Lecture 00: Course Mechanics

DATA 503: Fundamentals of Data Engineering

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This lecture covers the course mechanics for DATA 503: Fundamentals of Data Engineering.

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1 About

1.1 Meet Your Professor

Dr. Lucas Cordova, Ph.D.

- Email: LPCordova@willamette.edu

Office Hours:

Day	Time	Location
Monday	10:20 - 11:20 AM	Salem
Monday	4:30 - 5:30 PM	Portland
Wednesday	10:20 - 11:20 AM	Salem
Wednesday	4:30 - 5:30 PM	Salem

Schedule an Appointment

1.2 Teaching Assistant

TBD

- Email: TBD
- Office Hours: TBD
- Location: TBD

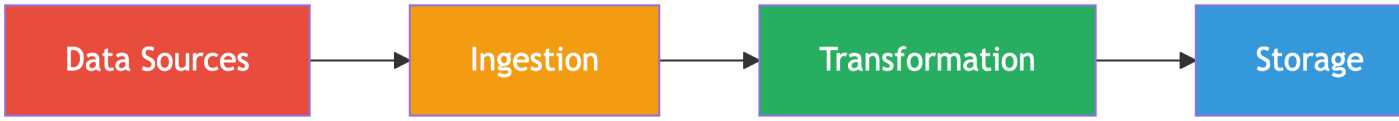
The TA will be available to help with:

- Assignment questions
- SQL debugging
- Project guidance
- General course support

2 Course Overview

2.1 What is Data Engineering?

Data Engineering is the practice of designing and building systems for collecting, storing, and analyzing data at scale.



Data engineers build the infrastructure that enables data scientists and analysts to do their work.

2.2 Why Data Engineering Matters

In the era of big data, organizations need professionals who can:

- Design scalable data architectures
- Build reliable data pipelines
- Ensure data quality and accessibility
- Bridge the gap between raw data and actionable insights

This course prepares you to be that professional.

