



Advanced Database Systems Design CS 632-852 Syllabus

Spring 2025

Course Modality:

This is an online course, which will be conducted fully online, asynchronously via Canvas. For more information on using Canvas and other supported learning tools, visit the IST Service Desk <u>Knowledgebase</u>.

Instructor Information

| Instructor | Email | Office Hours |
|-------------|-----------------------|---|
| James (Jim) | james.geller@njit.edu | Jim Geller's Office is in |
| Geller | | GITC, Suite 2100, Office 2103 |
| | | Tentative Office Hours will be |
| | | MO 1:00-2:30 |
| | | TH 2:30-4:00 |
| | | Office Hours may be attended in person or on zoom. In either case you should make an email appointment because I have several trips during the semester and might not be available. |

Email: Normally I will respond to a student email by the end of the next workday or sooner. If I am traveling or offline for another reason I will announce that fact by email to all students and/or by setting up a vacation responder on NJIT Gmail. In those cases response times will be longer. If there is a difficult issue I will acknowledge that I received the message and give an estimate by when it can be resolved.

Canvas Messages: DO NOT use Canvas Messages. I rarely read them.

Discussion Questions: Discussions will be graded within 24 hours in most cases.

Video Quizzes: Video quizzes will be graded within one week in most cases.

Projects: Students will always have at least two full weeks to do one of the four programming projects. Grading will normally also take about two weeks.

Exams: Exams will be graded in one to two weeks.

Prerequisites

CS 631

AND

Good knowledge of programming in any modern high-level procedural programming language such as Python, Java or C++.

Course Learning Outcomes

By the end of the course, students will be able to:

- Program with PL/SQL as "normal" language
- Program with PL/SQL accessing tables (using cursors)
- Use Oracle SQL Developer for Oracle programming
- Extract-Transform-Load of data sets into Oracle
- Perform simplified Object-Oriented Modeling
- Insert, Delete, etc. Data in PL/SQL
- Explain the Principles of Object-Oriented DBs
- Explain the Principles of Object-Relational DBs
- Program with Triggers in PL/SQL
- Explain the Principles of Regular Expressions in Oracle SQL and program with Regular Expressions
- Program with Objects in Oracle SQL
- Read and Write simplest HTML (brief)
- Model Data with XML
- Model Data with JSON
- Explain the Principles Database Security
- Program XML data insertion in Oracle SQL
- Program Queries against XML data in Oracle SQL
- Program with JSON in Oracle SQL
- Explain the major types of No-SQL databases, esp. MongoDB, and how they are distinguished from each other
- Explain the Idea behind REST Interfaces
- Program in MongoDB

- Represent data using Graphs
- Program in Neo4j
- Build and use Indexes in Oracle and MongoDB
- Explain the issues in Buffer Tuning, Exceptions, and Transactions (brief)

Required Materials

There will be no text book.

Material will be on CANVAS most of the time, or on Google Drive, on the Web, or shared by email.

Grading Policy

NJIT Grading Legend

Final Grade Calculation

Final grades for all assignments will be based on the following percentages:

| Midterm Exam: | 100/600 |
|-----------------------------|--------------------------------|
| Final Exam: | 200/600 |
| Programming Project 1: | 40/600 |
| Programming Project 2: | 40/600 |
| Programming Project 3: | 40/600 |
| Programming Project 4: | 42/600 |
| Discussion Question points: | 42/600 (= 14 times * 3 points) |
| Video Quiz Credit: | 96/600 (= 12 times * 8 points) |

Course Work

Exams

There will be one midterm exam (1/6 of grade) and one final exam (1/3 of grade). We will most likely use ProctorU for the exams. Exams will be at a scheduled day and time (with some flexibility).

For the midterm and final exam, you MUST have and use a camera on your computer. If you do not have a camera, please buy or borrow one or register for another class.

Projects:

There will be four programming project assignments covering all the material that you will be studying in the class videos. Late policies will be announced together with the assignments. Non-programming questions might be added, but most of the work will involve SQL and programming (162/600 of grade).

In general, there will be late penalties.

Canvas Discussion Credit

You will get graded Canvas Discussion Questions every week (42/600 of grade).

You CANNOT make up the points for Discussion Questions later. You have to answer them in the week that they are due.

Video Quiz Credit

There will be videos to watch in Canvas (almost) every week.

There will be brief quizzes attached to the videos in Canvas (96/600 of grade).

You will get exactly 8 points for each series of videos (for each "Module Group," independent of how many questions there are and independent of what points Canvas records.

If you miss the due date on the video quizzes you cannot make up the points later.

Extra Credit

There will be **NO** way to get extra credit. Please don't ask.

Letter to Number Grade Conversions

At the end of the semester, I will add up your total points and **curve** the results for the whole class. Thus it is impossible to give exact conversion numbers. It depends on the whole class. The following is ILLUSTRATIVE only, based on previous semesters.

| А | Typically 550-600 points |
|----|--------------------------|
| B+ | Typically 520-549 points |
| В | Typically 490-519 points |
| C+ | Typically 460-489 points |
| С | Typically 420-459 points |
| F | Typically 0-419 points |

The department has voted on a stringent curve for all courses. Only the top 25% of the class should expect an A.

