S511: Database Design

Indiana University-Indianapolis (IUPUI)
School of Informatics and Computing
Department of Library and Information Science

Spring Semester, 2018

Active Time Zone  ET/EST
Meeting Time  Asynchronous
Meeting Location  Online via Canvas
Instructor  Kyle M. L. Jones (MLIS, Ph.D.)
Office Hours  By appointment
E-Mail  kmlj@iupui.edu
Zoom Web Conferencing Room  https://iu.zoom.us/j/507229692
Office Phone  (317) 278-0046
Emergency Phone  (317) 762-6201

NOTE: This is a public version of the course’s syllabus. A full version can be made available upon request by contacting the instructor via the e-mail address listed above.
# Table of Contents

**Course Overview** 3
- Catalog Description ................................................................. 3
- Instructor’s Description .......................................................... 3
- Course Prerequisites ............................................................... 3
- Technical or Skill Prerequisites ............................................... 4
- Instructional Style and Philosophy ......................................... 4
- Student Learning Outcomes .................................................... 4

**Materials and Resources** 7
- Required Textbooks ................................................................ 7
- Other Required and Supplementary Materials ....................... 7
- Suggested Texts and Resources .............................................. 7
- Technology ............................................................................ 8
- Other Resources .................................................................... 10

**Grading and Assessments** 12
- Grading Scale .......................................................................... 12
- Overview of Assessments ...................................................... 13

**Semester Structure** 15
- Overview ............................................................................... 15
- Units and Modules ............................................................... 15
- Semester Schedule .............................................................. 16
Course Overview

Catalog Description

Concerned with a comprehensive view of the processes involved in developing formal access to information from a user-centered point of view. Considers various database models such as flat file, hierarchical, relational, and hypertext in terms of text, sound, numeric, image, and geographic data. Students will design and implement databases using several commercial database management systems.

Instructor’s Description

Database Design is a three-credit course that is concerned with a comprehensive view of the processes involved in developing formal access to data and information from a user-centered point of view. The course will introduce you to technical skills, theoretical concepts, and critical data issues on database design, management, and related socio-technical and ethical concerns. As an introduction to the area, we will cover basic database models and review different systems, which will support your work in libraries, museums, archives, cultural heritage institutions, and other various information roles.

Course Prerequisites

Department of Library and Information Science Students

I designed this course to serve students in the Department of Library and Information Science (DLIS). If you are a DLIS student, you should have completed the following courses before enrolling in this course:

- S401 - Computer-Based Information Tools.
- S501 - Information Services and Services
- S502 - Acquisitions and Management of Knowledge and Information
- S503 - Organization and Representation of Knowledge and Information

Other School of Informatics and Computing Students

If you are a student from other departments within the School of Informatics and Computing, you should have completed the following course(s):

- INFO I501 or INFO B506 or INFO B519 or INFO B530 or INFO H541

Note: Students pursuing a Master of Science in Informatics with a specialization in Applied Data Science, a Master of Science in Informatics with a specialization in Sports Analytics, or a Ph.D. in Data Science should consider taking the fall semester, face-to-face course instead of this version. This course emphasizes concepts, skills, and technologies fit to professional needs of library and information science students.
Technical or Skill Prerequisites

I expect you to have the ability to manage your computer with respect to installing new applications. While not required, a curiosity about and interest in learning new technologies will serve you well in this course. Other than that, no specific database skills are necessary to be successful in this course.

Instructional Style and Philosophy

I strive to create inclusive learning communities whereby we can work together—students with instructor, students with students—to achieve our educational objectives and co-construct knowledge. To achieve these ends, I work to develop social learning experiences and environments that engage my students at personal, professional, and intellectual levels to share their past experiences and knowledge, as well as their future ambitions. Each student needs to respect him or herself, his or her peers, and his or her instructor to maximize the plurality of ideas that may arise when we interact as a community and optimize the goods that come from intellectual inquiry.

