

# IST659 Data Administration Concepts and Database Management

Syracuse University Graduate Course Syllabus

## Course Information

### Description

Definition, development, and management of databases for information systems. Data analysis techniques, data modeling, and schema design. Query languages and search specifications. Overview of file organization for databases. Data administration concepts and skills.

### Additional Course Description

This is an introductory course in database management systems. It examines data structures, file organizations, concepts, and principles of database management systems (DBMS), as well as data analysis, database design, data modeling, database management, and database implementation. More specifically, it introduces hierarchical, network, and relational data models; entity-relationship modeling; basics of Structured Query Language (SQL); data normalization; and database design. This course provides hands-on experience in database design and implementation through assignments, lab exercises, and course projects. This course also introduces advanced database concepts such as transaction management and concurrency control, distributed databases, multitier client-server architectures, database applications, improving query performance through indexing, and advanced data query patterns for extract, transform, load (ETL).

**Prerequisite/Co-requisite:** None

**Audience:** This is an introductory course and requires no prior knowledge in the subject area.

**Credits:** 3

### Learning Objectives

Upon completing this course, the learner should be able to:

- Describe fundamental data and database concepts, including various storage models.
- Explain and use the database development life-cycle and data models.
- Analyze business problems and design and implement appropriate data-oriented solutions using the relational data storage model.
- Solve problems by constructing database objects and queries using SQL.
- Identify performance and data integrity improvements of existing database designs and implementations.
- Evaluate and select approaches for data migrations, temporal data, and data normalization.
- Critique the effectiveness of DBMS in computer information systems.

## Course Fees and/or Costs

- None

## Required Textbooks and Supplies

- *Applied Database Management*, by Michael Fudge. ISBN 9781644965900. The book is an online text, available <https://www.grlcontent.com/>.
- Students are expected to have a laptop computer to participate in the class sessions, run the lab software, and complete the Homework Problem Sets. Requirements are any Mac OS X, Windows 10, or Chromebook with 8GB RAM and 8GB free disk space.

## Understanding the Approach Used in This Course

To instill good habits and routine, the approach used in this course is the same each week. It is designed to allow you to progress as a learner, ask questions, and grow comfortable with the material throughout the week. There are three phases to the approach:

- **Coursework before class** consists of a chapter reading from the textbook and a video lecture. Both are active learning tools, and you will be asked questions as you read and watch. Your responses are not graded but will be reviewed by your instructor to prepare for the in-class session. As part of your engagement with the learning process, it is expected that you will review your own answers and prepare any questions or doubts you have about the coursework. You will also be issued a quiz that reinforces basic concepts from the textbook and asynchronous content. Your learning outcomes at this stage are to recall key terms and understand the concepts presented to you.
- The **live session** allows you to reinforce what you have learned and to begin to apply it to new problems and situations. We begin each class with students posting their coursework questions to the community board. Your questions should be based on concepts that remain unclear to you. These questions will guide our class discussions and activities. We then review the previous week's homework problem set, discussing strategies, and sharing answers to them.
- **After class** you will complete a lab and Homework Problem Set. The lab contains a walk-through to guide you through the application of the problem-solving approaches relevant to this week's material. The Homework Problem Set is your opportunity to self-measure your knowledge of the material and application of it to new situations and scenarios. Included with your Homework Problem Set is a metacognitive activity where you are asked to reflect on your experiences as a learner that week and assess your comfort level with the material.

## Tools We May Use in This Course

It is suggested that you install and configure these tools on your laptop before the course begins.

