Course Syllabus

Summary

Course Title	Advanced Database Systems: Theory and Programming
Course No.	CS 04530
CRN	
Start/End Dates	
Term/Module	

Delivery Method	Number of Face-to-Face Meetings
Face-to-Face	15

Course Description

This course focuses on the design of DBMS and their use to create databases. The course covers both the theoretical concepts and the implementation aspects of database systems with a special emphasis on relational database systems, SQL, programming (in a modern programming language such as C++ or Java) using a real database Application Programming Interface (such as JDBC or ODBC).

> **I reserve the right to amend, alter or change the information in this course guide at my discretion.**
> **All terms and interpretations will be defined by me and are final.**

Instructor

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Office Hours	Maintained in Rowan Starfish Network

Objectives

Objectives for this graduate course: Students successfully completing this course will:

- Be fluent in the areas covered in the undergraduate BA course and have a strong understanding of the areas covered in the undergraduate BS course.
- Be able to expedite software development using ORMs
- Know the fundamentals of managing geospatial data
- Develop a complete database system and compare database systems in the domain of a specified business area
- Have conducted a limited literature review, explaining how a topic/issue is defined in a scholarly article, summarize previous research findings germane to the article, and distill the key findings of the article into an absorbable presentation.

For reference, these are the objectives of the undergraduate version of this course in Rowan's BS program in Computer Science. Students successfully completing that course will be able to:

- Define the terminology, features, classifications, and characteristics embodied in database systems.
- Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.
- Demonstrate an understanding of the relational data model.
- Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.
- Formulate, using SQL, solutions to a broad range of query and data update problems.
- Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
- Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.
- Understand the value of NoSQL databases, and how to implement and query them
- Use a desktop database package to create, populate, maintain, and query a database.
- Demonstrate a rudimentary understanding of programmatic interfaces to a database and be able to use the basic functions of one such interface.
- Be familiar with the basic issues of transaction processing and concurrency control.

Also for reference, these are the course goals of the undergraduate version of this course in Rowan's BA program in Computing and Informatics:

- Students can distinguish poorly designed database (that may appear to work) from well- designed databases
- Students have implemented a project in a relational database for a specified operating system.
- Students will be able to assess the accuracy of relational queries expressed in SQL.
- Students will have developed database triggers or other applications.
- Students have considered the data requirements of a particular domain and have produced and justified a particular database model to support the information needs.
- Students will have produced correct ER / EER diagrams that are routinely manifested in database design specifications.

Prerequisites

- Acceptance into Rowan's Master Program in Computer Science

  Since not every graduate student will have formally studied databases as an undergraduate, this course will quickly review key undergraduate concepts.

  A pre-test that measures comprension of the basic database concepts will be made available to students so that they may assess their readiness. Mastery of these basic database concepts is not required as a prerequisite; however, in this course, this material will not receive the extensive coverage that one would expect in an undergraduate section.

Materials and Texts

The course will use some papers on database topics chosen from journals and conference proceedings. (http://jackmyers.info/db/readings).

Required text: SQL Antipatterns: Avoiding the Pitfalls of Database Programming.. Pragmatic Programmers. 2010. ISBN: 978-1934356555.

To supplement the required text, the following sources could be useful

- **Theoretical Database Concepts**: Fundamentals of Database Systems, 7th Edition, Ramez Elmasri & Shamkant B. Navathe, 2016.
- **MySQL - Practical Discussion on SQL, DB Design/Normalization and Programming:** Murach's MySQL (2nd Edition), Joel Murach, 2015.
- **Graph Databases:** Graph Databases: New Opportunities for Connected Data, Robinson, Webber & Eifrem.
- **MongoDB:** MongoDB: The Definitive Guide, Second Edition, Kristina Chodorow, 2013,
- **Python Flask Web Development:** Flask Web Development: Developing Web Applications with Python 2nd Edition, Miguel Grinberg, 2018.
- **Python Database Access:** Essential SQLAlchemy: Mapping Python to Databases 2nd Edition. Jason Myers, Rick Copeland, 2015.
- **Oracle Spatial**: Pro Oracle Spatial for Oracle Database 11g. Kothuri, Godfrind, and Beinat. 2007

Schedule See

Assignment Outline

Individual assignment outlines are available at http://jackmyers.info/db

Grading

Final Grade Breakdown

Grading Criteria/Assignment	Percentage
Literature Review: Presentation of journal or conference paper	20%
Assignments: Completed / Late / Not Completed	20%
Semester Project	40%
Final Exam	20%
Total	**100%**

