Department of Electrical and Computer Engineering
University of Puerto Rico
Mayagüez Campus

Syllabus for ICOM 5016 – Introduction to Database Systems
Fall 2003

1. Faculty

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2. Teaching Assistant

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3. Course Description

Introduction to Database Management Systems, with emphasis on relational database design and application development. Study of Entity-Relationship Model, Relational Model, Object-Oriented Model and Object-Relational Model. Techniques for database design: E-R modeling , UML modeling, E-R to relational mappings, functional dependencies, and normalization. Discussion of Structured Query Language (SQL), Applications servers and DBMS, XML and Web applications. Introduction to Transaction Processing and Database Recovery. Overview of DBMS implementation techniques: Storage Management, Indexing and Access Methods, Query evaluation and optimization.

4. Pre-requisites

ICOM 4035 or equivalent. Proficiency with C++, Java and UNIX.

5. Time and Place

Lecture:

Tuesdays and Thursdays, 4:30 PM – 5:50 PM, S-227

Laboratory:

There will be no laboratory in this course.

6. Credits

3 credits

7. Class Web Page

http://www.ece.uprm.edu/~manuel/class/fall03/icom5016/

You are responsible to read this Web page periodically to obtain class materials, and other important announcements about this class

8. Textbooks

Required:

Fundamentals of Database Systems, 4th Ed.
Ramez Elmasri and Shamkant B. Navathe
Addison-Wesley, 2004
ISBN: 0-321-12226-7

Recommended:

Database Systems Concepts, 4th Ed
Abraham Silberschatz, Henry F. Korth, and S. Sudarshan
McGraw-Hill, 2002
ISBN: 0-07-228363-7

9. Grading

Your grade will be based **exclusively** on the scores that you obtain in the class projects, and exams. The curve to be used to assign a grade to your score will be as follows:

Score	Grade
100 – 90	A
89 – 80	B
79 – 70	C
69 – 65	D
64 – 0	F

Your total score will be calculated from your individual scores in the projects, exams and laboratory assignments. The weights assigned to each of these categories are as follows:

Term Project	40%
Midterm Exams (3)	40%
Final Exam (Comprehensive)	20%

There will be no special project, no special homework, no special exam, nor any other kind of "*special work*" to improve grades. However, each project or exam might have an extra credit problem that you can use to help improve your score in that corresponding category.

10. Exams

In this course, there will be three midterm exams and a comprehensive final exam. Unless otherwise indicated, all exams will be taken with closed books and closed notes. The midterm exams will be administered outside the regular class time. The date and time for each midterm exam will be as follows:

Exam Number	Date	Time	Place
I	September 17, 2003	6:00 PM – 8:00 PM	S-113
II	October 22, 2003	6:00 PM – 8:00 PM	S-113
III	November 24, 2003	6:00 PM – 8:00 PM	S-113

The final exam will be administered in accordance with the schedule specified by the Registrar of the University of Puerto Rico, Mayagüez Campus. ***NOTE: THE FINAL EXAM CANNOT AND WILL NOT BE A TAKE HOME FINAL***.

The lowest score in the midterm exams can be replaced with the score in the final exam, provided that the score in the final exam is higher. Otherwise, the scores in the midterm exams will neither be replaced nor dropped.

Each question included in each exam (midterm or final) will be a multiple choice question. On some questions, there will be one full credit answer and one partial credit answer. These will be clearly marked. Otherwise, the question will only have one full credit answer (i.e. no partial credit). The question will ask you to choose an answer that serves as:

- Explanation of a technical concept.
- Proof of a mathematical proposition.
- Correct relational algebra expression.
- Correct SQL query for a given expression.
- Solution to a problem using the concepts discussed in class.

10.1 Exam Reposition Policy

In this course, there will be **NO** repositions for missed midterm exams. If a student misses one midterm exam then that scored will be replaced with the score obtained in the final exam. Any other missed midterm exam will carry a score of 0.

11. Incomplete Grade Policy

A student will receive an incomplete grade if and only if the student misses the final exam and has a valid excuse. Such excuse must be one of the following:

- Medical certificate indicating illness.
- Legal certificate indicating an appointment to attend a Court of Law.
- Certificate from a hospital or a physician indicating the death of either: parent, child, husband, wife or sibling.

12. Term Project

In this course you will be required to complete a term project, consisting on the design and implementation of full-fledged database application. This application will manage all business tasks

associated to an on-line CD Store. At the end of the semester, you will deliver a complete solution similar to the portal used by stores such as TigerDirect or Amazon. More details will be given during the second week of the course.

You will work in teams of three students, and you will use the facilities of the ADASEL Computer Center and the AMADEUS Computer Center. The project will constitute 40% of your grade.

13. Class attendance

Attendance to the class is mandatory. You will be required to sign an assistance sheet that will be used to keep track of your attendance.

14. Use of laptops during class time

THE USE OF LAPTOPS DURING CLASS TIME IS NOT PERMITTED. VIOLATORS WILL BE ASKED TO LEAVE THE ROOM.

15. Academic Integrity

Each student is expected to work individually on all projects, exams and laboratory assignments. You may not share your answers to the laboratory assignments. You may not use code from another student, or code that you find on the Internet or any similar resources. You may not share your code with another student. Failure to comply with these requirements will result in a grade of F in the course for the student(s) breaking these rules. Unauthorized group efforts, particularly during exams, will be considered academic dishonesty and the students involved will receive an F in the course. You should read Article 10 of the "Reglamento General de Estudiantes de la Universidad de Puerto Rico" to learn more about the possible sanctions that you might experience if caught in an act of academic dishonesty.

16. List of Topics

The following is a list of the course topics in the order in which they will be presented. This list is subject to change and it will vary depending on the pace of the lectures.

TOPICS:

1. Discussion of the Course Syllabus
2. Entity-Relationship Model
3. UML Modeling
4. Relational Model of Data
5. Relational Algebra
    a. Selection Operator
    b. Projection Operator
    c. Join Operator
    d. Set-oriented Operators
    e. Aggregate Operators

    f. Data Cube Operator
6. E-R to Relational Mappings
7. Structured Query Language (SQL)
    a. Data Definition Language
    b. Data Manipulation Language
8. Web-based Application Development
    a. Middle-tie Architectures
    b. Web Servers
    c. Servlets
    d. Web Services
9. Integrity and Security in Databases
    a. Triggers
10. Normalization Rules and Functional Dependencies
    a. First Normal form
    b. Second Normal Form
    c. Third Normal Form
    d. Boyce-Codd Normal Form
11. Object-oriented Databases
12. Object-relational Databases
13. eXtensible Markup Language (XML)
14. Disk Organization and RAID
15. File Structures
16. Indexing and Access Methods
    a. B+-trees
    b. Hashing
17. Transaction Processing
    a. ACID properties
    b. Schedules and Serializability
18. Concurrency Control
    a. Two-Phase Locking
    b. Deadlocks and Starvation
19. Database Recovery Techniques
    a. Write-Ahead Login
20. Query Optimization

a. Cost models
b. Relational expression equivalences
c. Dynamic Programming Optimization Algorithm