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CS-220 Database Management

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Office Hours: Thursday 7:30-8:15 PM ET
Dates/Times: Thursday 8:15-10:55 PM ET
Number of Meetings: 16
All Meetings are Live online in Canvas.

Fall 2019

Course Description:

An overview of database systems, with an emphasis on relational databases and the relational model. Terminology, basic analysis and database design using Entity-Relationship diagrams and relational schemas (primary-foreign key relationships). Data modeling and Normalization. Database implementation, queries, and updates in a modern relational database management system. An overview of key database concepts including transactions and concurrency. Data warehouses, OLAP vs. OLTP. NoSQL and NewSQL databases will be discussed. Database technology as a foundation for modern Artificial Intelligence applications will be demonstrated. How to decide on the correct database technology based on the workload will be discussed. Application programming for databases will be demonstrated and covered in course projects.

This course introduces database models and the fundamentals of database design. Topics include database structure, database modeling, normalization, database processing, and application programs which access a database. MySQL and MongoDB will be used for class laboratories and projects. Oracle database technologies will be

introduced. The student should finish the course with a sound understanding of relational databases and how to construct SQL queries.

A review of the mathematical concepts necessary for this course will be provided during the lectures.

The following topics will be covered (in no respective order):

SQL	NoSQL
NewSQL	Data modeling
Entity-Relationship Diagrams	Cardinality
Optionality	Conceptual Modeling
Logical Modeling	Physical Design
DDL vs. DML	Strong and Weak Entities
Simple vs. Composite Attributes	Identifiers
Simple vs. Composite Identifiers	Multivalued Attributes
Relationship degree (unary, binary, ternary)	Domain Constraints
Primary and Foreign Keys	Data Types
Referential Integrity	Normalization (1NF, 2NF, 3NF)
Anomalies	Coding Representation Techniques
OLAP vs. OLTP	Transactions
Concurrency	Database Security
ACID	HTAP (Hybrid Transactional Analytical Processing)
Data Warehousing	ETL
Big Data	Analytics
Machine Learning	Dataframes (R and Python)
Key-Value Stores	JSON
XML	Hadoop
Cloud Databases	Schema on Read vs. Schema on Write
IOT and Signal Data	Sharding
Horizontal vs. Vertical Scaling	Distributed Computing
Lambda Architectures	Columnar Storage

Time and Locations

Synchronous lessons will be online on Thursday Evenings from 8:15-10:55 PM ET.

Course Materials/Books:

The course content will draw from multiple sources.

- Modern Database Management, 11th Edition, Pearson ISBN 13: 978-0-13-266225-3

Hoffer/Ramesh/Topi

- My own self-developed course notes/documents and other supplemental material

Course Schedule

The schedule will follow a weekly format with three exams on the dates provided below. The provided required readings are subject to change and additional readings will be assigned throughout the semester.

- Note that students should read the chapters in question before the scheduled lecture

<u>Week/Date</u>	<u>Lecture Topic</u>	<u>Other Notes</u>
1 – 9/5/2019	Course overview/syllabus Introductory Material	
2 – 9/12/2019	Chapter 1 and PHPMyAdmin Project	
3 – 9/18/2019	Chapter 2 and in class examples	
4 – 9/25/2019	Chapter 2 and in class examples	
5 – 10/2/2019	Chapter 3 and datawarehousing	
6 – 10/9/2019	Chapter 3 and datawarehousing	
7 – 10/16/2019	In Class Drill Questions	
8 – 10/23/2019	Chapter 4 and MongoDB	
9 – 10/30/2019	Chapter 5 and MongoDB	
10 – 11/6/2019	Chapter 5	
11 – 11/13/2019	Chapter 6	
12 – 11/20/2019	Chapter 7	
13 – 11/27/2019	In Class Timed Examination	
14 – 12/4/2019	Chapter 8	
15 – 12/11/2019	Review and Application Programming Examples	
16 – 12/18/2019	Final Exams	

Three Exams:

Week of October 9th – Take Home Exam

November 29th – Timed Exam in Canvas

Week of December 17th – Take Home Final

Grading

Grading Components:

Projects: 40% (Programming Laboratories)

Exam 1: 10%

Exam 2: 10%

Final: 20%

HW: 15%

Attendance: 5%

Late homework and assignments will be accepted with a 50% penalty for up to one week after due date. After one week from due date, the student will receive a score of 0.