- **Zoom.** Zoom is a video conferencing tool we will use for our scheduled online and hybrid face-to-face sessions. Download the Zoom client at <https://zoom.us>
- **Microsoft Teams.** Teams is collaboration tool. Integrating with email and calendar, Teams offers presence awareness and chat/messaging. These chats can be elevated into a video conference. We will use teams for class discussions, homework questions, and office hours. You are welcome to contact me whenever my status says I am available. Your Office 365 account is linked to your NetID. Log on to teams by visiting <https://portal.office.com>, entering your SU email [netid@sy.edu](mailto:netid@sy.edu) and then your NetID password. Once you are signed into Office 365, click the Teams icon.
- **Google Docs.** We will use Google Docs as a collaborative note-taking tool to work in class on problems and breakout activities. Log in with your SU Google account: <https://g.syr.edu>.
- **Docker.** Docker is a containerization platform, allowing you to run applications in isolation from your host computer. In this course, we use it to run the DBMS itself and supporting tools. You can download and install Docker by following the instructions here: <https://docs.docker.com/get-docker/>
- **Azure Data Studio.** Azure Data Studio (ADS) is a SQL database client. While you can get away with using the web tools provided with the Learn Databases setup, the ADS experience is better. To install, follow the instructions here: <https://docs.microsoft.com/en-us/sql/azure-data-studio/download-azure-data-studio>
- **Learn Databases.** Learn Databases is a suite of Docker containers that create a database lab environment on your computer. There are containers for the SQL Server database management system itself and three web tools for provisioning sample databases, database administration, and writing SQL scripts. After you have installed Docker, follow the instructions at <https://github.com/mafudge/learn-databases#walkthrough> to set it up. Do not create any sample databases at this time—you will do this as part of the first Homework Problem Set.

## Special Considerations

### Class Materials and Recordings

Please be aware that all class sessions will be recorded. Original class materials (handouts, code samples, assignments, quizzes, textbook chapters, etc.) and recordings of class sessions are the intellectual property of the

course instructor. You may download these materials for your use in this class. However, you may not provide these materials to other parties (e.g., websites, social media, other students) without permission. Doing so is a violation of intellectual property law and of the student code of conduct.

## Academic Expectations

### Requirements

As an enrolled student in this course, it is expected that you will:

1. **Complete asynchronous coursework.** It is expected you will complete the assigned textbook readings, quizzes, and video coursework as prescribed.
  - Participation in the assigned reading and video coursework is required and will be measured.
  - Attendance in online or face-to-face sessions is required, and there are no excused absences other than medical illness documented by the university.
  - While in attendance, you are expected to be engaged, an active participant in class. You should be prepared to ask and answer questions to the best of your ability when called upon.
  - It is expected that you will have your microphone muted until you need to speak, and your video camera on at all times.
  - In some classes, an ungraded pop quiz or other type of diagnostic instrument will measure your comprehension of coursework and passing will count as your participation grade for that week.
  - **Reading, participation, and coursework are not graded but do impact your grade.**
    - **unprepared for 2 units of the course: decrease your final grade by one Registrar Grade. (For example, A to A-)**
    - **For 4 or more units of the course: decrease your final grade one complete letter: B+ to C+ for example.**
    - **You will be notified when you reach these thresholds.**
2. **Complete quizzes.** The intention of the quiz is to ensure that you are keeping pace with the coursework and to measure your understanding of the class material. Quizzes should be completed by 11:59 PM Eastern the day before our live session.
  - You will get one attempt at the quiz, and your attempt must be complete before your class meeting.
  - Quizzes are open book.
  - Quizzes consist of multiple-choice and/or short answer questions.
  - Quizzes measure only individual effort.
  - You must complete the quiz on your own time, outside class.
  - Quizzes are due 11:59 PM Eastern the day before our live session. This provides your instructor ample time to review student answers and prepare for the live session.
3. **Complete homework problem sets.** Homework Problem Sets are technical activities that enforce key concepts learned in the lesson through problem solving and practice. You start them after the live session and complete them by the 11:59 PM Eastern the day before our next live session. It is important to remember that the homework is practice; if you do not have the right answers, it is expected you will have questions. Save those questions for our discussions. You are expected to reflect on your learning. Each homework problem set is assigned a grade of:
  - High Pass (10 points)—the assignment is complete and correct, with very minor errors, and the student contributes to homework discussion in class and reflects on your learning for that week.
  - Pass (7 points)—the assignment is complete and mostly correct, or the student has few to no contributions to homework discussions in class or little to no reflection on your learning for the week.
  - Needs Improvement (3 points)—the assignment is incomplete or has several errors or is late, with no reflection.
  - Fail (0 points)—the assignment was not turned in after 1 week.

4. **Complete a team project**, which demonstrates your ability to work in a team to design and implement a functional system with a database, based on what you have learned in the course. Guidelines for this are:
- Work in self-assembled teams of two to three students.
  - Devise your own database to design and implement. The project idea must be preapproved, prior to beginning work.

