BMI 544: Databases
Winter term, 2016

An introduction to databases and database management systems. The main topics covered in this course include database principles, relational databases, database design with Entity-Relationship modeling, the SQL query language, database optimization, and data warehousing. Individual database projects will be completed.

Instructor: Justin Fletcher, Ph.D.
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Required Textbook:
Database Design, Application Development, & Administration, 6th edition
Michael V. Mannino
Ingram Book Company 2014
ISBN-10: 0983332428

Grading:
35% homework assignments: there will be weekly reading assignments and homework assignments. Late assignments will lose 10% or more depending on number of days late unless prior permission is obtained.
15% quizzes
20% final examination
30% project
Online Materials:

New class material will be posted each week on Wednesdays.

Computing requirements:

Students will be required to have a PostgreSQL relational database available for use. A tutorial is available on Sakai if you have difficulty with this installation.

In addition, each student will need an application to create Entity-Relationship diagrams. You can download a program called E/R Assistant from the McGraw-Hill website which will support the diagramming conventions we use. It does, however, require a Windows OS. Using MS Word, you can make good drawings although they are more tedious. Other programs such as SmartDraw and Visio can also be used. Google Docs also creates good ER Diagrams using their Drawings tool. Make a template for the different design elements that you can save.

Goals:

Understand the basic principles and purposes of databases.
Have cursory knowledge of the historical database models and how they differ from the relational database model.
Understand the structure and major tenets of relational databases.
Optimize database design using Entity-Relationship diagrams and then convert those models into a relational database.
Optimize a database design through normalization to Boyce-Codd Normal Form.
Create relational database models with traditional, EAV, and star schemas.
Write and execute data definition, manipulation and query statements in SQL.
Write and execute complex SQL queries.

Additional topics may include:

Understand principles of decision support using databases: data warehousing, OLAP, and data mining techniques.
Understand the basics of database system architecture and physical database design
Measure efficiency in queries and optimize indexes and queries.
Create reports and data visualizations using data in relational databases.

Term Project:

The project for this term is for you to describe a database-dependent application and implement the relational database required for that application. The application might be for a business that you are familiar with or for a household need, perhaps one of your hobbies. The data requirements must be simple enough to manage in a small project but still be challenging to you.

You will be graded on content, completeness, and presentation.
**Weekly Topics and Assignments:** Note that new class material is posted on Wednesday each week. The schedule below is tentative and does not show associated readings.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Assignments</th>
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<tr>
<td><strong>BASIC</strong></td>
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| 1 | Data, databases and database management systems  
The relational model | Assignment #1 |
| 2 | SQL: CREATE statement  
SQL: SELECT statements  
Writing use cases | Assignment #2 |
| 3 | Conceptual data modeling:  
Entity-Relationship Diagrams  
Converting and ER diagram to relational tables | Assignment #3 |
| 4 | Database optimization:  
Normalization of relational tables | Quiz #1 |
| **ADVANCED** | | |
| 5 | Data modeling: Extended ER diagrams | Assignment #4 |
| 6 | Alternate schemas for relational databases: traditional, EAV, star schemas | Assignment #5 |
| 7 | Advanced SQL | Assignment #6 |
| 8 | Advanced normalization and synthesis | Quiz #2 |
| **ADDITIONAL TOPICS** | | |
| 9 | Topics by track (tentative)  
A (CI): Data warehouses  
B (BCB): Python programming for databases  
C (HIM): Data reporting and visualization tools | Assignment #7 |
| 10 | Topics by track (tentative)  
A: Database system architecture  
B: Indexes and data structures for biomedical databases  
C: Data reporting and visualization tools | Complete projects |
| 11 | | Final examination |

**Course Grading Policy**

Final grades are determined at the end of the quarter and usually are assigned as follows:

- A 94 – 100
- A- 90 – 93
- B+ 87 – 89
- B 83 – 86
- B- 80 – 82
- C+ 77 – 79
- C 73 – 76
- C- 70 – 72
- D/F < 70
Graduate Studies in the OHSU School of Medicine is committed to providing grades to students in a timely manner. Course instructors will provide students with information in writing at the beginning of each course that describes the grading policies and procedures including but not limited to evaluation criteria, expected time needed to grade individual student examinations and type of feedback they will provide.

