

CPS352 - DATABASE SYSTEMS

Professor: Russell C. Bjork
Office: KOSC 242 x4377
russell.bjork@gordon.edu
Hours: MWF 2:10-3:10 pm;
Tu 9:00 am - noon and by
appointment

Spring semester, 2016-2017
MWF 3:20-4:20 pm KOSC 126

Blackboard course site plus
public site: <http://www.cps.gordon.edu/courses/cps352>

HANDOUT #1: SYLLABUS - 1/20/2017

CATALOG DESCRIPTION:

Explores database technology; various data models, query languages, and application program-DBMS interface. Prerequisites: CPS122, CS221 and MAT230.

COURSE OBJECTIVES:

In general, this course is designed to introduce you to basic database management system concepts and applications.

In particular, upon completion of this course, you should be familiar with:

1. The entity-relationship and relational data models, plus new directions utilizing object-oriented and NoSQL databases.
2. The use of SQL.
3. Design and normalization principles for relational databases, including the various normal forms.
4. Underlying file structures used to implement databases, and their performance implications.
5. Multi-user database concerns such as crash recovery, concurrency control, security and integrity
6. Various applications of database systems.

TEXT: Silberschatz, Abraham, Henry F. Korth and S. Sudarshan. *Database System Concepts* (6th ed). (New York: McGraw-Hill, 2011).

Sandalage, Pramad J. and Martin Fowler. *NoSQL Distilled; A Brief Guide to the Emerging World of Polyglot Persistence*. (Reading, MA: Addison-Wesley, 2012)

AVAILABLE ONLINE: Selected tutorial material on SQL and IBM documentation for DB2 will be accessible from the Blackboard site.

COURSE TECHNIQUES AND PROCEDURES:

This is a survey course, in which we will attempt to gain a general familiarity with a large volume of material. For this reason, textbook reading and problem sets will play a larger-than-usual role in the course, with a proportionately reduced emphasis on actual programming. Homework exercises and two projects (one focusing on database design and the other on programming with commercial DBMS software) will provide an opportunity for you to experience practical application of the theoretical material.

COURSE REQUIREMENTS AND EVALUATION:

1. You will be expected to read most of the textbook, as assigned in the topic schedule below. Reading assignments should be completed **BEFORE** the class hour in which the topic is discussed. Lecture presentations will assume that you have read the text, and it is expected that your participation in the class will reflect that fact. However, our classroom discussion will not rigidly follow the order of material in the text, nor will it be confined to material covered there.
2. Eight homework sets will be distributed during the semester and will be due as shown in the course schedule. These will consist mostly of selected problems from the text, plus on-line exercises using database tools. All told, these will account for 25% of the final course grade. Note that these are fairly substantial assignments; you would do well to work on the problems throughout the time before they are due, rather than waiting until just before the set is due to tackle the whole assignment.

Set Number	Tentative Emphases
------------	--------------------

- | | |
|----|--|
| 1) | Fundamental Concepts; The Relational Model |
| 2) | Basic SQL |
| 3) | The E-R Model; Integrity and Security; The Relational Calculus |
| 4) | Relational Database Design and Normalization |
| 5) | Database Application Development; DBMS File Structures; Indices; Efficient Query Processing/Optimization |
| 6) | Transactions; Concurrency; Crash Recovery |
| 7) | Non-Relational DBMS's |
| 8) | Decision Support; Distributed Databases; Information Retrieval; Database System Architecture |
| | Total |

The following guidelines should be observed when doing these homework sets

- Homework sets will be due at the start of class on the date indicated. Late homework sets will **NOT** be accepted.