Required artifacts for team project submission are as follows:

1. Document with team name, group members, and which project you will work on. If the project is your own idea, a requirements document must be submitted and approved.
2. Data analysis of the facts listing entities, attributes, and relationships in the data model.
3. Conceptual data model diagram.
4. Logical data model diagram.
5. Identification of your external data model and data logic.
6. Basic layout of all application screens.
7. Diagram of each screen used in the application.
8. SQL up/down script to implement the internal model with initial data.
9. SQL up/down Script to load/migrate in existing data.
10. SQL up/down script of data logic for the external data model.
11. Implementation of the application itself.
12. A team log recording individual and group contributions to the project, including when and by whom.
13. A slide deck of your presentation.
14. A video recording of your team presentation.
15. A video reflection of what you learned from the experience, what you would do better if you had the time, etc.

The rubric is as follows:

1. Quality of artifacts (slides, code, video, documents, etc.)
2. Completeness of project—does it work?
3. Purpose of project—does it do something of value?
4. What was learned from the experience?
5. Does the project demonstrate what the team has learned pertinent to the course?

### Grading:

Type of Activity	Quantity	Points	Notes	Total
1. Homework Problem Sets	10	10	Start after class, complete before next class.	100
2. Quizzes	10	10	Complete before class.	100
3. Final Team Project	1	50	Refer to team project section in “Academic Expectations.”	50
<b>Total Points</b>				<b>250</b>

### Grading Scale:

Student Achievement	Points	Grade Points	Registrar Grade
Mastery	238–250	4.0	A
	225–237	3.667	A-
Satisfactory	213–224	3.333	B+
	200–212	3.0	B
Low Passing	188–199	2.667	B-
	175–187	2.333	C+
Unsatisfactory	163–174	2.0	C

Student Achievement	Points	Grade Points	Registrar Grade
	150–162	1.667	C-
	0–149	0	F

## Course Calendar

### Course Schedule

Week	Topic for That Week	Due 11:59PM Eastern 1 day before live session
0	Make sure you have the text and that your lab environment works.	
1	1. Introduction to Databases	<ul style="list-style-type: none"> <li>• Video coursework for Week 1</li> <li>• Read Unit 1; Unit 1 quiz</li> </ul>
2	2. The Relational Data Model	<ul style="list-style-type: none"> <li>• Complete <b>Homework Problem Set 1</b></li> <li>• Video coursework for Week 2</li> <li>• Read Unit 2; Unit 2 quiz</li> </ul>
3	3. Introduction to SQL	<ul style="list-style-type: none"> <li>• Complete <b>Homework Problem Set 2</b></li> <li>• Video coursework for Week 3</li> <li>• Read Unit 3; Unit 3 quiz</li> </ul>
4	4. SQL Select, Part I	<ul style="list-style-type: none"> <li>• Complete <b>Homework Problem Set 3</b></li> <li>• Video coursework for Week 4</li> <li>• Read Unit 4; Unit 4 quiz</li> </ul>
5	5. SQL Select, Part II	<ul style="list-style-type: none"> <li>• Complete <b>Homework Problem Set 4</b></li> <li>• Video coursework for Week 5</li> <li>• Read Unit 5; Unit 5 quiz</li> </ul>
6	6. Data Modeling	<ul style="list-style-type: none"> <li>• Complete <b>Homework Problem Set 5</b></li> <li>• Video coursework for Week 6</li> <li>• Read Units 7 and 8; Unit 7 and 8 quizzes <ul style="list-style-type: none"> <li>◦ The average of the two quiz scores will be your quiz grade for this week.</li> </ul> </li> </ul>
7	7. Database Applications and Programming	<ul style="list-style-type: none"> <li>• Complete <b>Homework Problem Set 6</b></li> <li>• Video coursework for Week 7</li> <li>• Read Units 9 and 10; Unit 9 and 10 quizzes <ul style="list-style-type: none"> <li>◦ The average of the two quiz scores will be your quiz grade for this week.</li> </ul> </li> </ul>
8	8. Transactions and Concurrency Control	<ul style="list-style-type: none"> <li>• Complete <b>Homework Problem Set 7</b></li> <li>• Video coursework for Week 8</li> <li>• Read Unit 11; Unit 11 quiz</li> </ul>
9	9. Performance and Indexing	<ul style="list-style-type: none"> <li>• Complete <b>Homework Problem Set 8</b></li> <li>• Video coursework for Week 9</li> <li>• Read Unit 12; Unit 12 quiz</li> </ul>
10	10. Data Normalization	<ul style="list-style-type: none"> <li>• Complete <b>Homework Problem Set 9</b></li> <li>• Video coursework for Week 10</li> <li>• Read Unit 13; Unit 13 quiz</li> </ul>
11	Final Team Project	<ul style="list-style-type: none"> <li>• Complete <b>Homework Problem Set 10</b></li> <li>• Complete Final Team Project</li> </ul>