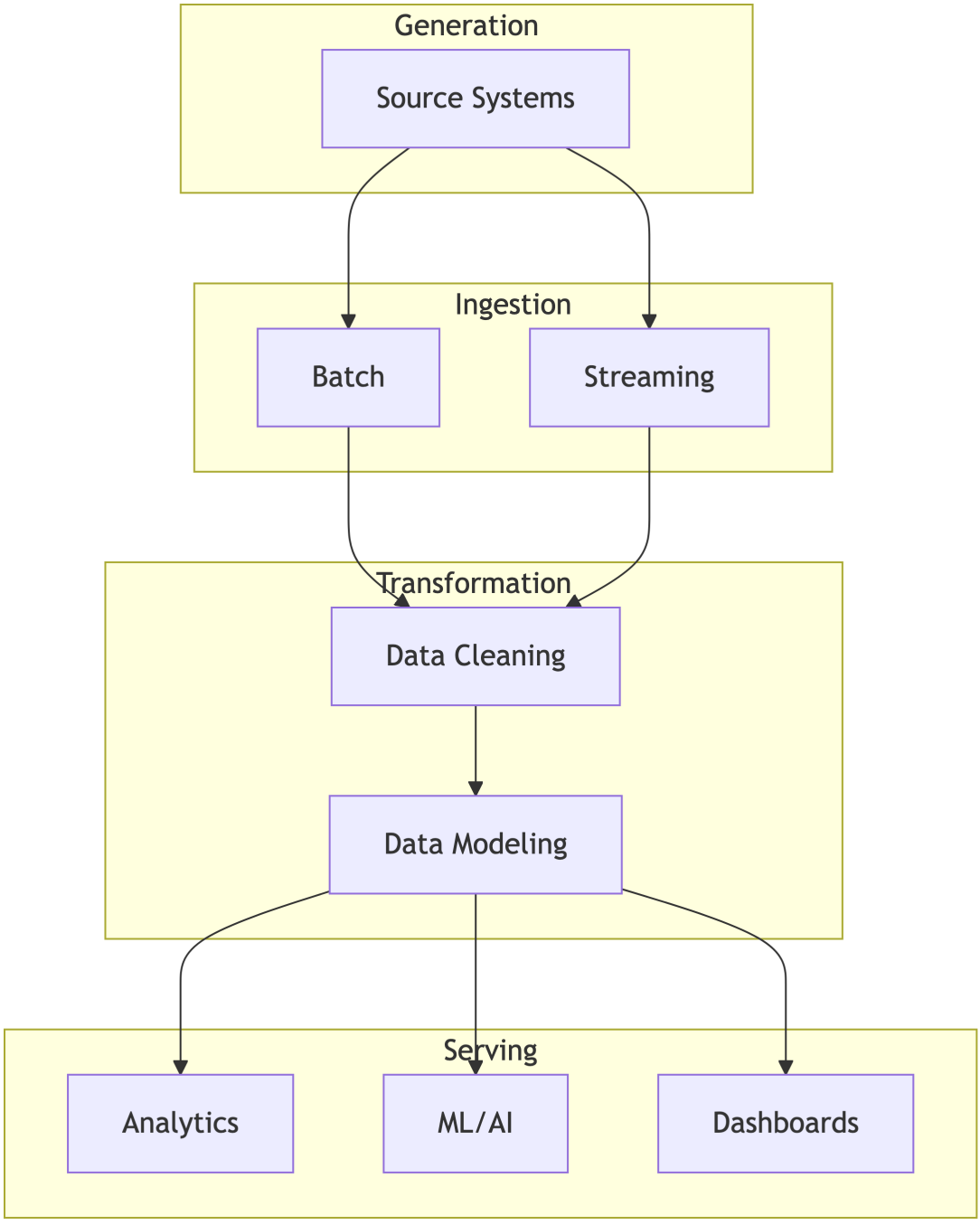
2.3 Course Focus Areas

This course is split into two primary areas:

1. **Relational Databases with SQL**: Learning how to design, manage, and query relational databases using SQL with a focus on PostgreSQL
2. **Data Engineering Pipelines**: Understanding the components of the data engineering pipeline including data acquisition, transformation, and storage

You will gain both theoretical understanding and hands-on experience.

2.4 The Data Engineering Lifecycle



2.5 Course Learning Outcomes

Upon successful completion of this course, you will be able to:

1. Understand the key tasks of a data engineer and their role in organizational pipelines
2. Work with and query relational databases using SQL
3. Analyze database design choices based on key factors
4. Execute advanced SQL queries involving text mining and spatial data
5. Explore alternatives to relational databases and current trends in data engineering

2.6 Learning Objectives

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

- Explain the purpose and advantages of relational databases
- Design and implement relational databases with tables and relationships
- Perform SQL queries, including advanced filters and joins
- Use SQL for text parsing and spatial data analysis
- Describe the role of data engineers in data pipelines
- Implement the full data engineering pipeline, from ingestion to serving data

3 Required Materials

3.1 Textbook (Required)

Practical SQL: A Beginner's Guide to Storytelling with Data (2nd Edition)

- Author: Anthony DeBarros
- ISBN-13: 9781593278274
- Note: 1st Edition is acceptable, but chapters may differ

3.2 CodeGrade Enrollment Key (Required)

CodeGrade Enrollment Key ($35):

- Available via Bookstore (Bearcat Bundle) or personal credit card
- Accessed through Canvas (do not access CodeGrade directly)
- You will set up your account during the first assignment

3.3 Optional Textbooks

Fundamentals of Data Engineering

- Authors: Joe Reis and Matt Housley
- ISBN: 9781098108304
- A comprehensive overview of data engineering tasks and tools

The Data Warehouse Toolkit (3rd Edition)

- Authors: Ralph Kimball and Margy Ross
- ISBN-13: 978-1118530801
- A must-read for dimensional modeling and data warehouse design

