

Course Syllabus

CS 6400 DATABASE SYSTEMS CONCEPTS AND DESIGN

Creator: Leo Mark; [leo.mark@pe.gatech.edu \(mailto:leo.mark@pe.gatech.edu\)](mailto:leo.mark@pe.gatech.edu)

Instructor: Leo Mark; [leo.mark@pe.gatech.edu \(mailto:leo.mark@pe.gatech.edu\)](mailto:leo.mark@pe.gatech.edu)

Head TA: Peter Graening; [peter.graening@gatech.edu \(mailto:peter.graening@gatech.edu\)](mailto:peter.graening@gatech.edu)

Several additional TAs: will be introduced on Piazza

(Please note, any private communications should be addressed to "Instructors" on Piazza. Messages received via email or Canvas messaging will be ignored.)

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

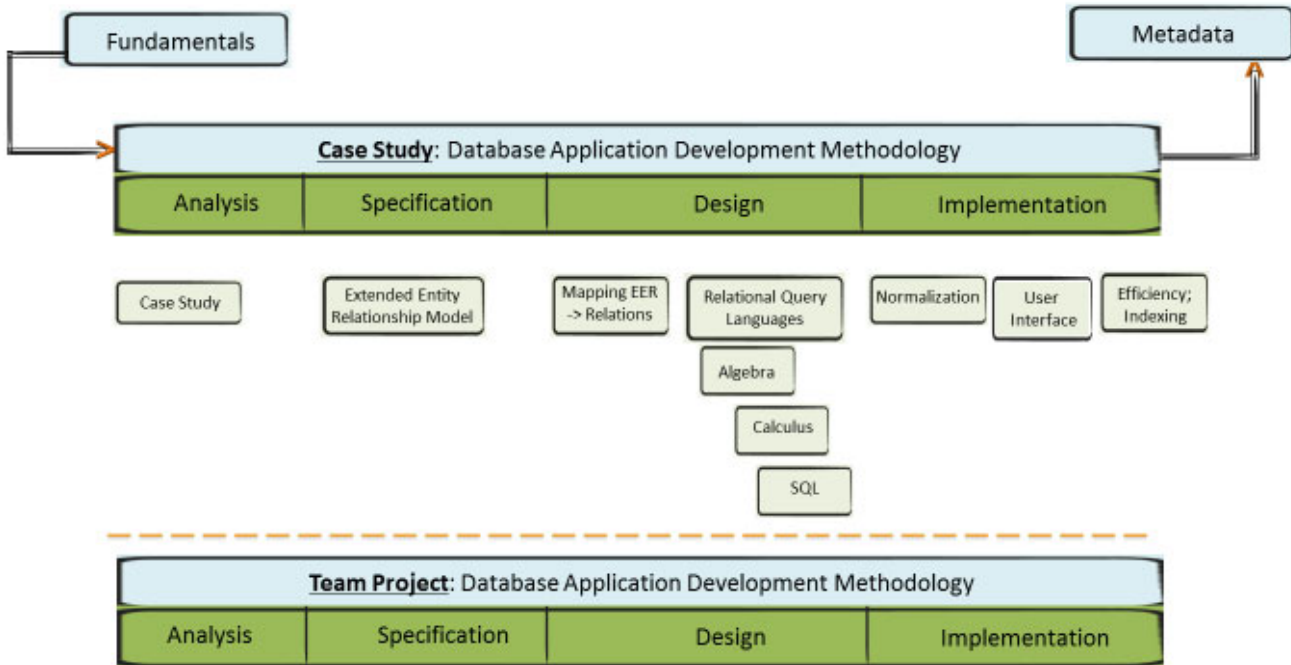
Please be sure you are familiar with the additional course policies not covered in the syllabus. (These will not be available until the course start date).

