INST 733 - Database Design  
Fall 2013 - Tentative Syllabus

Instructor: Vedat G. Diker  
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E-mail: v d i k e r @umd.edu  
Office Hours: By appointment

Class meeting time and place:  
Tuesday evenings (9/3/2013 - 12/10/2013)  
6:00 PM to 8:45 PM  
in SG-III, Room 4225 (Shady Grove campus)

Catalog Description:  

Extended Description:  
The second decade of the 21st century has been an interesting and exciting period to work on data in general, and database design in particular. The relational database paradigm, which was developed and refined over almost half a century, is still defending its position as the industry standard for most database-related work. However, it is once again being challenged by a new wave of non-relational alternatives; this time by the so-called NoSQL paradigms. Given the fundamentally novel data/information landscape brought about by the Internet and other recent advances in information technology, this may well be the most formidable challenge the relational paradigm has yet to face. While there are groups of people who vehemently defend a “relational-only” stance, or push a “give-up-relational-altogether” approach, many database professionals see the usefulness of both relational and non-relational paradigms, and focus on developing and identifying best practices for combining the two approaches to address database design problems.

In INST 733 - Database Design, we will learn the fundamental concepts and methods within the domain of relational databases. This endeavor will make up most or all of our work in the semester depending on how the students’ learning unfolds. Learning relational database design is still the most important issue we have at hand, since relational databases continue to make up the largest segment of industry-level databases out in the world. As much as time permits towards the end of the semester, we will also look at some of the contemporary non-relational approaches.

Goals:  
After completing this course the student will be able to:
- understand and define fundamental concepts in relational databases,
- develop a logical database design,
- develop entity-relationship diagrams,
- normalize relational databases,
- develop a physical database based on a logical design,
- perform CRUD (create, read, update, delete) operations on relational databases
- (possibly, but not definitely,) understand and define fundamental concepts in one or more of the contemporary non-relational databases paradigms, as compared to the relational model.
Elements of the Course:

Active Participation: The course will involve in-class discussions, as well as in-class exercises. The students are expected to come to class prepared, and participate actively. Please inform the instructor in advance if you will not be able to participate in a class meeting.

In-Class/At-Home Assignments: Student will do hands-on work in the classroom, and some of these exercises will be collected via Canvas to be graded. Students can work on the in-class assignments individually or in consultation with one or more other students; however, each student will be expected to make his/her own submission, if an exercise is graded. Some in-class assignments will have at-home components, which will also be submitted via Canvas.

Individual Project: Each student will work on developing a logical design for a database and subsequently implementing the design in a physical database. Furthermore, students will populate their databases with sample data and run CRUD operations on their databases. The following stages of the project will be graded as separate elements:
- Logical design (including an E-R diagram, and normalization as necessary),
- Physical design (including data type choices and queries for building the physical database),
- Sample data and CRUD operations.

Students will keep a log/diary of their activities on the database, which will be part of the grading of different elements. A final report will summarize the overall project. The database and the report will be of professional quality, in the sense that they could be used as the basis for an actual relational database in real world. Each student will have another student and his/her “peer coach.” Peer coaches will review their partner’s work on an ongoing basis, and provide comments, suggestions and encouragement for improvements. In order to keep things simple, each student will be his/her peer coach’s peer coach. Details about the expectations for the individual project and submission deadlines will be given on the course website on ELMS.

Grading:
- In-Class/At-Home Assignments (On Time) 30%
- Individual Project - Logical Design 20%
- Individual Project - Physical Design 15%
- Individual Project - Sample Data and CRUD 20%
- Individual Project - Project Diary and Report 15%

Active Participation and Attendance Although this component will not be added as extra points to your grade, excessive absence (missing more than three sessions with documented explanation, or more than one session without explanation,) non-participation, disruptive behavior in class, or other unwanted behavior may affect your grade negatively.

Texts:
  Peachpit Press. ISBN: 0321553578 / 978-0321553577
  (An electronic version might be available for purchase/download.)

Other: A number of other readings from different sources will be made available to students. Students are expected to read the material by the deadlines, and before coverage in the class.
Classroom Computer Use:
There will be a good amount of hands-on work in the course. It is highly recommended that you bring a portable computer with you to every class meeting. You may not be able to get the best learning experience from this course without a computer in class. The computer can run on any of the commonly-used operating systems, such as Windows, MacOS or Linux. It must have wireless Internet capability. For the best learning experience, students must refrain from using their computers for activities that are not related to the course, during class time.

Required Software:
We will use the freely-available MySQL Database Server and MySQL Workbench to work on exercises and to build our project databases. Please install the software on your computer at your earliest convenience. You can download them through the links below; you will need both. If you need help with installation and configuration, contact the instructor as soon as possible.
- MySQL Server: http://dev.mysql.com/downloads/mysql/ (see the options under the “Select Platform” drop-down for the correct operating system.)
- MySQL Workbench: http://dev.mysql.com/downloads/tools/workbench/ (see the options under the “Select Platform” drop-down for the correct operating system.)

Other Software:
Depending on the non-relational approaches we are able to cover later in the semester, students may want to install other relevant software on their own computers. However, this will not be mandatory. Links to download and install the software will be provided if and when we cover those non-relational approaches.