3.4 Technology Requirements

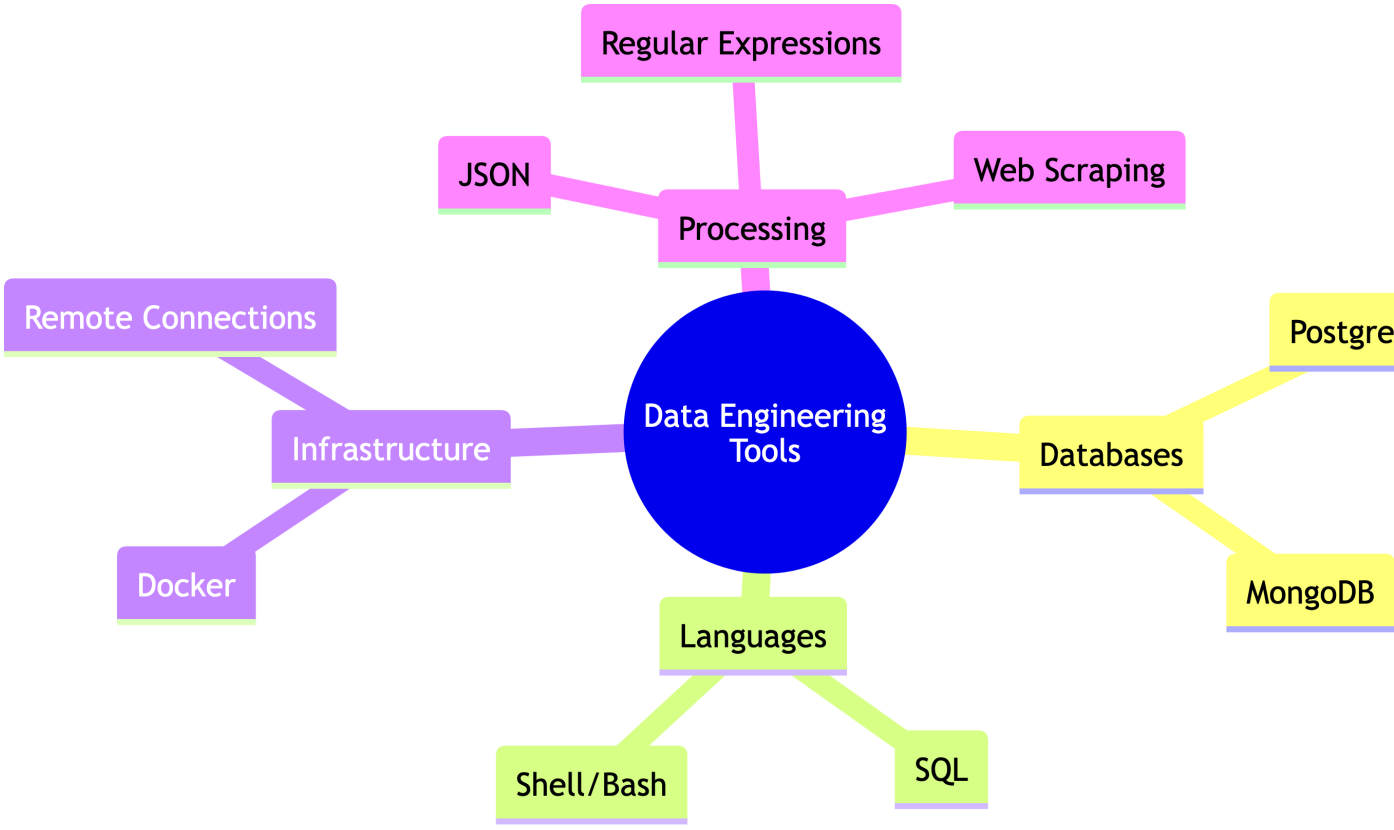
Hardware:

- A laptop capable of running PostgreSQL
- Bring to class for hands-on activities
- Contact me if you need one provided

Software:

- PostgreSQL (latest stable version)
- Beekeeper Studio or pgAdmin
- Docker (later in semester)
- Text editor of your choice

3.5 Data Engineer's Toolkit



4 Assessments

4.1 Grade Breakdown

Deliverable	Individual Weight	Total Weight
Attendance and Participation	~1% each	10%
Assignments (~10)	~5% each	50%
Midterm	15%	15%
Project	30%	25%
Total		**100%**

4.2 Letter Grade Distribution

Grade	Range	Grade	Range
A	>= 92.00	C	72.00 - 77.99
A-	90.00 - 91.99	C-	70.00 - 71.99
B+	88.00 - 89.99	D+	68.00 - 69.99
B	82.00 - 87.99	D	62.00 - 67.99
B-	80.00 - 81.99	D-	60.00 - 61.99
C+	78.00 - 79.99	F	<= 59.99

4.3 In-Class Exercises

Your grade for this category is based on:

- **Attendance**: Tracked randomly throughout the semester
- **Active Participation**: Completion of in-class exercises

Important notes:

- In-class exercises cannot be made up if missed
- These exercises are integral to your learning experience
- Come prepared and ready to contribute

4.4 Homework Assignments

Assignments reinforce concepts and techniques from lectures.

Each assignment challenges you to:

- Apply knowledge to solve specific problems
- Engage in design, coding, or analysis
- Work with real-world data engineering scenarios

Assignments are submitted via **CodeGrade** launched from Canvas.

4.5 Midterm Exam

The midterm is a **video-based assessment**.

Requirements:

- Create a 10 to 15 minute explanatory video
- Demonstrate understanding of course objectives
- Should be polished, similar to educational YouTube content

The due date and specific instructions will be communicated in advance. More to come on this! The midterm cannot be made up.