Literature Review: Select one of the papers from the class list (http://jackmyers.info/db/readings/journal_articles), and give a 45-minute talk presenting the paper to the class**.** Alternate articles may be chosen and approved by the instructor. They should come from a reputable database journal such as

- ACM transactions on database systems
- ACM transactions on information systems
- International journal of data warehousing and mining
- Journal of database management
- Journal of intelligent information systems
- Data base for advances in information systems
- Data & knowledge engineering
- Journal of big data
- Database trends and applications
- OODS: Object-Oriented Database Systems
- IDEAS: International Database Engineering & Applications Symposium

Final Exam: While subject to adjustment, the final exam will have a heavy focus on SQL Antipatterns, will include fundamental questions from the literature presentations (pay attention and take notes!) and a light smattering of other course topics

Assignments are meant to reinforce lecture materials and will be graded on suitability

- **Suitable:** All objectives of assignment were met. Grade: 100
- **Deficient:** Turned in on time, but significantly incomplete/incorrect Grade: 70
- **Late:** Assignment is suitable, but turned in a week late. Grade: 70
- **Missing:** Assignment not turned in, or more than a week late. Grade: 40

Grading Scale

A	93 and Up	C	73 – 76
A-	90 – 92	C-	70 – 72
B+	87 – 89	D+	67 – 69
B	83 – 86	D	63 – 66
B-	80 – 82	D-	60 – 62
C+	77 - 79	F	59 and below

Rowan Policies

1. **Attendance**

   Attendance is mandatory. The attendance/class participation portion of the course grade will be computed based on the number of missed classes and student's contribution to class discussion. See the official Rowan University Attendance policy. Please inform the instructor in advance, preferably by email, if you will be absent from a class or lab session. **As this is a hybrid class, 5 points are removed from final grade from each unexcused absence.**

2. **Academic Integrity**

   Plagiarism is a form of academic dishonesty which includes but is not limited to submitting someone else's work as your own and working on the individual assignments in groups. It is college policy that students who commit an act of academic dishonesty may be subject to failure in the course, suspension from the College, or both. See the official Rowan University Academic Integrity policy

   If you use materials that you've obtained on the Internet, from a book, etc., for example as part of a programming assignment, you must include an appropriate reference. To use such materials without proper attribution is a form of plagiarism. Students who copy homework, cheat on tests, or plagiarize material for any test or assignment in this course will receive a **failing grade for the test or assignment.**

3. **Classroom Decorum**
   When meeting in a classroom, in order to show proper respect for the instructor and for your fellow students, please observe the following:

   a. Be on time! Class will begin promptly at the scheduled time. Allow yourself enough time to park and get to class, ready to learn, before the period begins. Quizzes will be given at the start of the class so if you are late you may miss a quiz.

   b. Do not eat in class.

   c. Do your best to remain in the room during the period. Exiting and entering during the period breaks the concentration of your fellow students, and makes it hard for you to get the full value of the class.

d. Turn off all cell phones, pagers, and anything else that would cause a distraction to yourself or others around you.

e. Students are permitted to use computers/laptops during class for note-taking and other class-related work only. Those using computers/laptops during class for work not related to that class (like e-mailing, instant messaging, game playing or internet surfing) will be asked to leave the classroom for the remainder of the class period.

4. **Section 504 Accommodations**
    Please be aware that Rowan University is committed to providing Section 504 accommodations for all persons with disabilities. If you have specific physical, emotional, or learning disabilities and require accommodations, please contact the Office of Equity and Diversity at 856-256-4294 as soon as possible to ensure that such accommodations can be implemented in a timely fashion.

5. **Academic Issue**
    If at any time a student has an academic problem in any course with a grade or any other issue, the student's first course of action to resolve the matter should be to make an appointment with the instructor to discuss the issue.

6. **Dropping or Withdrawing from this Class**
    Please visit the Registrar page for a list of key dates for the semester. These dates include the full academic calendar as well as the last days to withdraw from this class with and without a refund.

7. **Illness**
    It is important to get a note from student health services, or your personal doctor, or other form of documentation if you miss a class or a lab meeting. If you are not feeling well on a given day, please email or call me ahead of time. In this case, if you miss a quiz, I may let you make up that quiz.. If you have to miss an exam (and I hope you will not), re-tests will be given only in cases of extreme hardship as defined by the rules of Rowan University, and I require documentation of the reasons for your absence.