Course Syllabus

CS 6400 DATABASE SYSTEMS CONCEPTS AND DESIGN – Spring 2021

Creator: Leo Mark; leo.mark@pe.gatech.edu
Instructor: Leo Mark; **leo.mark@pe.gatech.edu (mailto:leo.mark@pe.gatech.edu)**
Head TAs: Will Johnson; **tjohnson306@gatech.edu, (mailto:tjohnson306@gatech.edu,)** Peter Graening; **peter.graening@gatech.edu (mailto:peter.graening@gatech.edu)**
Several additional TAs: will be introduced on Piazza

Office hours: Probably Wednesday evenings, 7-8pm EDT (details TBD)

Please be sure you are familiar with the additional course policies not covered in the syllabus. (These will not be available until the course start date).

Overview:
We believe in learning-by-example and learning-by-doing.
This course presents an example of applying a database application development methodology to a major real-world project. All the database concepts, techniques and tools that are needed to develop a database application from scratch are introduced along the way when they are needed. In parallel - slightly delayed - learners in the course will apply the database application development methodology, the techniques and the tools to their own major class team project.
In addition to the development methodology, techniques and tools learned in this course will include the Extended Entity Relationship Model, the Relational Model, Relational algebra, calculus and SQL, database normalization, efficiency and indexing. Finally, techniques and tools for metadata management and archival will be presented.
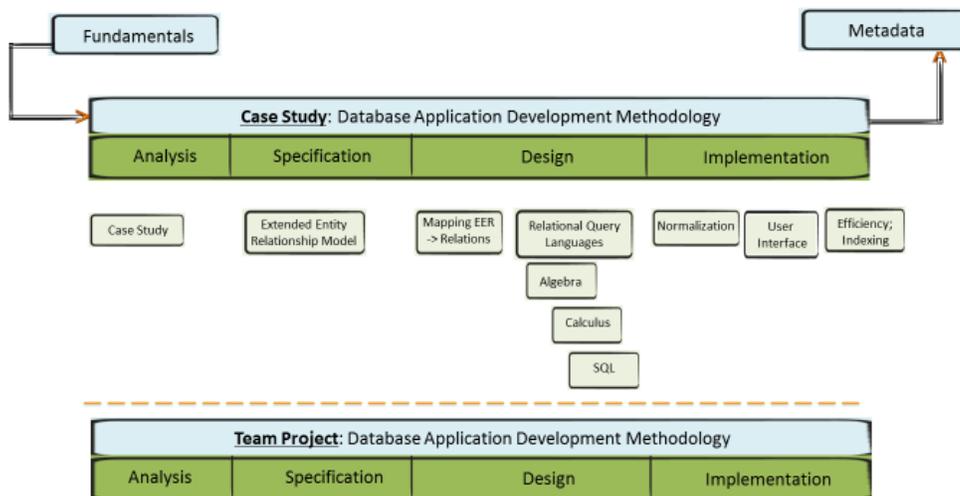
Prerequisites:
Learners should be familiar with at least one scripting or programming language, e.g. PHP, Python, Java. Some familiarity with software engineering concepts and Git/source control will be helpful. Willingness to learn basic system administration/database administration tasks is necessary. Flexibility and readiness to work remotely with team members is a must.

Learning Outcomes:
At the end of this course the learner will:

- Understand and apply the concepts of data independence, database and database management system architecture, and the role and placement of a database management system the application stack
- Understand and apply the theoretical foundation of relational databases and query languages to create SQL data structure definitions and queries that meet identified requirements

- Create a relational database application, including the requirement analysis, specification, design and implementation of relational database applications
- Evaluate alternative internal schema structures and create indices for efficient database operation

This course is a graduate-level introduction to database systems. Advanced topics in databases (such as query optimizers, NoSQL databases, DBMS implementations, etc.) will not be covered.

Grading Summary:

50%	Four exams • Exam 1 - 12.5% • Exam 2 - 12.5% • Exam 3 - 12.5% • Exam 4 - 12.5%
35%	Three project phases: • Phase 1 – 10% • Phase 2 – 10% • Phase 3 – 15% (While the phases are not equally weighed, they are of equal importance. You will receive more time to work on Phase 3, and therefore it is given greater weighing.)
15%	Participation • Onboarding Exam – 1% • Team Formation Survey – 1% • Course Policy Review – 1% • Exam Policy Review – 2% • Teammate Evaluation – 10%

Please note: If your team assessment for a phase of the project indicates that you did no work on that phase, and we do not see evidence of contributions from you towards that phase, you may receive a reduced grade or even a zero for that phase, and it will be your responsibility to justify why you should share the grade that your team earned.

