Implementation and Management* (4<sup>th</sup> OR 5<sup>th</sup> Edition). New York, NY: Addison Wesley.

[ISBN-13: 978-0321523068]

**Software**

This course requires software to produce diagrams. Students may download a free 60-day trial of Microsoft Visio<sup>®</sup> at <<http://visiotoolbox.com/visio2007freetrial/>>. Macintosh<sup>®</sup> users may use ConceptDraw PRO.

**Learning Goals**

The goals of this course are to:

- Discuss key terms and concepts used in database management.
- Design a database using diagrams and models.
- Interpret database diagrams.
- Explain relational languages and how they are used to provide the interface with Oracle DBMS.
- Evaluate existing databases in order to make recommendations for improvement or adding additional data or functionality.
- Analyze a database for errors and other issues and take the necessary steps to resolve errors and issues.
- Evaluate security risks of a given database and recommend strategies to mitigate the identified risks.

**Evaluation**

The student's final grade will be based on homework, projects, the final exam, and participation.

Homework 1: 100 Points  
Homework 2: 100 Points  
Homework 3: 100 Points  
Homework 4: 100 Points  
Homework 5: 100 Points

Final Exam: 400 Points  
Participation: 100 Points  
**Total: 1000 Points**

### **Discussion Board Etiquette**

The purpose of discussion boards is to allow students to freely exchange ideas and participation is highly encouraged. It is important that we always remain respectful of one another's viewpoints and positions and, when necessary, agree to disagree, respectfully. While active and frequent participation is encouraged, cluttering a discussion board with inappropriate, irrelevant, or insignificant material will not earn additional points and may result in receiving less than full credit. Although frequency is not unimportant, content of the message is paramount. Please remember to cite all sources—when relevant—in order to avoid plagiarism.

### **Proctored Assessment**

There is no proctored assessment requirement in this course.

### **Grading Scale**

93%–100% = A  
90%–92% = A-  
85%–89% = B+  
82%–84% = B  
78%–81% = B-  
75%–77% = C+  
73%–74% = C  
65%–72% = C-  
0%–64% = F

### **Attendance**

This course is asynchronous, meaning that we will not meet at a particular time each week. Even though we will not meet face-to-face in a physical classroom, participation on all discussion boards is required and paramount to your success.

### **Late Work**

Assignments are due on Sundays at 11:55 p.m., central time. Late submission of assignments will be assessed a penalty of 10% per day. No exceptions are made. Assignments more than **two days late will not be accepted** and will receive a grade of 0. Always back up your work as technical issues are not a reason to turn in assignments late. Students missing exams due to a pre-arranged or excused absence will be allowed to take the exam early. Only official excuses will be accepted. Any uncoordinated, unexcused, missed exam will result in a score of 0 for that exam.

### **Learning Groups**

There will be no learning groups in this course.

### **Academic Integrity at Northwestern**

Students are required to comply with University regulations regarding academic integrity. If you are in doubt about what constitutes academic dishonesty, speak with your instructor or graduate coordinator before the assignment is due and/or examine the University Web site. Academic dishonesty includes, but is not limited to, cheating on an exam, obtaining an unfair advantage, and plagiarism (e.g., taking material from readings without citation or copying another student's paper). Failure to maintain academic integrity will result in a grade sanction, possibly as severe as failing and being required to retake the course, and

could lead to a suspension or expulsion from the program. Further penalties may apply. For more information, visit: <[www.scs.northwestern.edu/student/issues/academic\\_integrity.cfm](http://www.scs.northwestern.edu/student/issues/academic_integrity.cfm)>.

Plagiarism is one form of academic dishonesty. Students can familiarize themselves with the definition and examples of plagiarism, by visiting the site <[www.northwestern.edu/uacc/plagiar.html](http://www.northwestern.edu/uacc/plagiar.html)>. Myriad other sources can be found online, as well.

Some assignments in this course may be required to be submitted through SafeAssign, a plagiarism detection and education tool. You can find an explanation of the tool at <<http://wiki.safeassign.com/display/SAFE/How+Does+SafeAssign+Work>>. In brief, SafeAssign compares the submitted assignment to millions of documents in very large databases. It then generates a report showing the extent to which text within a paper is very similar or identical to pre-existing sources. The user can then see how or whether the flagged text is cited appropriately, if at all. SafeAssign also returns a percentage score, indicating the percentage of the submitted paper that is similar or identical to pre-existing sources. High scores are not necessarily bad, nor do they necessarily indicate plagiarism, since the score doesn't take into account how or whether material is cited. (If a paper consisted of just one long quote that was cited appropriately, the score would be 100%. This wouldn't be plagiarism, due to the appropriate citation. However, just submitting one long quote would probably be a pretty bad paper.) Low scores are not necessarily good, nor do they necessarily indicate a lack of plagiarism. (If a 50-page paper had all original material, except for one short quote that was not cited, the score might be around 1%. But, not citing a quotation would still be plagiarism.)