How does this philosophy play out in the classroom? I often employ collaborative projects, and I purposefully use discussion forums to engage all learners. I create opportunities for students to explore their personal interests, but I make sure personalized learning is aligned to course learning objectives. I scaffold student learning by encouraging—and sometimes requiring—students to explore minority-held positions, contrarian viewpoints, and alternative values and value sets. Note that some course material fits these types of aims better than others, but the overarching goals remain.

Student Learning Outcomes

Departmental Master of Library Science Learning Outcomes

The Master of Library Science (M.L.S.) program prepares students to become reflective practitioners who connect people and communities with information. Upon completion of the M.L.S. program, graduates are prepared to:

1. Approach professional issues with understanding
   1.1. Understand the social, political, ethical, and legal aspects of information creation, access, ownership, service, and communication
   1.2. Anticipate emerging trends and respond proactively

2. Assist and educate users
   2.1. Analyze and identify the information needs of diverse communities of users
   2.2. Educate users and potential users to locate, use, and evaluate information resources and tools
   2.3. Analyze and evaluate information systems and services in a variety of settings

3. Develop and manage collections of information resources
   3.1. Design and apply policies and procedures that support the selection and acquisition of information resources for particular communities of users
3.2. Manage, evaluate, and preserve physical and virtual collections of information resources
3.3. Uphold ethical and legal standards in acquiring, leasing, preserving, and providing access to information resources

4. Manage and lead libraries and other information organizations
   4.1. Perform basic managerial functions, including planning, budgeting, and performance evaluation
   4.2. Communicate effectively to a variety of audiences
   4.3. Apply theories of organizational behavior and structure

5. Represent and organize information resources
   5.1. Understand and apply principles of representation and organization

6. Use research effectively
   6.1. Design, conduct, interpret, and take action based upon research and evaluation

7. Deploy information technologies in effective and innovative ways
   7.1. Implement and evaluate information and communication technologies for efficiency, usability, and value to users

Course Learning Outcomes
Upon completion of this course, students should be able to do the following each thematic area:

1. Conceptualize databases for particular users and operational needs
   1.1. Understand conceptual design of relational databases including basic concepts such as tables, keys, relationships, create commands and query commands
   1.2. Understand advanced concepts such as enforcing referential integrity and mandatory and optional relationships
   1.3. Build entity-relationship diagrams (ERDs) for relational databases using crows’ foot notation
   1.4. Document a database for current and future maintainers/users
   1.5. Clearly community a database’s construction for current and future maintainers/users

2. Develop databases following conceptual strategies
   2.1. Implement relational databases using GUI interfaces
   2.2. Implement relational databases in open source environments using Structured Query Language (SQL) commands

3. Retrieve data from databases
   3.1. Analyze data dictionaries and ERDs for available data
   3.2. Use SQL to retrieve data according to user and operational needs

4. Understand relevant social issues of databases and emerging database design
   4.1. Recognize the potential benefits and harms that could accrue from Big Data practices
   4.2. Acknowledge the role of databases in creating potentially unfair classificatory systems
   4.3. Critique data practices for perpetuating social injustices
## Student Learning Outcome Map

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>M.L.S. Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>2.1.</td>
</tr>
<tr>
<td>1.1.</td>
<td>2.3.</td>
</tr>
<tr>
<td>1.2.</td>
<td>3.1.</td>
</tr>
<tr>
<td>1.3.</td>
<td>4.2.</td>
</tr>
<tr>
<td>1.4.</td>
<td>5.1.</td>
</tr>
<tr>
<td>1.5.</td>
<td>7.1.</td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>2.1.</td>
<td>7.1.</td>
</tr>
<tr>
<td>2.2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>2.1.</td>
</tr>
<tr>
<td>3.1.</td>
<td></td>
</tr>
<tr>
<td>3.2.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>1.1.</td>
</tr>
<tr>
<td>4.1.</td>
<td>1.2.</td>
</tr>
<tr>
<td>4.2.</td>
<td>3.3.</td>
</tr>
<tr>
<td>4.3.</td>
<td></td>
</tr>
</tbody>
</table>
Materials and Resources

Required Textbooks

I require the following texts for this course. Please order the materials from your favorite bookseller at your earliest convenience. Unless otherwise noted, purchase the edition of the text when I note it in the citation.