Exam reading and lectures breakdown:

	Topic	Textbook chapter readings	Lectures
Exam 1	Intro, ER, EER	1, 2, 3 (except 3.8), 4 (except 4.6)	Course overview Fundamentals of Databases Extended Entity-Relationship Model
Exam 2	Relational algebra and calculus, EER mapping	5, 8, 9	EER Relational Mapping Relational Query Languages: Algebra & Calculus
Exam 3	SQL	6, 7	Relational Query Languages: SQL
Exam 4	Functional dependencies, normalization, file organization, indexing	14, 15.1, 15.2, 16 (except 16.2.3, 16.8.3, 16.10, 16.11), 17 (except 17.4 and 17.5)	Normalization Efficiency

Note: all chapters listed are for the 7thedition of the textbook. Prior editions are not supported in this course.

Project reading and lecture breakdown:

	Deliverable	Textbook chapter readings	Lectures
Phase 1	Analysis & Specification: • IFD (10%) • EER Diagram (40%) • Data formatting (5%) (attributes, domains) • Constraints (5%) • Task Decomposition (10%) • Abstract code (30%)	1, 2, 3, 4	Methodology I: Analysis Methodology II: Specification
Phase 2	Design: • (revised) EER diagram • EER to Relational mapping. (25%) • SQL Create Table statements (25%) • Task designs w/abstract code that refers to EER replaced w/SQL that refers the relations (50%)	5, 6, 7, 9	Methodology III: Design Methodology III: Design [SQL]
Phase 3	Implementation: • Evaluation of completed functionality demonstrated by your team, incorporating inserts, updates, deletes, and queries • Specific criteria will be provided later this semester	10, 11, 14, 15.1, 15.2, 16, 17	Methodology IV: Implementation

Note: all chapters listed are for the 7thedition of the textbook. Prior editions are not supported in this course.

Schedule:

You will receive all assignments and projects through Canvas, along with their due dates and instructions on how to complete them. The "course summary" section below this syllabus will list due dates for all deliverables, but they may be adjusted. **We may amend the course schedule, assignment content, or assignment due dates if circumstances require us to do so.** Please be sure to complete all assignments and projects by their due date, as late work generally will not be accepted for grading and no credit will be granted for work not completed and submitted on time. Some assignments may have a small period after the deadline where submissions are accepted, but any submission after the deadline will be subject to a grade penalty at the discretion of the instructors. You will also receive grades and information on how much each graded item counts toward the overall grade for the course through Canvas.

(This course uses "Anywhere on Earth" (AoE) ☐ **(https://en.wikipedia.org/wiki/Anywhere_on_Earth) time. Please make sure to set your Canvas time zone to your local time zone, so that there is no confusion about due dates/times. "Midnight" can be ambiguous, so in our usage, "Midnight Tuesday" is one second after 11:59:59pm on Tuesday night, AoE time.)**

Communications:
We will be using **Piazza** ☐ **(https://piazza.com/)** as a forum. Please submit all of your course-related questions through Piazza. Please also make sure to read all Piazza postings, or you may miss important information about the course and the project. You should check Piazza every day throughout the semester.

Office hours will be held. All students are strongly encouraged to either watch in real time, or watch the recording, as information given during the office hour may not be presented separate from the office hour.

Please do not contact the course staff via email, Canvas messages, Slack, or any medium other than Piazza. There may be people with names similar to the instructional team in the GT directory, so to avoid any accidental miscommunication, email should be avoided. Other communications channels are not monitored by all members of the course staff. Therefore, any communications received outside of Piazza may

be ignored or discarded. When posting on Piazza, make sure to post to the "Instructors" group (not an individual) or your post may not be answered in a timely manner.