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%	<p>Exams</p> <ul style="list-style-type: none"> • Exam 1 - 12.5% • Exam 2 - 12.5% • Exam 3 - 12.5% • Exam 4 - 12.5%
35%	<p>Team project:</p> <ul style="list-style-type: none"> • Phase 1 – 10% • Phase 2 – 10% • Phase 3 – 15% <p>(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.)</p>
15%	<p>Participation</p> <ul style="list-style-type: none"> • Onboarding Exam – 1.25% • Team Formation Survey – 1.25% • Teammate Evaluation – 12.5%

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)	<p>Course overview</p> <p>Fundamentals of Databases</p> <p>Extended Entity-Relationship Model</p>
Exam 2	Relational algebra and calculus, EER mapping	5, 8, 9	<p>EER Relational Mapping</p> <p>Relational Query Languages: Algebra & Calculus</p>

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 7th edition 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • (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: <ul style="list-style-type: none"> • Evaluation of completed functionality demonstrated 	10, 11, 14, 15.1, 15.2, 16, 17	Methodology IV: Implementation

	by your team, incorporating inserts, updates, deletes, and queries <ul style="list-style-type: none"> • Specific criteria will be provided later this semester 		
--	--	--	--

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

Due dates and deadlines:

It is your responsibility to be aware of all due dates and ensure assignments are submitted before they are due. All assignments will generally have a deadline at 7 am ET (8 am ET when daylight saving time is in effect.)

Late work/missing submissions:

Late work is not accepted in this course. Failure to submit an assignment on time due to misunderstanding the due date or forgetting about the assignment will not be a valid excuse and makeup work or submissions for full or partial credit is unlikely. Any makeup opportunities, if they are provided at the discretion of the instructional team, may incur a penalty of at least 15% total (for example, a 15 point reduction on a 100 point assignment, not 15% of what was scored).

Team assignments:

Due to their nature, we are unable to provide accommodations or extensions for group assignments. Should you experience a personal emergency that impacts a group deliverable, it is your responsibility to inform your teammates that you are unavailable as soon as possible so that they are given ample time to work around your potential absence. In the same vein we strongly recommend planning, organizing, and starting a group assignment right after it opens; should an emergency befall one of your teammates a few days before something is due, we will not be able to provide any accommodation as adequate time had already been provided (usually on the order of weeks) to complete any work prior to the unexpected emergency.

Planned absences:

Please be aware of any work, personal, vacation, family, or travel plans (including disruption to travel) that may conflict with the course schedule. 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) due to a non-emergency conflict cannot be accommodated, should not be requested, and will be automatically denied if requested. If you have an unavoidable conflict and cannot work around the course schedule, you should drop it and consider taking it in a future semester. Note that some limited 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/> [\(http://www.catalog.gatech.edu/rules/4/\)](http://www.catalog.gatech.edu/rules/4/).

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.

A note about email forwarding

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 safelisted 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. 7th Edition. 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 7th edition, 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. You may not make any of your work from this class publicly available. If we discover that you have, we reserve the right to issue you a final grade of "Incomplete" until you make your work unavailable.

All Georgia Tech students are expected to uphold the [Georgia Tech Academic Honor Code](http://policylibrary.gatech.edu/student-affairs/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:

While it is highly unlikely this will apply to you, we recommend reviewing this section several times so that you are aware of it in the event you experience a personal or medical emergency!

We understand that unplanned emergencies can and will occur. However, failing to promptly inform us of a personal or medical emergency you experience hinders our ability to accommodate you. (Be aware, while disruption to travel plans is unfortunate, we do not consider it an emergency situation, as it

is considered part of your responsibility to ensure travel and vacation plans do not conflict with the course schedule.)

Qualifying emergencies

For individual assignments we will only provide make-up opportunities or extensions under the following circumstances:

- Hospitalization or serious medical illness that has been appropriately documented and judged by the instructional team as preventing you from preparing adequately for the assignment and/or totally unable to complete an assignment
- Serious illness (requiring hospitalization) in your immediate family
- Death in your immediate family or second-degree relatives (ex: aunts, uncles, grandparents, etc.)

How and when to notify us

Note that unless you are incapacitated and completely, physically unable to communicate with anyone, you are expected to inform us of your emergency situation as soon as possible through a private post to “Instructors” on Piazza, and provide documentation if it is available. While we understand you may be dealing with a crisis, taking a few minutes to let us know your status sooner rather than later will allow us to help determine and plan appropriate accommodations for your situation. Notifying us of a personal or medical emergency after it has occurred and after a due date has passed or assignment grades have been released may receive limited or no accommodation. In the event your emergency has left you physically incapable of communicating with anyone, you must inform us within seven (7) calendar days from the resolution of your emergency (so, for example, a situation that ends on 10/1 must be communicated to us by 10/7), after that point, any requests will be administratively denied and no accommodation will be granted.