This text is expensive. I apologize for the cost, but it is of superior quality. I reviewed over five texts, and none compared regarding quality, clarity, and instructional support (e.g., sample databases, sample SQL statements).

A note on older editions: I have reviewed the detailed tables of contents for the 9th, 10th, and 11th editions. It seems that these editions align very closely with our 12th edition text, and they may be a fine substitute at a much lower cost. Consider buying them used or renting them from Amazon for as low as $3.

I will refer to examples and sample files from the 12th edition, and some of our homework will come from the 12th edition. Concerning the sample files and homework questions, I will make them accessible to you so that you do not need the 12th edition text.


This text is widely available used at a low cost, usually for less than $7. An eBook copy is available via IUCAT using your IU account.

However, the electronic copy is a single-user edition, which means that if one student selects “check out” on the ebook, it will be unavailable to all. However, if students do not select “check out,” multiple users will be able to read it online and/or print chapters.


Other Required and Supplementary Materials

Other book chapters, journal articles, miscellaneous readings, and media listed in the weekly modules are either openly accessible or accessible using your IU credentials.

Suggested Texts and Resources

I recommend the following texts, and they may help you to be successful in this course:

I am a stickler for APA, and I often include proper APA citation and format style as criteria on my rubrics. Please be familiar with this text, or at the least get familiar with the Purdue University Online Writing Lab’s (OWL) APA formatting and style guide.


Technical courses such as this one benefit from the accessibility to a wide variety of free, online resources. I highly encourage you to peruse and reference the following resources throughout the course as needed:

IU resources:
- IU IT Training workshop materials (look for Access and SQL items)
- Books 24x7 IT Pro

Self-paced tutorials/“courses”:
- W3schools SQL Tutorial
- Code School
- Khan Academy
- Code Academy
- lynda.com Access tutorials
- lynda.com SQL tutorials

Some self-paced tutorial sites require you to create an account. Lynda.com videos are available at no charge by signing into the organizational portal by putting in iupui.edu as the organization name.

**Technology**

**Basics**
Internet and computer access is required. Your Internet speed should sufficiently support uploading and downloading large file sizes. Your computer should be up-to-date with the latest operating system to support the required applications listed below; it should also have anti-virus software. The latter is especially important given the fact that we will be sharing files between ourselves. You also need a microphone; a webcam may be useful, but it is not necessary.

**Course Site**
We have access to a Canvas course site. I will use this site as a way to post updates, store documents, receive assignments, and to accommodate online learning activities, among other things. It is your responsibility to review the course site multiple times a week.

**Required Applications**
The following applications are required for you to participate successfully in this course. I will not make accommodations for alternative applications because these tools are directly related to exercises, assignments, and learning objectives.
1) **Kaltura**

We will use Kaltura to create and share screencasts, as well as your final Virtual Symposium presentation. Screencasts can capture our desktop and applications as we interact with them, which allows us to demonstrate our processes and technical questions in an easy way. Kaltura is available for free using your IU account.

To capture your desktop, you will need to install the Kaltura CaptureSpace Desktop Recorder, which is free and available for PC and Mac users. You can manage all of your recordings by logging in and going to your my media page. Once you’ve created some media, you can share it. Watch this instructional screencast to find out how.

2) **Zoom**

We will use Zoom for meetings and “Coffee Chats” (discussed below). Zoom is a web-conferencing application that allows us to share our desktops, applications, microphones, and webcams. The URL to our Zoom room is available on the first page of this document.

To learn how to join a Zoom room and download the necessary (but free) software for PC and Mac users, see this instructional video.

3) **Microsoft Access 2013**

We will use Access for all of our database exercises.