SafeAssign includes an option in which the student can submit a paper and see the resultant report before submitting it to the instructor as a final copy. This ideally will help students better understand and avoid plagiarism.

#### **Other Processes and Policies**

Please refer to your SCS student handbook at <[www.scs.northwestern.edu/grad/information/handbook.cfm](http://www.scs.northwestern.edu/grad/information/handbook.cfm)> for additional course and program processes and policies.

## **Course Schedule**

**Important Note:** Changes may occur to the syllabus at the instructor's discretion. When changes are made, students will be notified via an announcement in Blackboard.

### **Session 1**

#### **Learning Objectives**

After this session, the student will be able to:

- Identify the term database and describe what is contained within the database.
- Explain the purpose and use of a database.
- Identify the term database management system (DBMS) and describe the functions of a DBMS.
- Explain the concept of tables.
- Explain the concept of relationships.
- Describe the history and development of database processing.

## Course Content

*Reading—For this session, please read:*

Chapters 1 of the textbook:

Connolly, T. and C. Begg (2010). *DataBase Systems: A Practical Approach to Design, Implementation and Management* (5th Edition). New York, NY: Addison Wesley.

Multimedia:

Everyday Databases

## Discussion Board

Each session you are required to participate in all discussion board forums. Your participation in both posting and responding to other students' comments is graded. For this week's discussion topic(s), visit the discussion board in Blackboard.

## Assignment

There are no assignments due this session.

## Session 2

### Learning Objectives

After this session, the student will be able to:

- Explain the basic concepts associated with the entity-relationship (E-R) model.
- Utilize the E-R modeling in database design.
- Employ a diagrammatic technique for displaying an E-R model using unified modeling language (UML).
- Identify the limitations of the basic concepts of the E-R model.
- Identify and resolve connection traps in E-R models.
- Discuss diagrammatic technique for displaying specialization/generalization, aggregation, and composition in an E-R diagram using UML.
- Define the function of a key.
- Build an E-R model from a requirements specification.

## Course Content

*Reading—For this session, please read:*

Chapters 12 & 13 of the textbook:

Connolly, T. and C. Begg (2010). *DataBase Systems: A Practical Approach to Design, Implementation and Management* (5th Edition). New York, NY: Addison Wesley..

Web links:

Introduction to Database Analysis

Handouts:

Oracle Database Instructions

UML Notation Quick Reference Guide

Multimedia:

E-R Diagramming

### **Discussion Board**

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### **Assignment**

Homework 1 is due. For more information, click *Assignments* on the left navigation bar in Blackboard, and scroll to this assignment's item.

## **Session 3**

### **Learning Objectives**

After this session, the student will be able to:

- Utilize E-R modeling to build a conceptual data model based on the information given in a view of the enterprise.
- Identify primary keys and differentiate when to use a surrogate key.
- Create referential integrity constraints.
- Create ID-dependent, 1:1, 1:N, and N:M relationships in tables.
- Represent weak entities in tables.
- Represent supertype/subtypes as tables.
- Represent recursive relationships as tables.
- Implement referential integrity actions required by minimum cardinalities.

### **Course Content**

*Reading—For this session, please read:*

Chapters 16 & 17 of the textbook:

Connolly, T. and C. Begg (2010). *DataBase Systems: A Practical Approach to Design, Implementation and Management* (5th Edition). New York, NY: Addison Wesley.

Multimedia:

Relational Models

### **Discussion Board**

Each session you are required to participate in all discussion board forums. Your participation in both posting and responding to other students' comments is graded. For this week's discussion topic(s), visit the discussion board in Blackboard.

### **Assignment**

Homework 2 is due. For more information, click *Assignments* on the left navigation bar in Blackboard, and scroll to this assignment's item.

## **Session 4**

### **Learning Objectives**

After this session, the student will be able to:

- State the purpose and importance of the SQL.

- State the history and development of SQL.
- Identify data types supported by the SQL standard.
- Perform database updates using INSERT, UPDATE, and DELETE.
- Retrieve data from the database using the SELECT statement.
- Explain the purpose of the Integrity Enhancement Feature of SQL.
- Utilize the Integrity Enhancement Feature in the CREATE and ALTER TABLE statements.
- Identify integrity constraints using SQL including:
  - required data;
  - domain constraints;
  - entity integrity; and
  - referential integrity.
- Write an SQL command.
- Build SQL statements that:
  - use the WHERE clause to retrieve rows that satisfy various conditions;
  - sort query results using ORDER BY; and
  - use the aggregate functions of SQL.

### Course Content

*Reading—For this session, please read:*

Chapters 6 & 7 of the textbook:

Connolly, T. and C. Begg (2010). *DataBase Systems: A Practical Approach to Design, Implementation and Management* (5th Edition). New York, NY: Addison Wesley.

Web links:

SQL Tutorial—Learn SQL  
 A Gentle Introduction to SQL  
 SQL Tutorial

Handout:

SQL Handout

### Discussion Board

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### Assignment

Click *Assignments* on the left navigation bar in Blackboard, and scroll to this assignment's item.

