COLLEGE OF ENGINEERING
Department of Computer Science and Engineering

CMPT 506 - Advanced Database Systems

Fall 2016

Instructor Information

Abdelkarim Erradi
Assistant Professor

Office: Office 132, Female Engineering Building
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Office Hours: Sunday 3:30 to 5pm and Sunday after the class

Class/Laboratory Schedule

Sunday 5pm to 8pm at BCR- Corridor F224

Coordinator Information

Same as the instructor.

Course Information

Catalog Description:
Advanced database concepts, principles and techniques for modeling, designing, querying and managing large databases: advanced data modeling techniques, storage and indexing, query optimization and performance tuning, concurrency control and recovery, data warehousing for decision support, and emerging database trends.

Credits:
3

Contact Hours:
3

Textbook(s):
Elmasri, R. and S. B. Navathe; *Fundamentals of Database Systems*, 6th Edition, Pearson Education, 2014. ISBN: 0136086209

References:
Pramod J. Sadalage and Martin Fowler; *NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot*

Persistence, 1st Edition; Addison-Wesley Professional, 2012. ISBN: 0321826620

Eric Redmond and Jim R. Wilson; *Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement*, 1st Edition; Pragmatic Bookshelf, 2012. ISBN: 1934356921

Course Objectives:
- Expand and deepen knowledge about the inner workings of modern database systems to better design and manage large databases.
- Develop knowledge for new database applications and trends

Course Learning Outcomes (CLO):
1. Explain and apply approaches for improving a database's performance, including the use of indexes, and data partitioning
2. Understand and perform query optimization
3. Explain concurrency control and discuss database mechanisms for achieving Atomicity, Consistency, Isolation, and Durability
4. Design and build a data analysis solution using data warehousing and Online Analytical Processing (OLAP)
5. Understand the basic concepts of NoSQL database management systems
6. Critically discuss different architectures for distributed databases, database future trends and emerging applications

Relationship of Course Outcomes (COs) to Student Outcomes (SOs):

CO #	Related to SOs	Contribution to SO Assessment
1	CMPT-SO(b)	
2	CMPT-SO(b)	
3	CMPT-SO(b)	
4	CMPT-SO(d)	
5	CMPT-SO(b)	
6	CMPT-SO(a)	

CMPT-SO(a): Conduct independent research or project to solve a specific problem in the field of computing
CMPT-SO(b): Analyse, assimilate and produce technical documents in computing
CMPT-SO(c): Recognize professional computing practices in realistic contexts such as global, economic, environmental, and/or social issues.
CMPT-SO(d): Design and evaluate a computer-based system, process, or component to meet desired needs.
CMPT-SO(e): Engage in self-directed lifelong learning.

Topics Covered:

Topics	Chapter	Section	CO	Weeks
Review of fundamental database concepts and introduction to NoSQL	1 to 4			2
Storage and database file organization	16			1
Indexing techniques	17			2

Query processing and optimization	6, 18, 19			2
Transaction management	20			1
Concurrency control and recovery	21, 22			1
Storage and query of XML/JSON documents	11			1
Data warehousing and OLAP				2
Database future trends (e.g., NoSQL and Cloud data services)	Research papers			3
Total				**15**

Method of Instruction

The course is taught primarily through lectures with frequent class discussions, examples, demos and a project. The approach adopted is project oriented learning by developing hands-on assignments and a project to reinforce the concepts introduced in the lectures. Throughout the course, students perform hands-on exercises that build their practical knowledge and skills to design, build, test, and advanced databases. The course uses concrete examples taken from real applications.

Learning Activities
To achieve the objectives of the course, students will carry out several learning activities:

1. **Readings**: The lectures will follow the topics listed in the course detailed schedule. The students are expected to read the assigned textbook chapters, research papers and lecture slides. The reading assignments will elaborate on information presented in the lectures. **Each student is responsible for reading all related material prior to each lecture.** This is a Master course and students are expected to learn independently as much as needed in order to complete the course requirements.
   Frequent class discussions are organized based on reading assignments.