- Homework sets must be done on one side only of 8-1/2 x 11 paper, and pages must be stapled in problem-number order. Problems must be numbered, and final answers (where appropriate) should be highlighted. (Homework sets not conforming to these standards will be returned ungraded.)
 - You may work together with another student on homework, provided each of you works on each problem.
 - Where an exercise calls for writing a program, it is sufficient to write it out by hand; you need not enter it into the computer.
3. Structured Query Language (SQL) is the standard language for querying databases - even those based on some model other than the relational model for which it was developed. For this reason, it is important that you become thoroughly familiar and comfortable with using SQL. One homework set will focus on basic SQL, and most of the subsequent homework sets will include several questions that can be answered by performing a query and/or an update on an example database; you will be required to turn in the queries/updates and the answers that you got from them as part of the homework. Learning how to formulate the required queries and updates may require some searching of relevant SQL tutorial resources and reference materials.
 4. Working as part of a team of 2-3 students, you will apply what you are learning to a designing a relational database application of your own choice, requiring on the order of a dozen tables. You will be responsible for turning in (1) a description of the requirements for this system; (2) an E-R diagram; and (3) a relational schema and an actual database with simulated data. (You are not responsible for building the application - only for designing the database for it.) Specific requirements for the project will be distributed in class. All parts of this project, together, will be worth 20% of the final course grade.
 5. Working as part of a team of 2-3 students, you will do a major programming project involving the development of a DBMS application using SQL embedded in Java, using a database design and GUI furnished by the professor. Specific requirements will be distributed in class. This project will be worth 20% of the final grade.
 6. There will be a midterm and a final examination given as shown in the course schedule below. The midterm will account for 15% and the final 20% of the final course grade (total 35%). Exams will be open book, open notes.

Summary: 8 Homework sets	25%
Database design project	20%
Programming project	20%
2 Exams	<u>35%</u>
	100%

7. Your final grade will be computed on the basis of a weighted sum of the items listed above.
The following are minimum guaranteed grades for the percentages indicated:

87% - 89.9%: B+	93% - 100%: A	90% - 92.9%: A-
77% - 79.9%: C+	83% - 86.9%: B	80% - 82.9%: B-
67% - 69.9%: D+	73% - 76.9%: C	70% - 72.9%: C-
	63% - 66.9%: D	60% - 62.9%: D-

ACADEMIC DISHONESTY

From the Gordon College Student Handbook: "Academic dishonesty is regarded as a major violation of both the academic and spiritual principles of this community and may result in a failing grade or suspension. Academic dishonesty includes plagiarism, cheating (whether in or out of the classroom) and abuse or misuse of library materials when such abuse or misuse can be related to course requirements." For the purposes of this course, abuse or misuse of Gordon computer systems or networks related to course requirements will also be viewed as academic dishonesty.

Academic dishonesty will not be tolerated. You know better. Just don't!

POLICY STATEMENT ON EXTENSIONS AND INCOMPLETES:

1. Extensions of the due dates for homework or projects MAY be given in the event of extenuating circumstances (such as illness, personal emergency) IF you submit a brief written request to the professor as soon as possible after the circumstances arise.
2. A grade of Incomplete MAY be given without penalty IF you are unable to complete the course work by the last day of the term due to major illness or other similar emergency. You must apply for this using the form provided by the registrar. Such a request will only be granted if you are substantially up-to-date with your course work and were making good progress in the course up to the time that the difficulty arose. Of course, you must complete all work for the course by the midpoint of the next semester in accordance with College policy.

ATTENDANCE POLICY:

Regular class attendance is expected of all students, and class attendance will be recorded. Absences from class will be classified as "documented" or "undocumented". A documented absence is one where written documentation is submitted supporting an absence from class due to circumstances beyond the student's control. An undocumented absence is any other absence, including one which could qualify as documented if proper documentation were submitted.

Students who have more than three undocumented absences during the semester should expect to see their final grade reduced by 1% for each undocumented absence over 3, and students who have more than 12 undocumented absences will fail the course automatically. The allowance of 3 undocumented absences will be reduced by one for each documented absence over 3 - e.g. a

student who has 5 documented absences will be allowed only 1 undocumented absence without grade penalty. (This will not be applied retroactively, though) Note that it is not necessary to document absences unless there are more than three total absences; for most students, this will avoid the need to submit documentation. A student who anticipates the need to miss more than three classes due to athletic competitions or other student activities should review the college's attendance policy in the catalog, and should then discuss alternatives to class attendance with the professor at the start of the semester.

A student who is habitually late will have late arrival for class counted as a half absence for that class, and a student who sleeps through most or all of a given class session will be counted as absent for that class.

You may ask the professor to waive this policy for you if you earned an A in the prerequisite course, or if you have an A average in this course as of the mid-term exam. If you wish to take advantage of this exemption, you must so inform the professor. However, the attendance policy will be reimposed if your subsequent work deteriorates.