4.6 Project

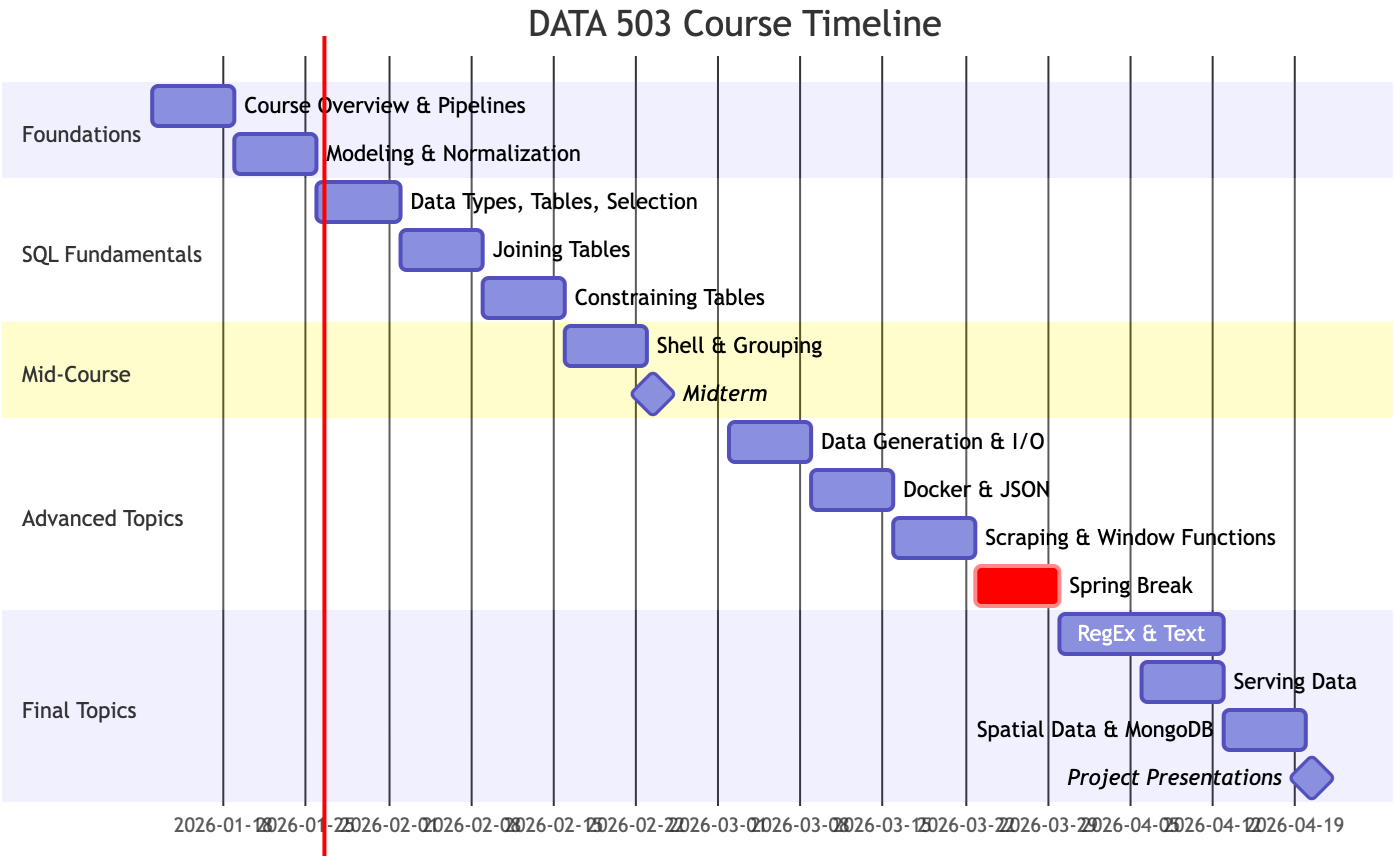
A semester-long partner collaboration.