2. **Lectures**: students are expected to attend every lecture; this is where the course material will be discussed and ambiguities clarified. Class participation is highly encouraged. Some of the technologies to be applied in the project and the assignments will be presented in the lectures via examples and demos.
   There are no labs for this course but students are required to practice and extend the examples and the demos provided. Also during some classes, time will be allocated to clarify implementation issues and provide further guidelines about the assignments.

3. **Assignments**: homework assignments will be given so that students practice and apply the material covered in class. The assignments are used as a tool to help the student reinforce the concepts covered in class and gain hand-on development skills. It also offers an opportunity to study covered concepts in more depth and to apply them to realistic scenarios.

4. **Exams:** The midterm and the final exams focus on fundamental concepts covered in the lectures and the assigned readings.

5. **Presentation and discussion leading:** each group will present and demo their project outcomes including a literature survey based on recent papers. Students will present their project and lead the discussion. In-class participation is based on student participation in discussions.

Assessment Methods and Grading Policy

Homework: 15%
Review Paper: 10%
Project: 30%
Midterm Exam: 20%
Final Exam: 25%

Computer/Software Usage

All submissions must be in MS Word format. Many database management systems will be used such as SQL Server, SQL Server Analysis Services and various NoSQL databases such as Cassandra, Neo4j, CouchDB, Redis, MangoDB and VoltDB.

Laboratory Projects

None

Course Ground Rules

Homework Submission:

All homework or project documents should be written using MS-Word and/or appropriate computer software. All due assignments must be submitted on time through the blackboard system at http://mybb.qu.edu.qa and a hard-copy should be submitted at the beginning of the session. No hand-written submission will be accepted.

Each team should also demo their work to the instructor during office hours throughout the semester. Submissions without demo will get 30% deduction.

Late submission policy: 10 points deduction for each late day.

Attendance Policy:

University attendance policies will be enforced. Attendance will be taken during each class meeting. You are responsible for all material covered and all announcements made in class. Classes will start on time. No one should be more than 5 minutes late. Switch off mobile phones during lecture time, pay utmost attention to lecture.

Academic Honesty:

Plagiarism (cheating on an exam, turning in something not entirely your own) will not be tolerated. The university rules will be enforced in case of cheating and plagiarism.

Student submissions must submit their own work without coping from the Internet or from other students. Students could be asked to explain their implementation. A student who shares code with another student will be treated the same as the person who does the copying.

Support for Students with Special Needs

It is Qatar University policy to provide educational opportunities that ensure fair, appropriate and reasonable accommodation to students who have disabilities that may affect their ability to participate in course activities or meet course requirements. Students with disabilities are encouraged to contact their Instructor to ensure that their individual needs are met. The University through its Special Needs Section will exert all efforts to accommodate for individuals' needs.
Contact Information for Special Needs Section:
Tel-Female: (00974) 4403 3843
Tel-Male: (00974) 4403 3854
Location: Student Activities Building
Email: specialneeds@qu.edu.qa

Academic Support and Learning Resources

The University Student Learning Support Center (SLSC) provides academic support services to male and female students at QU. The SLSC is a supportive environment where students can seek assistance with academic coursework, writing assignments, transitioning to college academic life, and other academic issues. SLSC programs include: Peer Tutoring, the Writing Lab, Writing Workshops, and Academic Success Workshops. Students may also seek confidential academic counseling from the professional staff at the Center.
Contact Information for Students Support and Learning Resources:
Tel: (00974) 4403 3876
Fax: (00974) 4403 3871
Location: Female Student Activities Building
E-mail: learningcenter@qu.edu.qa

Student Complaints Policy

Students at Qatar University have the right to pursue complaints related to faculty, staff, and other students. The nature of the complaints may be either academic or non-academic. For more information about the policy and processes related to this policy, you may refer to the students' handbook.

Declaration

This syllabus and contents are subject to changes in the event of extenuating circumstances. The instructor (with approval of the Head of Department) reserves the right to make changes as necessary. If changes are necessitated during the term of the course, the students will be notified by email communication and posting the notification on the online teaching tool Blackboard. It is student's responsibility to check on announcements made while they were absent.

Faculty Name: Abdelkarim Erradi
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