<u>A note about email forwarding</u>
We use external sites, such as CATME, BlueJeans, and Piazza in this course. We will register your GT username-based email (ex: **gpburdell3@gatech.edu (mailto:gpburdell3@gatech.edu)**) with those external resources. If you have email forwarding configured for your GT account, we are not responsible if emails from external sites do not reach you! Emails from these sites are whitelisted on GT's email servers, so to avoid missing any kind of communication, we recommend disabling email forwarding and using your GT email as a regular email account.

Required text:
Elmasri & Navathe: Fundamentals of Database Systems. 7thEdition. Pearson 2016.
Please respect the intellectual property and hard work of the textbook authors and purchase a licensed copy of the text. A downloaded PDF from the Internet is **NOT** a legal copy of the text.
Prior editions of the text are not supported in this course. International editions, if listed as the 7thedition, are acceptable, but page numbering may differ between US and International editions.
Additional course material, if necessary, will be available online.

Academic honesty:
Plagiarism is considered a serious offense. You are not allowed to copy and paste or submit materials created or published by others, as if you created the materials. All materials submitted and posted must be your own or, on team assignments, the work of your team. Any background materials you use should be cited. Use of any previous semester course materials, such as tests, quizzes, homework, projects, videos, and any other coursework, is prohibited in this course.

All Georgia Tech students are expected to uphold the **Georgia Tech Academic Honor Code** ⤤ **(http://policylibrary.gatech.edu/student-affairs/academic-honor-code)** . Deep collaboration within project teams is encouraged. Collaboration between teams is not allowed in any way whatsoever. Any of your work from this class may not be shared publicly.

Diversity and Disability Statement:
Georgia Tech values diversity and inclusion; we are committed to a climate of mutual respect and full participation. Our goal is to create learning environments that are usable, equitable, inclusive and welcoming. If there are aspects of the instruction or design of this course that result in barriers to your inclusion or accurate assessment or achievement, please notify the instructor as soon as possible. Students with disabilities should contact the Office of Disability Services to discuss options of removing barriers in this course, including accommodations. ODS can be reached at 404.894.2563, **dsinfo@gatech.edu (mailto:dsinfo@gatech.edu)** , or disabilityservices.gatech.edu

A note about the video lecture example database:
The GT Online database in the lecture videos is a simplified example for educational purposes. The database schema implies that sex is the same as gender, and that the only possibilities are male and female. This unintentional simplification does not accurately reflect the world at large.

Access and Accommodations:
Your experience in this class is important to the instructor. If you have already established accommodations with the Offices of Disability Services, please communicate your approved accommodations to the instructor at your earliest convenience so your needs in this course can be discussed.

If you have not yet established services through Disability Services, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), please contact the Office of Disability Services at 404.894.2563 or dsinfo@gatech.edu or **disabilityservices.gatech.edu.** ⤤ **(http://depts.washington.edu/uwdrs/)**

Disability Services offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s) and Disability Services. It is important to the Georgia Institute of Technology to create inclusive and accessible learning environments consistent with federal and state law.

Personal and Medical Emergencies:
In the event of a genuine emergency that could impact your ability to participate in the course, please contact the Dean of Students Office (**https://studentlife.gatech.edu** ⤤ **(https://studentlife.gatech.edu/)**) as soon as possible, and they will validate your reasons, provide you with any assistance the Institute can render, and instruct us how to proceed. You must notify us within a reasonable amount of time (as soon as you are able to do so) that you are in the process of requesting such an exception. Requests for exemptions/extensions that are received more than 30 days after the first possible notification date will be administratively denied.

Please be aware of any work, personal, or travel plans that may conflict with the course schedule, as these are not considered emergency situations, including disruption to travel. Due to the size of this class, any request for an individual exception to the course schedule (such as taking an exam earlier or later) cannot be accommodated. If you have an unavoidable conflict and cannot work around the requirements and schedule of this course, you should drop it and consider taking it in a future semester.   Note that some types of absences **are** allowed with proper advanced notice, and further details can be found in the Institute catalog: **http://www.catalog.gatech.edu/rules/4/** ⤤ **(http://www.catalog.gatech.edu/rules/4/)** .

Additional course policies:
Additional policies regarding this course that are beyond the scope of this syllabus have been published on Canvas. It is your responsibility to review those policies and be aware of them, especially policies regarding examinations. Any violations of these policies may result in grade penalties and/or referral for improper academic conduct, even if you were unaware of the policy you violated.