Project components:

- Partner work throughout the semester
- Graded milestones at key points
- Final deliverables include presentation, database structure, and analysis
- Presentations occur on the last day of class (Week 15)

5 Course Schedule

5.1 Semester Roadmap



5.2 Weekly Schedule (Weeks 1-5)

Week	Date	Topics	Due
1	Jan 12	Course Overview, Data Engineering Pipelines	
2	Jan 19	Modeling and Normalization, Environment Setup	Assignment 1
3	Jan 26	SQL: Data Types, I/O, Tables, Selection	Assignment 2

Week	Date	Topics	Due
4	Feb 2	SQL: Joining Tables	Assignment 3
5	Feb 9	SQL: Constraining Tables	Assignment 4

5.3 Weekly Schedule (Weeks 6-10)

Week	Date	Topics	Due
6	Feb 16	Shell, Remote Connections, Grouping	Project Proposal
7	Feb 23	**Midterm**	Midterm
8	Mar 2	SQL: Data Generation, I/O	Assignment 6, Project Forming
9	Mar 9	Docker, JSON, SQL with JSON	Assignment 7
10	Mar 16	Web Scraping, Subqueries, Window Functions	Assignment 8

5.4 Weekly Schedule (Weeks 11-15)

Week	Date	Topics	Due
11	Mar 23	**Spring Break** (No Class Mar 26)	
12	Mar 30	Regular Expressions, Transforming Text	Project Milestone
13	Apr 6	Dashboards, APIs, Views, Functions, Triggers	Assignment 10
14	Apr 13	Spatial Data (PostGIS), MongoDB	
15	Apr 20	**Project Presentations**	Project, Presentation, Video

6 Course Policies

6.1 Attendance Policy

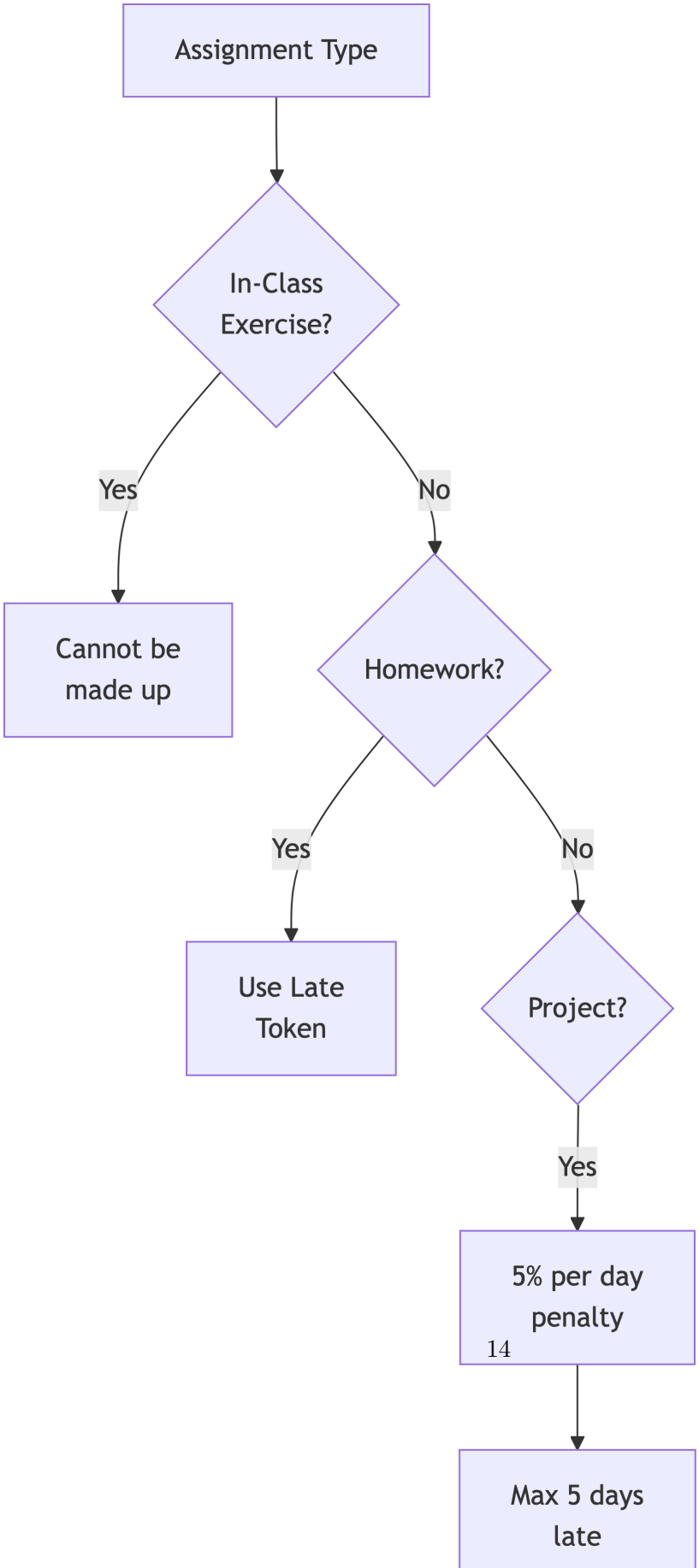
Consistent attendance is essential for your success.