Class grades are due to the Registrar by the Friday following the week of finals. However, on those occasions when a grade has not been submitted by the deadline, the following procedure shall be followed:

1) The Department\textsuperscript{1} /Program Coordinator\textsuperscript{2} will immediately contact the Instructor requesting the missing grade, with a copy to the Program Director and Registrar.
2) If the grade is still overdue by the end of next week, the Department\textsuperscript{1} /Program Coordinator\textsuperscript{2} will email the Department Chair directly, with a copy to the Instructor and Program Director requesting resolution of the missing grade.
3) If, after an additional week the grade is still outstanding, the student or Department\textsuperscript{1}/Program Coordinator\textsuperscript{2} may petition the Office of Graduate students for final resolution.

\textsuperscript{1} For courses that are run by a specific department.
\textsuperscript{2} For the conjoined courses (course number is preceded by CON_ that are run by Graduate Studies.

**Academic Honesty**

Academic honesty is required in order to pass this course. Students are encouraged to help each other; nevertheless, all quizzes, written assignments and presentations must be the work of the individual student. Literature and resources (including Internet resources) employed in fulfilling assignments must be cited.

Likewise, students are expected not to collaborate on the answers to homework problems, although discussion of the concepts involved and working of similar problems together is permitted.

See [http://www.ohsu.edu/xd/education/library/research-assistance/plagiarism.cfm?WT_rank=1](http://www.ohsu.edu/xd/education/library/research-assistance/plagiarism.cfm?WT_rank=1) for information on code of conduct for OHSU and [http://www.ohsu.edu/xd/education/teaching-and-learning-center/for-students/index.cfm](http://www.ohsu.edu/xd/education/teaching-and-learning-center/for-students/index.cfm) for more information on citing sources and recognizing plagiarism.

*In an effort to uphold the principles and practice of academic honesty, faculty members at OHSU may use originality checking systems such as Turnitin to compare a student’s submitted work against multiple sources.*

*To protect student privacy in this process, it will be necessary to remove all personal information, i.e. student name, email address, student u-number, or any other personal information, from documents BEFORE submission.*
Copyright Information

Every reasonable effort has been made to protect the copyright requirements of materials used in this course. Class participants are warned not to copy, audio, or videotape in violation of copyright laws. Journal articles will be kept on reserve at the library or online for student access. Copyright law does allow for making one personal copy of each article from the original article. This limit also applies to electronic sources.

To comply with the fair use doctrine of the US copyright law, Sakai course sites close three weeks after grades are posted with the Registrar. Please be sure to download all course material you wish to keep before this time as you will have no further access to your courses.

Use of Sakai

This course will have an online component, which can be accessed through Sakai, OHSU’s online course management system. For any technical questions or if you need help logging in, please contact the Sakai Help Desk.

Hours: Sakai Help Desk is available Mon – Fri, 8 am – 9 pm and weekends and 12 pm – 5 pm.

Contact Information:
(Toll-free) 877-972-5249
(Web) http://atech.ohsu.edu/help
(Email) sakai@ohsu.edu

Student Access

OHSU is committed to providing equal access to qualified students who experience a disability in compliance with Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA) of 1990, and the ADA Amendments Act (ADA-AA) of 2008. If you have a disability or think you may have a disability (physical, sensory, chronic health, psychological or learning) please contact the Office for Student Access at (503) 494-0082 or studentaccess@ohsu.edu to discuss eligibility for academic accommodations. Information is also available at www.ohsu.edu/student-access. Because accommodations may take time to implement and cannot be applied retroactively, it is important to have this discussion as soon as possible. All information regarding a student’s disability is kept in accordance with relevant state and federal laws.

DMICE Communication Policy

1. If the syllabus directs the student to contact the TA before contacting the instructor, the student should do so. Otherwise, the student should contact the instructor and allow 2 business days (not including weekends) for a response.
2. If the student does not receive a response from the instructor within 2 business days, s/he should contact the TA (if there is one). When contacting the TA s/he should cc the instructor and Diane Doctor at doctord@ohsu.edu.
3. If a student does not receive a response from the TA within 1 business day (not including weekends), s/he should contact Diane Doctor at doctord@ohsu.edu and cc the instructor and the TA.

4. If Diane does not reply within 1 business day (not including weekends), the student should contact Andrea Ilg at ilgan@ohsu.edu.

5. Students having difficulties with Sakai should contact the Sakai Help Desk at sakai@ohsu.edu or at (877) 972-5249. Sakai help is available M-F from 8am to 10-pm and weekends from Noon to 5pm. Do not contact the instructor.