Furthermore, up to 20% of the class may face a C+, C, or F.

Also note that most students typically get all the points on the Homework assignments. Thus your position in the curve and your class grade depend almost entirely on the exams. On the other hand, missing a single homework is highly likely to lower your grade at least by one letter grade.

Policy for Late Work

Exam makeup *after* missing the exam will be only allowed in extreme cases with written proof, e.g., hospital stay, car accident with police report, and similar.

Exam makeup due to travel may or may not be approved ahead of time and **never** after the trip. As above, trips related to an extreme emergency, e.g., death in the family, will be allowed with written proof (death announcement in a newspaper or government death certificate with *official* English translation, if from a foreign country).

For projects there will be a 20% late penalty during the first week after the due date and zero credit after one week.

For Video Quizzes and Discussion Questions you will get zero credit after one week.

You will STILL need to do the Video Quizzes even without credit, otherwise you will not get credit for every week afterwards.

Academic Integrity

"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree

that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the <u>NJIT academic code</u> <u>of integrity policy</u>.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at <u>dos@njit.edu</u>"

The Four Projects are NOT Group Projects. You have to work ALONE.

You may "talk" about Project assignments with each other. Where does talking end and cheating start? You may NOT copy lines of code from anybody. You may NOT use code in your program where you don't understand WHY it works, even if it works, and even if you wrote it yourself.

Every assignment will contain specific rules for using ChatGPT and other Generative AI and LLM systems. Where and how you are permitted to use them --- or NOT to use them.

The NJIT policy can be found here:

https://www.njit.edu/dos/responsible-use-artificial-intelligence

Netiquette

Throughout this course, you are expected to be courteous and respectful to classmates by being polite, active participants. You should respond to discussion forum assignments in a timely manner so that your classmates have adequate time to respond to your posts. Please respect opinions, even those that differ from your own, and avoid using profanity or offensive language.

Course Schedule

Assignment and Due Dates

Assignment due dates are ALL contained in the calendar grid that is accessible through the first Canvas module group. Look for pages **that look like this.**



Topics

Topics are discussed in great detail at the beginning of the weekly module groups. Here is an aggregate summary:

- 1) Review your SQL and learn more of it.
- 2) Learn PL/SQL.
- 3) Practical ETL (Extract-Transform-Load) of data.

4) Study of a few advanced topics on databases, such as XML, OODBs, DB security, Indexing, and Buffer tuning, and REST interfaces.

- 5) Study JSON and No-SQL databases, especially MongoDB.
- 6) Learn regular expressions in Oracle SQL and other systems.
- 7) Study the graph database Neo4j

Accessibility:

This course is offered through an accessible learning management system. For more information, please refer to Canvas's <u>Accessibility Statement</u>.

Requesting Accommodations:

The Office of Accessibility Resources and Services works in partnership with administrators, faculty, and staff to provide reasonable accommodations and support services for students with disabilities who have provided their office with medical documentation to receive services.

If you are in need of accommodations due to a disability, please contact the <u>Office of</u> <u>Accessibility Resources and Services</u> to discuss your specific needs.

Resources for NJIT Online Students

NJIT is committed to student excellence. To ensure your success in this course and your program, the university offers a range of academic support centers and services. To learn more, please review these <u>Resources for NJIT Online Students</u>, which include information related to technical support.

Computer Use

- You have to get a UCID, if you don't already have one.
- You will need a Web access, and a text editor (e.g. MS Word or Notepad++) and EXCEL (or another spreadsheet system).
- As noted above, you will need a camera by the time of the Midterm exam.
- You will need fast internet connection otherwise watching videos will be difficult.

Canvas:

We will use CANVAS. You will need to watch videos posted there and take quizzes there.

Google Drive:

Some class material may be on Google Drive.

Oracle and SQL Developer:

You will use the Oracle database system and PL/SQL.

PL/SQL is part of the normal Oracle distribution.

Instructions about the *SQL Developer* software are in the class materials and I will talk about them in the lecture videos.

MongoDB:

We will use MongoDB. It is available at NJIT.

Studio3T:

We will use the Studio3T development environment as a frontend to MongoDB. The company is making it available for free to NJIT students. Find the information here:

https://studio3t.com/discount/education

Neo4j

https://neo4j.com/graphacademy/university-program/

NJIT Passwords:

If there is an NJIT password problem, try this: <u>http://myucid.njit.edu</u>

This is the UCID password reset.

Click here:



- You need a DIFFERENT password for Oracle.
- The Oracle Password Reset is also available at the link above.

In order to work from home on Oracle you need to install VPN. See Here: <u>https://ist.njit.edu/vpn</u>

• The computer we are using is called **prophet.njit.edu** The connection identifier that you will be asked for is **course**.

There is extensive documentation about Oracle online. Too much actually. Please Google it.

PROCTORU: We will use the ProctorU services, or another exam supervision method as needed for Midterm and Final.

See here to get started with Meazure/ProctorU:

ProctorU

Computing Support

The

IST Service Desk

is the central hub for computing information and first point of contact for getting help and reporting issues related to computing technology at NJIT.

Scroll down to



and click.

or call (973) 596-2900 Monday - Friday from 8:00am - 9:00pm