## Session 5

### Learning Objectives

After this session, the student will be able to:

- Build SQL statements that:
  - group data using GROUP BY;
  - use subqueries; and
  - join tables together.
- Perform set operations (UNION, INTERSECT, and EXCEPT).

- Explain the purpose of views.
- Write SQL statements to create and delete views using SQL.
- Explain how the DBMS performs operations on views.
- Discuss the advantages and disadvantages of views.
- Utilize the GRANT and REVOKE statements as a level of security.

### Course Content

*Reading—For this session, please read:*

Web Links:

SQL Tutorial—Learn SQL  
A Gentle Introduction to SQL  
SQL Tutorial

### Discussion Board

Each session you are required to participate in all discussion board forums. Your participation in both posting and responding to other students' comments is graded. For this week's discussion topic(s), visit the discussion board in Blackboard.

### Assignment

Homework 3 is due. For more information, click *Assignments* on the left navigation bar in Blackboard, and scroll to this assignment's item.

## Session 6

### Learning Objectives

After this session, the student will be able to:

- Identify various types of update anomalies such as insertion, deletion, and modification anomalies.
- Identify functional dependencies represented in a relation.
- Identify determinants and dependent attributes.
- Describe functional dependencies (FDs).
- Describe the appropriateness or quality of the design of relations.
- Explain how to mathematically derive a primary key for a given relation.

### Course Content

*Reading—For this session, please read:*

Chapter 14 (pp.368-378) of the textbook:

Connolly, T. and C. Begg (2010). *DataBase Systems: A Practical Approach to Design, Implementation and Management* (5th Edition). New York, NY: Addison Wesley.

Multimedia:

Functional Dependencies

### Discussion Board

Each session you are required to participate in all discussion board forums. Your participation in both posting and responding to other students' comments is graded. For this week's discussion topic(s), visit the discussion board in Blackboard.

## Assignment

Homework 4 is due. For more information, click *Assignments* on the left navigation bar in Blackboard, and scroll to this assignment's item.

## Session 7

### Learning Objectives

After this session, the student will be able to:

- Describe ARMSTRONG'S AXIOMS theorems.
- Utilize ARMSTRONG'S AXIOMS theorems to remove functional dependency redundancy.
- Distinguish between different types of query provided by the Microsoft Access DBMS QBE facility.
- Recognize the main features of query-by-example (QBE).
- Utilize QBE to build queries to select fields and records.
- Utilize QBE to target single or multiple tables.
- Perform calculations using QBE.

### Course Content

*Reading—For this session, please read:*

Chapters 9 of the textbook:

Connolly, T. and C. Begg (2010). *DataBase Systems: A Practical Approach to Design, Implementation and Management* (5th Edition). New York, NY: Addison Wesley.

### Discussion Board

Each session you are required to participate in all discussion board forums. Your participation in both posting and responding to other students' comments is graded. For this week's discussion topic(s), visit the discussion board in Blackboard.

### Assignment

Click *Assignments* on the left navigation bar in Blackboard, and scroll to this assignment's item.

### Multimedia:

Finding Minimum Cover

## Session 8

### Learning Objectives

After this session, the student will be able to:

- Describe the problems associated with breaking tables.
- Determine the natural join of two tables.
- Determine if a table is lossless, lossy, or FD-preserved.
- Analyze the impact of relations that lose original data.



## Course Content

*Reading—For this session, please read:*

Chapter 14 (pp.378-385 ) of the textbook:

Connolly, T. and C. Begg (2010). *DataBase Systems: A Practical Approach to Design, Implementation and Management* (5th Edition). New York, NY: Addison Wesley..

## Discussion Board

Each session you are required to participate in all discussion board forums. Your participation in both posting and responding to other students' comments is graded. For this week's discussion topic(s), visit the discussion board in Blackboard.

## Assignment

None.

## Session 9

### Learning Objectives

After this session, the student will be able to:

- State the purpose of normalization.
- State the problems associated with redundant data.
- Utilize functional dependencies to group attributes into relations that are in a known normal form.
- Identify the most commonly used normal forms, namely first (1NF), second (2NF), and third (3NF) normal forms.
- Normalize a database.

### Course Content

*Reading—For this session, there is no additional assigned reading.*

Multimedia:  
Normalization

### Discussion Board


Each session you are required to participate in all discussion board forums. Your participation in both posting and responding to other students' comments is graded. For this week's discussion topic(s), visit the discussion board in Blackboard.

### Assignments

Homework 5: Normalization is due. For more information, click *Assignments* on the left navigation bar in Blackboard, and scroll to this assignment's item.

## Session 10

### Learning Objectives



No new learning objectives will be introduced in this session.

**Course Content**

*Reading—For this session, please read:*

None.

**Discussion Board**

Each session you are required to participate in all discussion board forums. Your participation in both posting and responding to other students' comments is graded. For this week's discussion topic(s), visit the discussion board in Blackboard.

**Assignment**

Your final exam is due. For more information, click *Assignments* on the left navigation bar in Blackboard, and scroll to this assignment's item.