*For PC:* Access is available to download for free within the Microsoft Office 2013 package via the IUware software system.

*For Mac users:* Access is available for free using the IUanyware desktop virtualization platform. See the knowledge base document for help. Note that you must have an Internet connection in order to use IUanyware.

4) **Microsoft Visio 2013**

We will use Visio to create entity relationship diagrams using Crow’s Foot notation.

*For PC AND Mac users:* Access is available for free using the IUanyware desktop virtualization platform. See the knowledge base for help. Again, note that you must have an Internet connection in order to use IUanyware.

5) **Tableau Public**

We will use Tableau’s “public” version for our last module on querying for data visualization purposes. You can download Tableau Public for free for your Mac or Windows computer.

**Privacy Policies**

The technologies we use in this course have different privacy policies. I believe that the technologies we will use respect your privacy in that they do not negatively impact your ability to develop ideas and beliefs by interfering in the educational process. Regardless, you should review their policies to see if they respect your privacy preferences. The links below are to each technology provider’s respective site. Do note that IU or IUPUI may have made changes (e.g.,...
addendums) to these policies when the institutions developed contracts with the service providers; the general policies I list below may not reflect these changes.

The privacy policies:
  • Canvas
  • Kaltura
  • Zoom
  • Microsoft
  • Tableau

Other Resources

Adaptive Educational Services (AES)

Access the AES website
(317) 274-3241

What AES does for students and on your behalf:
  • AES receives students' documentation of disabilities, evaluates it to determine the correct accommodations and services students are entitled to receive.
  • AES provides some accommodations for students and directs them to other campus or off-campus groups that can provide other assistance.
  • AES works to educate the IUPUI staff and faculty both in Indianapolis and at Columbus regarding the university's and its employees' legal responsibilities regarding students with disabilities.
  • AES works with academic units to provide academic substitutions and waivers for students with disabilities which do not fundamentally alter those programs' standards.
  • AES serves as an advocate for students with disabilities, working as a mediator with faculty over classroom issues, with administrators regarding campus policies, and encouraging the university to expand its vision and policies regarding persons with disabilities.

Counseling and Psychological Services

Access the Counseling and Psychological Services website
(317) 274-2548
(317) 251-7575 for the 24 hours crisis hotline

Counseling and Psychological Services provides the following services to students:
  • group counseling
  • individual counseling
  • medication management
  • testing

Libraries

Access the library website
(317) 274-8278

The library staff takes an active interest in serving the teaching, research and scholarly activities of IUPUI students, faculty, staff, and the citizens of Indiana as well as visiting scholars. Beyond
its immense physical collection, the libraries offer a breadth and depth of online resources. Additionally, and most importantly for your needs, the librarians can provide custom research support for whatever project you have. Our liaison, Willie Miller (wmmiller@iupui.edu), should be your first point of contact for this service.

**University Information Technology Services (UI TS)**

Access the UITS website
Access the knowledge base
Get help using live chat
ithelp@iu.edu
(317) 274-4357

If you have any questions about or issues with any of the technology used in this course, please contact the University Information Technology Services (UI TS) support team. For Canvas questions, please search for “Canvas” in the knowledge base.

**The Writing Center**

Access The Writing Center website
(317) 274-2049

The Writing Center offers individual writing instruction, online assistance, and classes to students. Students can work one-on-one with experienced readers and writers to improve their writing process and receive constructive feedback on their assignments. It is an excellent resource for any type of writing assignment. All consultations are available online using Zoom web conferencing software.
# Grading and Assessments