Expectations:

- Attend all classes and actively participate
- Come prepared and ready to contribute
- Attendance tracked explicitly or through participation activities

If you cannot attend due to illness or emergency, notify me as soon as possible.

6.2 Late Work Policy Overview



6.3 Late Tokens for Homework

Each student receives **three late submission tokens** at semester start.

How to use a token:

1. Navigate to "Assignment Late Tokens" in Canvas
2. Submit a text entry with the assignment number and expected completion date
3. Wait for confirmation that the assignment has been reopened

Use tokens wisely. No additional tokens will be granted.

6.4 Project Late Policy

Late project submissions are accepted with penalties:

- **5% deduction per day** late (including weekends and holidays)
- Submissions more than **five days late** will not be accepted
- Timely completion is critical for course progress

This policy encourages time management and accountability.

6.5 Incomplete Policy

An incomplete grade will only be granted for:

- Prolonged illness
- Family emergencies removing you from campus for extended periods

An incomplete will **NOT** be granted for:

- Falling behind due to lack of motivation
- Poor understanding of material
- Time management issues

If struggling, come see me! We can work out a plan.

7 Academic Integrity

7.1 General Statement

Cheating is defined as any form of intellectual dishonesty or misrepresentation.

Plagiarism consists of intentionally or unintentionally representing someone else's work as your own.

Penalties range from grade reduction to failing the course.

7.2 Reasonable Actions

Things you CAN do:

- Discuss assignment requirements with classmates
- Brainstorm solution strategies verbally (no code sharing)
- Whiteboard solutions using diagrams or pseudocode
- Refer classmates to helpful resources
- Search the web for general concepts
- Use small code snippets from reliable sources (with citation)
- Work with a tutor (code must be your own)

7.3 Not Reasonable Actions

Things you CANNOT do:

- Submit another student's work as your own
- Copy from another student's quiz or exam
- View or copy another student's code
- Copy solutions from previous years
- Ask for or buy solutions
- Share code in public forums
- Maintain public repositories of course solutions

7.4 Use of Generative AI

Reasonable Use:

- Generating ideas or examples
- Clarifying concepts
- Exploring potential solutions without copying verbatim

Not Reasonable Use:

- Copying AI-generated code directly
- Submitting AI-generated work as your own without significant personal input

When in doubt, ask!

8 University Policies

8.1 Inclusive Classroom Space

I will honor your affirmed name and pronouns.

- Initial information comes from SAGE
- Inform me if your affirmed name or pronouns differ
- Let me know if I make an error

Your feedback helps ensure I address you correctly.

8.2 Time Commitments

Willamette's Credit Hour Policy:

For every hour of class time, expect **2-3 hours** of work outside class.

For our 4-hour Monday session, anticipate **8-12 hours** weekly of:

- Study time
- Reading and homework
- Assignments and research
- Group work

8.3 Diversity and Disability

Willamette values diversity and inclusion.

If aspects of this course create barriers to your inclusion or achievement, please notify me.

Accessible Education Services:

- Location: Matthews 103
- Phone: 503-370-6737
- Email: accessible-info@willamette.edu

8.4 SOAR Center

The Students Organizing for Access to Resources (SOAR) Center provides:

- Food (Bearcat Pantry)
- Toiletries
- Professional clothing
- Textbooks and scholarly resources

Location: Third floor of Putnam University Center

Contact: soar-center@willamette.edu

9 Getting Help

9.1 Resources Available

Office Hours:

- Drop-in or by appointment
- Multiple modalities (in-person, phone, Google Meet)

Teaching Assistant:

- TBD (details coming soon)

Email:

- LPCordova@willamette.edu
- Expect response within 24-48 hours

9.2 Tips for Success

1. **Attend class** and participate actively
2. **Start assignments early** to allow time for questions
3. **Practice SQL regularly** outside of class
4. **Use office hours** when stuck
5. **Collaborate appropriately** with classmates
6. **Read the textbook** alongside lectures
7. **Build your project incrementally** at each milestone

9.3 Questions?

Let's have a great semester learning Data Engineering!

Contact:

- Email: LPCordova@willamette.edu
- Office Hours: See schedule

Next Up:

Introduction to Data Engineering Pipelines