Course Summary:

Date	Details	
Mon Jan 25, 2021	📝 **Team Formation Survey** (https://gatech.instructure.com/courses/159634/assignments/648086)	due by 7am
Sun Jan 31, 2021	📅 **Project Teams and Team Resources Created** (https://gatech.instructure.com/calendar?event_id=1568771&include_contexts=course_159634)	12am
Mon Feb 1, 2021	📅 **Team Project Spec Released** (https://gatech.instructure.com/calendar?event_id=1568735&include_contexts=course_159634)	12am
Fri Feb 5, 2021	📝 **Course Policy Review** (https://gatech.instructure.com/courses/159634/assignments/648062)	due by 7am
	📝 **Onboarding Exam** (https://gatech.instructure.com/courses/159634/assignments/648054)	due by 7am
Mon Feb 8, 2021	📝 **Exam 1** (https://gatech.instructure.com/courses/159634/assignments/648052)	due by 7am
	📝 **Exam 1 Policy Review** (https://gatech.instructure.com/courses/159634/assignments/648064)	due by 7am
Mon Feb 22, 2021	📝 **Project Phase 1** (https://gatech.instructure.com/courses/159634/assignments/648078)	due by 7am
Mon Mar 1, 2021	📝 **Exam 2** (https://gatech.instructure.com/courses/159634/assignments/648056)	due by 7am
	📝 **Exam 2 Policy Refresher** (https://gatech.instructure.com/courses/159634/assignments/648066)	due by 7am
Wed Mar 3, 2021	📝 **Phase 1 Team Evaluation** (https://gatech.instructure.com/courses/159634/assignments/648072)	due by 7am
Mon Mar 22, 2021	📝 **Project Phase 2** (https://gatech.instructure.com/courses/159634/assignments/648080)	due by 8am
Mon Mar 29, 2021	📝 **Exam 3** (https://gatech.instructure.com/courses/159634/assignments/648058)	due by 8am
	📝 **Exam 3 Policy Refresher** (https://gatech.instructure.com/courses/159634/assignments/648068)	due by 8am

Date	Details	
Wed Mar 31, 2021	📝 **Phase 2 Team Evaluation** (https://gatech.instructure.com/courses/159634/assignments/648074)	due by 8am
Mon Apr 19, 2021	📅 **Team Project Demos** (https://gatech.instructure.com/calendar? event_id=1568773&include_contexts=course_159634)	8am to 11:59pm
	📝 **Project Phase 3** (https://gatech.instructure.com/courses/159634/assignments/648082)	due by 8am
Tue Apr 20, 2021	📅 **Team Project Demos** (https://gatech.instructure.com/calendar? event_id=1568775&include_contexts=course_159634)	12am
Wed Apr 21, 2021	📅 **Team Project Demos** (https://gatech.instructure.com/calendar? event_id=1568777&include_contexts=course_159634)	12am
Thu Apr 22, 2021	📅 **Team Project Demos** (https://gatech.instructure.com/calendar? event_id=1568779&include_contexts=course_159634)	12am
Fri Apr 23, 2021	📅 **Team Project Demos** (https://gatech.instructure.com/calendar? event_id=1568781&include_contexts=course_159634)	12am
Sat Apr 24, 2021	📅 **Team Project Demos** (https://gatech.instructure.com/calendar? event_id=1568783&include_contexts=course_159634)	12am
Sun Apr 25, 2021	📅 **Team Project Demos** (https://gatech.instructure.com/calendar? event_id=1568785&include_contexts=course_159634)	12am
	📝 **Team Project Demos** (https://gatech.instructure.com/courses/159634/assignments/648088)	due by 11:59pm
Wed Apr 28, 2021	📝 **Phase 3 Team Evaluation** (https://gatech.instructure.com/courses/159634/assignments/648076)	due by 8am
Mon May 3, 2021	📝 **Exam 4** (https://gatech.instructure.com/courses/159634/assignments/648060)	due by 8am
	📝 **Exam 4 Policy Refresher** (https://gatech.instructure.com/courses/159634/assignments/648070)	due by 8am
	📝 **Team Evaluation Individual Score** (https://gatech.instructure.com/courses/159634/assignments/648084)	