

## **BMI 544: Databases**

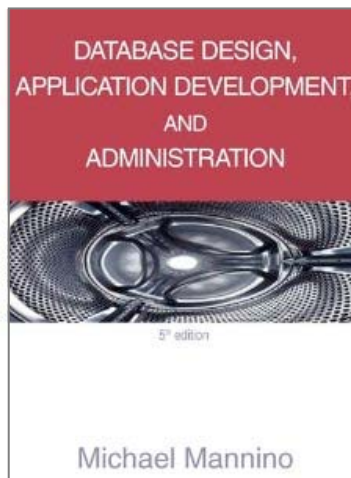
### **Winter term, 2015**

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.  
BICC 415  
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#### **Required Textbook:**

Database Design, Application Development, & Administration, 5<sup>th</sup> edition  
Michael V. Mannino  
Ingram Book Company 2011  
ISBN 9780983332404



#### **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.

For Mac OS X users, one suggestion is that you get VMwareFusion and create a Windows virtual machine. This is available with an educational discount at <http://www.vmware.com/products/fusion>. You will also need a Windows OS license and installation disc.

## **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.

For students in the CI track:

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

For students in the BCB track:

Write programs in Python for access and manipulation of data in databases.

Measure efficiency in queries and optimize indexes and queries.

For students in the HIM track:

Create reports and data visualizations using data in relational databases.

**BMI 544 Term Project, Winter 2015:**

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.

There are 5 steps for the project. You will be asked to submit the first four steps on set dates either to the course instructor or TA, to make sure that project requirements are met and to help with any problems. The final report consists of all documents from the five steps, but compiled in a professional manner. You will be graded on content, completeness, and presentation. Note that at any step you can improve on your previous work - you will receive a grade for the complete project only.

**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.

Week	Topics	Assignments
<b>BASIC</b>		
1	Data, databases and database management systems The relational model	Assignment #1
2	SQL: CREATE statement SQL: SELECT statements Writing use cases	Project, step 1 Assignment #2
3	Conceptual data modeling: Entity-Relationship Diagrams Converting an ER diagram to relational tables	Assignment #3
4	Database optimization: Normalization of relational tables	Project, step 2 Quiz #1
<b>ADVANCED</b>		
5	Data modeling: Extended ER diagrams	Assignment #4
6	Alternate schemas for relational databases: traditional, EAV, star schemas	Project, step 3 Assignment #5
7	Advanced SQL	Assignment #6
8	Advanced normalization and synthesis	Project, step 4 Quiz #2
<b>TOPICS</b>		
9	Topics by track A (CI): Data warehouses B (BCB): Python programming for databases C (HIM): Data reporting and visualization tools	All tracks: Assignment #7
10	Topics by track	All tracks:

	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<sup>1</sup> /Program Coordinator<sup>2</sup> 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<sup>1</sup> /Program Coordinator<sup>2</sup> 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<sup>1</sup>/Program Coordinator<sup>2</sup> may petition the Office of Graduate students for final resolution.

<sup>1</sup> For courses that are run by a specific department.

<sup>2</sup> 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> 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 – 10 pm and weekends and holidays 12 pm – 5 pm.

Contact Information:

(Toll-free) 877-972-5249

(Web) <http://atech.ohsu.edu/help>

(Email) [sakai@ohsu.edu](mailto:sakai@ohsu.edu)

## **Student Access**

OHSU is committed to providing equal access to qualified students with disabilities. Student Access determines and facilitates reasonable accommodations, including academic adjustments and auxiliary aids, for students with documented disabilities. A qualified student with a disability is a person who meets the academic and technical standards requisite to admission or participation in a particular program of study. As defined by the Americans with Disability Act (ADA), a person with a disability has a physical or mental impairment that substantially limits one or more major life activities of the individual. This may include, but is not limited to, physical conditions, chronic health issues, sensory impairments, mental health conditions, learning disabilities and ADHD. Student Access works with students with disabilities from all of OHSU's educational programs and at each campus.

Each school has an assigned Program Accommodation Liaison (PAL), who acts as an "in-house" resource for students and faculty concerning access issues for students with disabilities. The PAL works in collaboration with Student Access to implement recommended accommodations for students with disabilities.

It is recommended that you contact Student Access to consult about possible accommodations if you a) received disability accommodations in the past, b) begin experiencing academic difficulties, and/or c) are given a new diagnosis from your healthcare provider.

Learn more about Student Access:

Phone: 503-494-0082

(Web) [www.ohsu.edu/student-access](http://www.ohsu.edu/student-access)

(Email) [studentaccess@ohsu.edu](mailto:studentaccess@ohsu.edu)

## **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](mailto: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](mailto: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](mailto:ilgan@ohsu.edu).
5. Students having difficulties with Sakai should contact the Sakai Help Desk at [sakai@ohsu.edu](mailto: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.