## Grading Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Outstanding achievement. Student performance demonstrates full command of the course materials and evinces a high level of originality and/or creativity that far surpasses course expectations.</td>
<td>98-100</td>
</tr>
<tr>
<td>A-</td>
<td>Excellent achievement. Student performance demonstrates thorough knowledge of the course materials and exceeds course expectations by completing all requirements in a superior manner.</td>
<td>93-97</td>
</tr>
<tr>
<td>B+</td>
<td>Very good work. Student performance demonstrates above-average comprehension of the course materials and exceeds course expectations on all tasks as defined in the course syllabus.</td>
<td>88-92</td>
</tr>
<tr>
<td>B</td>
<td>Good work. Student performance meets designated course expectations, demonstrates understanding of the course materials, and performs at an acceptable level.</td>
<td>83-87</td>
</tr>
<tr>
<td>B-</td>
<td>Marginal work. Student performance demonstrates incomplete understanding of course materials.</td>
<td>78-82</td>
</tr>
<tr>
<td>C</td>
<td>Unsatisfactory work. Student performance demonstrates incomplete and inadequate understanding of course materials. An incomplete may be granted under special circumstances.</td>
<td>67-77</td>
</tr>
<tr>
<td>F</td>
<td>Student has failed the course. An incomplete is not an available option.</td>
<td>66 and below</td>
</tr>
</tbody>
</table>

Notes:

1) I will calculate final grades to the first decimal point. If your final grade is at .5 or above, I will round up. For instance, if you receive a 93.5 on your final grade, I will round this up to a 94.

2) Students must receive a B- or above for a course to satisfy core requirements (e.g. S501, S502). Students must receive a C or above for an elective course applied to the MLS. Students must maintain a 3.0 GPA overall and must finish coursework with a 3.0 GPA. If in any semester a student receives less than a 3.0 for that semester, he or she will be placed on probation and will need to achieve a 3.0 overall GPA during the next semester.

3) A “B” grade is the norm for graduate students. A+ grades are not given in the department.

4) Make special note that instructors coordinate letter grades to percentage scales differently. For instance, a 95% grade may count as an A in one course but a B in another. It is your responsibility to understand what percentage scale is in place for a given course.
## Overview of Assessments

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Outcomes</th>
<th>Points</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multimedia Introductions</td>
<td>NA</td>
<td>1</td>
<td>Sat, Jan 13, 2018 11:59 PM</td>
</tr>
<tr>
<td>Syllabus Agreement Survey</td>
<td>NA</td>
<td>1</td>
<td>Tue, Jan 16, 2018 11:59 PM</td>
</tr>
<tr>
<td><strong>Module Homework</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Module 1</td>
<td>1. (1.1. - 1.2.)</td>
<td>2</td>
<td>Tue, Jan 23, 2018 11:59 PM</td>
</tr>
<tr>
<td>Module 2</td>
<td>1. (1.1. - 1.2.)</td>
<td>2</td>
<td>Tue, Jan 30, 2018 11:59 PM</td>
</tr>
<tr>
<td>Module 3</td>
<td>1. (1.2.)</td>
<td>2</td>
<td>Tue, Feb 6, 2018 11:59 PM</td>
</tr>
<tr>
<td>Module 4</td>
<td>1. (1.2.)</td>
<td>2</td>
<td>Tue, Feb 13, 2018 11:59 PM</td>
</tr>
<tr>
<td>Module 5</td>
<td>1. (1.3. - 1.4.)</td>
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<tr>
<td>Module 6</td>
<td>1. (1.3. - 1.4.)</td>
<td>2</td>
<td>Tue, Feb 27, 2018 11:59 PM</td>
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<tr>
<td>Module 7</td>
<td>1. (1.4.)</td>
<td>2</td>
<td>Tue, Mar 6, 2018 11:59 PM</td>
</tr>
<tr>
<td>Module 8</td>
<td>1. (1.4.)</td>
<td>2</td>
<td>Tue, Mar 13, 2018 11:59 PM</td>
</tr>
<tr>
<td>Module 9</td>
<td>2. (2.1. - 2.2.)</td>
<td>2</td>
<td>Tue, Mar 27, 2018 11:59 PM</td>
</tr>
<tr>
<td>Module 10</td>
<td>3. (3.1. - 3.2.)</td>
<td>2</td>
<td>Tue, Apr 3, 2018 11:59 PM</td>
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<tr>
<td>Module 11</td>
<td>3. (3.1. - 3.2.)</td>
<td>2</td>
<td>Tue, Apr 10, 2018 11:59 PM</td>
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<tr>
<td>Module 12</td>
<td>3. (3.1. - 3.2.)</td>
<td>2</td>
<td>Tue, Apr 17, 2018 11:59 PM</td>
</tr>
<tr>
<td>Module 13</td>
<td>NA</td>
<td>2</td>
<td>Tue, Apr 24, 2018 11:59 PM</td>
</tr>
<tr>
<td>Module 14</td>
<td>3. (3.1. - 3.2.)</td>
<td>2</td>
<td>Tue, May 1, 2018 11:59 PM</td>
</tr>
<tr>
<td><strong>Discussion</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Participation</td>
<td>4. (4.1. - 4.3.)</td>
<td>20</td>
<td>Modules 1–10; see assessment description</td>
</tr>
<tr>
<td>Leadership</td>
<td>4. (4.1. - 4.3.)</td>
<td>5</td>
<td>Depending on your choice; see assessment description</td>
</tr>
<tr>
<td><strong>Data Book</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part 1: The Database Narrative</td>
<td>1. (1.1., 1.2., 1.4.)</td>
<td>10</td>
<td>Tue, Feb 20, 2018 11:59 PM</td>
</tr>
<tr>
<td>Part 2: The Entity Relationship Diagram</td>
<td>1. (1.3. - 1.4.)</td>
<td>15</td>
<td>Tue, Mar 27, 2018 11:59 PM</td>
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<tr>
<td>Part 3: The Database</td>
<td>2. (2.1. - 2.2.) 3. (3.1. - 3.2.)</td>
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<td>Virtual Symposium</td>
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<td>5</td>
<td>Wed, May 2, 2018 11:59 PM</td>
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Total Points = 100
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<thead>
<tr>
<th>Assessment</th>
<th>Outcomes</th>
<th>Points</th>
<th>Due Date</th>
</tr>
</thead>
</table>