## University Policies

### Academic Integrity Policy

Syracuse University's Academic Integrity Policy reflects the high value that we, as a university community, place on honesty in academic work. The policy in effect at the School of Information Studies defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should

understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The pilot policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The pilot policy also prohibits students from submitting the same work in more than one class without receiving written authorization in advance from both instructors. Under the pilot policy, students found in violation are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered. SU students are required to read an online summary of the university's academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check-in on MySlice. For more information and on the policy, see <http://academicintegrity.syr.edu>.

### Disability-Related Accommodations

Syracuse University values diversity and inclusion; we are committed to a climate of mutual respect and full participation. If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS), <https://disabilityresources.syr.edu>, located at 804 University Avenue, room 309, or call 315.443.4498 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue "Accommodation Authorization Letters" to students as appropriate. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible. Our goal at the iSchool 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 of achievement, please meet with me to discuss additional strategies beyond official accommodations that may be helpful to your success.

### Religious Observances Notification and Policy

SU's religious observances policy, found at <https://policies.syr.edu/policies/university-governance-ethics-integrity-and-legal-compliance/religious-observances-policy/>, recognizes the diversity of faiths represented in the campus community and protects the rights of students, faculty, and staff to observe religious holy days according to their tradition. Under the policy, students should have an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance, provided they notify their instructors no later than the end of the second week of classes through an online notification form in MySlice listed under **Student Services/Enrollment/My Religious Observances/Add a Notification**.

### Student Academic Work Policy

Student work prepared for university courses in any media may be used for educational purposes, if the course syllabus makes clear that such use may occur. You grant permission to have your work used in this manner by registering for and by continuing to be enrolled in courses where such use of student work is announced in the course syllabus.

I may use academic work that you complete this semester in subsequent semesters for educational purposes. Before using your work for that purpose, I will either get your written permission or render the work anonymous by removing all your personal identification.

### Course Evaluations

There will be an end-of-course evaluation for you to complete this term, described below. This evaluation will be conducted online and is entirely anonymous. You will receive a notification from the Syracuse University Office of Institutional Research and Assessment (OIRA) department in your email account with the evaluation website link and your passcode.

We faculty work hard to do the best possible job when preparing and delivering courses for our students. Please understand that not only does the school use the course evaluations to make decisions about the curriculum in order to improve where necessary, but they also use them to make decisions about faculty members. Please take the time and fill out this evaluation, as your feedback and support of this assessment effort is very much appreciated.

## Other Course Policies

- All work is due on the dates provided. No late work is accepted, unless explicitly noted. The reasoning is that the grading is participation/effort based and most of the content is time sensitive.
- Final grades will not be rounded up. A 94/100 is an A-; please don't ask.

## Academic Integrity

- We take academic integrity seriously, and so should you.
- It is our expectation that your work will be 100% representative of your academic abilities.
- Cheating, including assistance from others or use of non-sanctioned academic materials on quizzes or homework, is prohibited.
- Do not work together unless the instructions state explicitly that you are permitted to do so.
- When in doubt as to whether you can use a resource outside those provided in the course, ask.
- All violations of academic integrity will be reported to the AI Office. The proposed grade sanction is an F in the course.

## Office Hours

You are welcome to stop by during office hours without an appointment. Should you need to make an appointment to see me outside of office hours, you must request via email with the following:

- State your reason for the appointment.
- Include three times in which you can meet.
- Make sure two times are on different days.

I will respond to you within 24 hours.

## Group Work

The only group work permitted in this course is the team project. All other gradable work in this course should be considered as individual effort. It is assumed that each of you knows the difference between simply discussing work with your classmates and working collaboratively. When in doubt, ask.