Documentation

Documentation must be provided by an appropriate health official for medical emergencies. For other situations, appropriate documentation must also be provided if requested. It is at the discretion of the instructional team whether the provided documentation is acceptable.

Excluded assignments

No extensions can be provided for the Team Formation Survey, the Onboarding Exam, or Team Evaluations. Plenty of time is given to complete these assignments, and they take very little time to complete, so should an emergency occur shortly before the assignment is due, we will not be able to provide any accommodation as adequate time had already been provided to complete them prior to the unexpected emergency. It is in your best interest to complete these types of assignments as soon as they open.

Alternative mechanisms

While we have instituted our own process in order to be able to expedite and quickly resolve emergency situations, you may instead choose to utilize the assistance of the Dean of Students

(<https://studentlife.gatech.edu> [. \(https://studentlife.gatech.edu/\)](https://studentlife.gatech.edu/)). Should you choose to open a

request with them, you are still expected to notify us as soon as possible after making your initial request following the guidelines previously described under “How and when to notify us”. Failure to notify us may result in a limited or less than optimal accommodation. Please be aware that the Dean of Students’ process generally takes much longer for them to acknowledge and to resolve, and that we are unable to discuss accommodations until they have provided a resolution and confirmation for your situation. If you are enrolled in more than one class, it is recommended to follow both our procedure and notify the Dean of Students so that they may coordinate with your other instructors.





If broader circumstances are affecting your ability to participate












These procedures are meant for one-time occurrences or emergencies of a short nature as described under “Qualifying emergencies” where one or two instances of make-up work are anticipated. If you are experiencing a prolonged situation such as ongoing mental health issues, unusual life events, or other difficulties that prevent you from participating in the course at your best academic ability, we recommend contacting your academic advisor and the Dean of Students office as they can provide assistance at an institutional level that course instructors cannot provide.

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	Due
Fri Aug 26, 2022	 Registration Closes (https://gatech.instructure.com/calendar?event_id=3699707&include_contexts=course_264980)	4pm
Mon Aug 29, 2022	 Course Payment Deadline (https://gatech.instructure.com/calendar?event_id=3699709&include_contexts=course_264980)	4pm
Wed Aug 31, 2022	 Office Hour (https://gatech.instructure.com/calendar?event_id=3699663&include_contexts=course_264980)	7pm to 8pm
Sat Sep 3, 2022	 Team Formation Survey (https://gatech.instructure.com/courses/264980/assignments/1124844)	due by 8am

Date	Details	Due
Mon Sep 5, 2022	 Institute Holiday - Labor Day https://gatech.instructure.com/calendar?event_id=3699693&include_contexts=course_264980	12am
Tue Sep 6, 2022	 Team Project Spec Posted https://gatech.instructure.com/calendar?event_id=3699647&include_contexts=course_264980	12am
Tue Sep 6, 2022	 Teams Formed https://gatech.instructure.com/calendar?event_id=3699645&include_contexts=course_264980	12am
Wed Sep 7, 2022	 Office Hour https://gatech.instructure.com/calendar?event_id=3699665&include_contexts=course_264980	7pm to 8pm
Wed Sep 14, 2022	 Office Hour https://gatech.instructure.com/calendar?event_id=3699667&include_contexts=course_264980	7pm to 8pm
Fri Sep 16, 2022	 Onboarding Exam https://gatech.instructure.com/courses/264980/assignments/1124822	due by 8am
Mon Sep 19, 2022	 Exam 1 https://gatech.instructure.com/courses/264980/assignments/1124828	due by 8am
Wed Sep 21, 2022	 Office Hour https://gatech.instructure.com/calendar?event_id=3699669&include_contexts=course_264980	7pm to 8pm
Wed Sep 28, 2022	 Office Hour https://gatech.instructure.com/calendar?event_id=3699671&include_contexts=course_264980	7pm to 8pm
Mon Oct 3, 2022	 Project Phase 1 https://gatech.instructure.com/courses/264980/assignments/1124836	due by 8am
Wed Oct 5, 2022	 Office Hour https://gatech.instructure.com/calendar?event_id=3699673&include_contexts=course_264980	7pm to 8pm