Notes:

1) Late assessments will be penalized one point per day late.

2) I reserve the right to require you to revise and resubmit assessments in order to maximize your learning and the opportunity to earn substantial points towards your final grade.
Semester Structure

Overview

This course covers 17 weeks. 14 of those weeks include instruction; three weeks account for the intro to the course, Spring Break, and finals week. The semester has been broken down into 3 thematic units with their own interconnected modules.

Units and Modules

Full descriptions of each module and related readings are available at the course site.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Module</th>
<th>Module Name</th>
<th>Unit Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Database Systems</td>
<td>Unit 1 - Database Concepts</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>Data Models</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>Relational Databases, Part 1</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>Relational Databases, Part 2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>Entity Relationship Modeling, Part 1</td>
<td>Unit 2 - Database Design and Management</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>Entity Relationship Modeling, Part 2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>Advanced Data Modeling</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>Database Normalization</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>SQL Syntax and Programmatic Database Creation</td>
<td>Unit 3 - Data Access and Reporting Using Structured Query Language (SQL)</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>Beginning SQL Queries with the SELECT Statement</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>11</td>
<td>SQL Queries and Programmatic Joins</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>Filtering and Operators</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>13</td>
<td>Open Lab</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>14</td>
<td>Querying for Data Visualization</td>
<td></td>
</tr>
</tbody>
</table>
Semester Schedule

There is a new module each week. Make special note that each week begins on Wednesday at 12:00 AM and ends on the following Tuesday at 11:59 PM. I break it up this way to put Saturday and Sunday right in the middle of the week, which decreases weekend procrastination and improves student engagement in weekly discussions.

<table>
<thead>
<tr>
<th>Week</th>
<th>Unit</th>
<th>Module</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>Tue, Feb 20, 2018</td>
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<td>Tue, May 1, 2018</td>
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<td>Wed, May 2, 2018</td>
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S511: Database Design Syllabus Page 16 of 16