Course Requirements

Prerequisites: CS-130 or CS-150. You must take this course and CS-130 concurrently.

Knowledge of at least one programming language

Participation

Attendance for class is tracked in Canvas.

Homework

Homework will be due on the indicated due date in Canvas. Late homework will receive 50% credit.

Communication

Emails, phone calls, text. Canvas Appointments are suggested. Course announcements will be used frequently to communicate with the class.

Academic Integrity

Every Student is expected to be familiar with Capitol Technology University's Code of Academic

Conduct including (but not limited to) the issues of cheating, plagiarism, etc. All cases of suspected

academic dishonesty will be reported to the appropriate school officials, and disciplinary action may

result, following investigation by a judiciary committee. Some of the core concepts are given here:

DEFINITION AND EXPECTATIONS OF ACADEMIC INTEGRITY:

Cheating – intentionally using or attempting to use unauthorized materials, information or study aids in

any academic exercise. Examples include, but are not limited to, submitting another student's work as

your own, using books or notes during closed book tests.

Fabrication – intentional and unauthorized falsification or invention of any information or citation in an

academic exercise. Examples include, but are not limited to, changing collected data to meet the

hypothesis, listing a research source that does not exist, listing a quote that does not exist.

Facilitating academic dishonesty – intentionally or knowingly helping or attempting to help another to

violate any provision of this code. Examples include, but are not limited to, giving any individual other

than the professor your completed assignment, suggesting ways to cheat or plagiarize.

Plagiarism – The Technology University plagiarism policy may be found online at

<http://www.capttechu.edu/resources/lib/writingguide/plagiarism.html>

Self-Plagiarism – submitting the same paper or assignment for more than one class for a grade without

the professor's knowledge or permission.

Complicity – failing to report the incidents of academic dishonesty to the professor, department chair,

Dean of Academic Affairs, or the Vice President for Academic Affairs.

Code of Conduct – the academic integrity code is incorporated into the Capitol

Technology University's

Code of Conduct Standards.

Judicial Process

Any incidents should be reported to the appropriate Department Chair with written documentation. The

Department Chair will forward academic integrity cases to the Academic Affairs Council for review and

all other incidents to the Dean of Students. Once the case is reviewed, the Judicial Facilitator, Dean of

Students or designee, will meet with the student to discuss the allegations. The student will have the

opportunity to accept responsibility and sanctions or to have the case heard by a Conduct Review Panel

(CRP). If a CRP is needed, the student and all other faculty, staff or students who have direct knowledge

of the incident will be asked to participate in a hearing. The CRP is composed of three members who are selected by the Judicial Facilitator from a pool of faculty, staff, or students. In cases of potential violations of the Academic Integrity Code, the CRP is generally composed of faculty members. The CRP will determine if it is more likely than not that the campus policies have been violated. If the CRP finds that the policies have been violated, they will recommend sanctions. The Judicial Facilitator will notify the student in writing of the CRP's findings. The student has the opportunity to appeal to the VP for Academic Affairs.

To learn more about the official policies of the university on this issue, please read "Code of Academic Integrity" beginning on page 18 and "Sanctions for Violations of Regulations" beginning on page 63 of the Student Handbook. The Student Handbook can be downloaded from: <http://www.capttechu.edu/current-students/undergraduate/academic-resources>

The contents of this syllabus or the scheduled contained herein can be modified at any time without notice.by the Professor.