Date	Details	Due
Wed Oct 12, 2022	 Phase 1 Team Evaluation https://gatech.instructure.com/courses/264980/assignments/1124830	due by 8am
	 Office Hour https://gatech.instructure.com/calendar?event_id=3699675&include_contexts=course_264980	7pm to 8pm
Mon Oct 17, 2022	 Institute Holiday - Student Recess https://gatech.instructure.com/calendar?event_id=3699695&include_contexts=course_264980	12am
	 Exam 2 https://gatech.instructure.com/courses/264980/assignments/1137724	due by 8am
Tue Oct 18, 2022	 Institute Holiday - Student Recess https://gatech.instructure.com/calendar?event_id=3699697&include_contexts=course_264980	12am
Wed Oct 19, 2022	 Office Hour https://gatech.instructure.com/calendar?event_id=3699677&include_contexts=course_264980	7pm to 8pm
Wed Oct 26, 2022	 Office Hour https://gatech.instructure.com/calendar?event_id=3699679&include_contexts=course_264980	7pm to 8pm
Sat Oct 29, 2022	 Course Withdrawal Deadline https://gatech.instructure.com/calendar?event_id=3699711&include_contexts=course_264980	4pm
Mon Oct 31, 2022	 Project Phase 2 https://gatech.instructure.com/courses/264980/assignments/1124838	due by 8am
Wed Nov 2, 2022	 Office Hour https://gatech.instructure.com/calendar?event_id=3699681&include_contexts=course_264980	7pm to 8pm
Wed Nov 9, 2022	 Phase 2 Team Evaluation https://gatech.instructure.com/courses/264980/assignments/1124832	due by 7am

Date	Details	Due
	 Office Hour (https://gatech.instructure.com/calendar?event_id=3699683&include_contexts=course_264980)	7pm to 8pm
Mon Nov 14, 2022	 Exam 3 (https://gatech.instructure.com/courses/264980/assignments/1137726)	due by 7am
Wed Nov 16, 2022	 Office Hour (https://gatech.instructure.com/calendar?event_id=3699685&include_contexts=course_264980)	7pm to 8pm
Wed Nov 23, 2022	 Institute Holiday - Thanksgiving (https://gatech.instructure.com/calendar?event_id=3699701&include_contexts=course_264980)	11pm
Thu Nov 24, 2022	 Institute Holiday - Thanksgiving (https://gatech.instructure.com/calendar?event_id=3699703&include_contexts=course_264980)	11pm
Fri Nov 25, 2022	 Institute Holiday - Thanksgiving (https://gatech.instructure.com/calendar?event_id=3699705&include_contexts=course_264980)	11pm
Mon Nov 28, 2022	 Project Phase 3 (https://gatech.instructure.com/courses/264980/assignments/1124840)	due by 7am
	 Team Project Demos (https://gatech.instructure.com/calendar?event_id=3699649&include_contexts=course_264980)	11pm
Tue Nov 29, 2022	 Team Project Demos (https://gatech.instructure.com/calendar?event_id=3699651&include_contexts=course_264980)	11pm
Wed Nov 30, 2022	 Team Project Demos (https://gatech.instructure.com/calendar?event_id=3699653&include_contexts=course_264980)	11pm

Date	Details	Due
Thu Dec 1, 2022	 Team Project Demos (https://gatech.instructure.com/calendar?event_id=3699655&include_contexts=course_264980)	11pm
Fri Dec 2, 2022	 Team Project Demos (https://gatech.instructure.com/calendar?event_id=3699657&include_contexts=course_264980)	11pm
Sat Dec 3, 2022	 Team Project Demos (https://gatech.instructure.com/calendar?event_id=3699659&include_contexts=course_264980)	11pm
Sun Dec 4, 2022	 Team Project Demos (https://gatech.instructure.com/calendar?event_id=3699661&include_contexts=course_264980)	11pm
Wed Dec 7, 2022	 Phase 3 Team Evaluation (https://gatech.instructure.com/courses/264980/assignments/1124834)	due by 7am
Wed Dec 7, 2022	 Office Hour (https://gatech.instructure.com/calendar?event_id=3699691&include_contexts=course_264980)	7pm to 8pm
Mon Dec 12, 2022	 Exam 4 (https://gatech.instructure.com/courses/264980/assignments/1137722)	due by 7am
Mon Dec 12, 2022	 Team Evaluation Individual Score (https://gatech.instructure.com/courses/264980/assignments/1124842)	