Policy on Academic Misconduct
Cases of academic misconduct will be referred to the Office of Student Conduct irrespective of scope and circumstances, as required by university rules and regulations. It is crucial to understand that the instructors do not have a choice of following other courses of actions in handling these cases. There are severe consequences of academic misconduct, some of which are permanent and reflected on the student’s transcript. For details about procedures governing such referrals and possible consequences for the student please visit http://osc.umd.edu/OSC/Default.aspx.

University of Maryland Code of Academic Integrity:
"The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism.” For more information, please visit http://shc.umd.edu/SHC/Default.aspx and http://www.president.umd.edu/policies/iii100a.html.

Special needs
Students with disabilities should inform the instructor of their needs at the beginning of the semester. Please also contact the Disability Support Services (301-314-7682 or http://www.counseling.umd.edu/DSS/). DSS will make arrangements with the student and the instructor to determine and implement appropriate academic accommodations. Students encountering psychological problems that hamper their course work are referred to the Counseling Center (301-314-7651 or http://www.counseling.umd.edu/) for expert help.
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<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Readings (to be done before class)</th>
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<tbody>
<tr>
<td>Sep. 3</td>
<td>Introduction; Course logistics; software installation; Project ideas</td>
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<td>Sep. 10</td>
<td>Relational database fundamentals</td>
<td>[DMDLD] - Ch. 1</td>
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<td>[RDDCE] - Ch. 4</td>
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<td>[SQLRT] - Ch.s 1, 2, 3</td>
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<td>Sep. 17</td>
<td>Introduction to MySQL Server; Introduction to MySQL Workbench;</td>
<td>[BDBD] - Ch. 10</td>
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<td>Introduction to SQL</td>
<td>[MDBM] - Ch. 6</td>
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<td>[SQLVQS] - Ch.s 2, 3</td>
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<td>Sep. 24</td>
<td>Entity-relationship diagrams</td>
<td>[DMDLD] - Ch. 2</td>
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<td>[RDDCE] - Ch. 5</td>
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<td>[SQLCE] - Ch. 1</td>
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<td>Oct. 1</td>
<td>Normalization</td>
<td>[BDBD] Ch.s 8, 9</td>
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<td>[DMDLD] - Ch. 6</td>
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<td>[RDDCE] - Ch. 6</td>
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<td>Oct. 8</td>
<td>Read (<em>R</em>*) operations via SQL</td>
<td>[SQLVQS] - Ch.s 4, 5, 6, 7, 8, 9</td>
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<td>Oct. 15</td>
<td>In-class work on Individual Project</td>
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<td>Oct. 22</td>
<td>Physical design; Data types</td>
<td>[FDBMS] - Ch. 8</td>
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<td>[MDBM] - Ch. 5</td>
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<td>[PDBD] - Ch. 1</td>
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<td>Oct. 29</td>
<td>Physical design via SQL</td>
<td>[MDBM] - Ch. 7</td>
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<td>[SQLVQS] - Ch. 11</td>
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<td>Nov. 5</td>
<td>Create, Update, Delete (C*UD) operations via SQL</td>
<td>[SQLCE] - Ch. 2</td>
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<td>[SQLVQS] - Ch. 10</td>
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<td>Nov. 12</td>
<td>Indexes, Views; Aggregate functions; Triggers</td>
<td>[PDBD] - Ch. 2</td>
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<td>[SQLVQS] - Ch.s 12, 13</td>
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<td>Nov. 19</td>
<td>In-class work on Individual Project</td>
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<td>Nov. 26</td>
<td>In-class work on Individual Project</td>
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<td>Dec. 3</td>
<td>Contemporary non-relational approaches; “Polyglot persistence”</td>
<td>[NSQLD] Preface, Ch. 13</td>
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<td>[PNSQL] - Ch. 1</td>
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<td>Dec. 10</td>
<td>TBD</td>
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Chapters in *italics* will not be available on course reserves due to fair-use limitations.
Book Codes:

**BDBD**: Beginning Database Design - 2nd Edition [2012]


**MDBM**: Modern Database Management - 10th Edition [2011]

**NSQLD**: NoSQL Distilled [2013]

**PDBD**: Physical Database Design [2007]
(Sam Lightstone, Toby Teorey, Tom Nadeau) (Morgan Kaufmann - ISBN: 978-0-12-369389-1)

**PNSQL**: Professional NoSQL [2011]
(Shashank Tiwari) (Wrox - ISBN: 978-0-470-94224-6)

**RDDDCE**: Relational Database Design and Implementation: Clearly Explained - 3rd Ed. [2009]
(Jan L. Harrington) (Morgan Kaufmann - ISBN: 978-0-12-374730-3)

**SQLCE**: SQL Clearly Explained - 3rd Edition [2010]
(Jan L. Harrington) (Morgan Kaufmann - ISBN: 978-0-12-375697-8)

**SQLRT**: SQL and Relational Theory - 2nd Edition [2012]
(C.J. Date) (O’Reilly Media - ISBN: 978-1-449-31640-2)

**SQLVQS**: SQL Visual QuickStart Guide - 3rd Edition [2008]