STUDENTS WITH DISABILITIES:

Gordon College is committed to assisting students with documented disabilities (see Academic Catalog Appendix C, for documentation guidelines). A student with a disability who may need academic accommodations should follow this procedure:

1. Meet with a staff person from the Academic Support Center (Jenks 412 X4746) to:
 - a. make sure documentation of your disability is on file in the ASC,
 - b. discuss the accommodations for which you are eligible,
 - c. discuss the procedures for obtaining the accommodations, and
 - d. obtain a **Faculty Notification Form**.
2. Deliver a Faculty Notification Form to each course professor *within the first full week of the semester*; at that time make an appointment to discuss your needs with each professor.

Failure to register in time with your professor and the ASC may compromise our ability to provide the accommodations. Questions or disputes about accommodations should be immediately referred to the Academic Support Center. See Grievance Procedures available from the ASC.

TENTATIVE SCHEDULE OF TOPICS:

Date	Topic(s)	Reading	Homework/ Exams / Projects Due
F 1/20	Course Introduction; Fundamental DBMS Concepts	ch. 1	Start Design Project
M 1/23	(continued)		
W 1/25	Data Models; The Relational Model; Relational Algebra	§ 2.1-2.5	Start Homework 1
F 1/27	(continued)	§2.6-2.7; §6.1	
M 1/30	(continued)		
W 2/1	Oral Presentations / Class Discussion of Design Project Requirements; SQL		DESIGN PROJECT REQUIREMENTS
F 2/3	SQL (continued)	§3.1-3.7 - you may skim sections that are review	
M 2/6	(continued)	§ 3.8-3.9; § 4.1-4.3; § 5.4	HOMEWORK 1
W 2/8	(continued)	§ 4.4-4.5; § 5.3	
F 2/10	(continued)	§ 4.6-4.7	
M 2/13	Relational Calculus; QBE	§ 6.2-6.4; Appendix C.1	HOMEWORK 2
W 2/15	Entity-Relationship Data Modeling; Database Design	ch. 7	
F 2/17	(continued)		
M 2/20	Oral Presentations/Discussions of Design Project E-R Diagrams; Database Normalization	§ 8.1-8.5	DESIGN PROJECT E-R DIAGRAM
W 2/22	(continued)		HOMEWORK 3
F 2/24	(continued)		
M 2/27	(continued)	§ 8.6-8.10; Appendix B.1	
W 3/1	(continued)	Appendix B.2-B.4	
F 3/3	Database Application Development	ch. 9; § 5.1	HOMEWORK 4

M 3/6	(continued); Review and Catch-up		
W 3/8	MIDTERM EXAM		
F 3/10- F 3/17	<i>Quad Finals and Spring Break</i>		
M 3/20	Oral Presentations/Discussions of Design Project Database Schema DBMS File Structures	ch. 10	DESIGN PROJECT DATABASE SCHEMA/ IMPLEMENTATION; Start Programming Project
W 3/22	(continued)		
F 3/24	BTree and Hashed Indices	ch. 11	
M 3/27	(continued)		
W 3/29	Efficient Query Processing Strategies; Query Processing Optimization	ch. 12	
F 3/31	(continued)	§ 13.1-13.4	
M 4/3	(continued)		PROGRAMMING PROJECT PART I
W 4/5	The Transaction Concept	ch. 14	
F 4/7	(continued)		HOMEWORK 5
M 4/10	Concurrency Control	ch. 15	
W 4/12	Crash Recovery	§ 16.1-16.4	
F 4/14	<i>Good Friday - no class</i>		
M 4/17	<i>Easter Monday - no class</i>		
W 4/19	Non-Relational DBMSs	ch. 22; Sandalage ch. 1-3; 9-11	HOMEWORK 6
F 4/21	(continued)		
M 4/24	(continued)		
W 4/26	Database System Architectures	ch. 17	
F 4/28	Distributed Database Systems	ch. 19; Sandalage ch. 4-6	HOMEWORK 7
M 5/1	(continued)		

W 5/3 Decision Support Systems; Data Mining ch. 20; § 5.5-5.7 **PROGRAMMING PROJECT PART II**

F 5/5 (continued)

M 5/8 Information Retrieval Systems ch. 21

W 5/10 Guest Lecturer: Simon Miner **HOMEWORK 8**

F 5/12 - 12:00-2:00 pm **FINAL EXAM - COMPREHENSIVE, WITH FOCUS ON MATERIAL SINCE THE MIDTERM**

NOTE: Unless otherwise noted, all reading assignments are in the text by Silberschatz et al. (Appendices B & C are only available online at www.db-book.com) Some of the homework assignments will also include suggested readings in Birchall - accessible on the Blackboard site.