

STAT 423/523 Statistical Methods for Engineers and Scientists

Spring 2025

Time:	Tu/Th 10:35 AM – 11:50 AM	Location:	FULM 201
Instructor:	Chencheng Cai	Email:	chencheng.cai@wsu.edu
Prerequisites:	One 3-credit 300-level STAT course	Credit Hours:	3
Office Hours:	Tu/Wed 3 - 5 PM or by appointment	Office Location:	Neill Hall 405

Course Materials

1. **Lecture Notes:**
available on both Canvas and the course website: <https://chenchengcai.com/teaching/Stat523> .
2. **Textbook:**
Probability and Statistics for Engineering and the Sciences (9th Ed.). J. Devore. 2015.
not required to purchase. 8th edition is also acceptable.

Course Description

The course will focus on practical statistical methods that are widely used in engineering and scientific research. Those methods provide a toolbox for analyzing complex data and making decisions based on data. Implementations of the methods will be demonstrated using the R programming language. Specifically, the course will cover the following topics:

- Point Estimation
- Confidence Intervals
- Hypothesis Testing (one-sample and two-sample tests)
- Analysis of Variance (ANOVA)
- Linear Regression

Learning Outcomes

Week 1	Overview the topic and review prerequisites on probabilities and distributions.
Week 2-6	Understand point estimation and hypothesis testing concepts
Week 7-9	Understand the analysis of variance methods
Week 10-13	Understand linear regression methods
Week 14	Understand advanced topics in statistical modeling

Assessment

The grading of this course will be assessed based on (1) Homework, (2) Quizzes, (3) Midterm Exams, and (4) Final project according to the following allocations.

Homework	30%
Quizzes	30%
Mid-term Exam	20%
Project	20%
Total	100%

The grading scale table is as follows.

A	93% - 100%	C+	77%-79.99%
A-	90% - 92.99%	C	73% - 76.99%
B+	87% - 89.99%	C-	70% - 72.99%
B	83% - 86.99%	D+	66% - 69.99%
B-	80% - 82.99%	D	60% - 65.99%
		F	0% - 59.99%

Homework

There are approximately five homework to be assigned throughout the semester. These will come from problems provided by the textbook or materials discussed in the lectures. Homework assignments will primarily consist of methodological exercises and programming exercises, and both the two parts of the exercises need to be completed. Please organize the methodological part (either typed or scanned) and the codes (including outputs) into one PDF file and submit them through Canvas. Late homework without exemption from the instructor will be graded 0 points.

Quizzes

There are three quizzes scheduled throughout the semester. These will be 30 -40 minutes long and will be held in the later part of Thursdays lecture. The quiz problems will be developed from materials presented in lectures. The quizzes will not contain any programming problems. All quizzes are conducted in a open book open notes manner. Lowest quiz score will be dropped towards the the final grade.

Mid-term Exams

The mid-term exam is scheduled to Week 8. The problems will be developed from materials presented in lecture notes. These will primarily consist of concept checks, methodological questions and calculations. The mid-term exam is closed-book and closed-notes.

Project

In the final project, the students will be asked to group into teams of 2-3 students. Each group needs to apply statistical methods to a dataset. The dataset can be found online or is open-source from your discipline. The project will be graded based on both the report and presentation.

Class Participation

To properly gain a working knowledge of the material, attendance and participation in class are necessary. While this will not be graded, enrolled students are highly encouraged to attend the class.

Policies

Students with Disabilities

Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center at 509-335-3417 to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center. For more information contact a Disability Specialist on your home campus. Provide disability Specialist contact information: Pullman or WSU Online: 509-335-3417, Washington Building 217; <http://accesscenter.wsu.edu>, Access.Center@wsu.edu

Academic Integrity Statement

You are responsible for reading WSU's Academic Integrity Policy, which is based on Washington State law. If you cheat in your work in this class you will:

- Fail the course.
- Be reported to the Center for Community Standards.
- Have the right to appeal my decision.
- Not be able to drop the course or withdraw from the course until the appeals process is finished.

If you have any questions about what you can and cannot do in this course, ask me.

If you want to ask for a change in my decision about academic integrity, use the form at the Center for Community Standards website. You must submit this request within 21 calendar days of the decision.

Expectations for Classroom Conduct

Respect each other and treat others how you want to be treated. Please silence your cell phones and all other electronics and refrain from using these items during class. Do not disrupt the class, students are here to learn and cannot do so if others are being disruptive. If I feel you are disrupting the class or are disrespectful of anyone, I reserve the right to ask you to leave class for the day. Success in class requires reading the textbook, listening and asking questions in lectures, and doing all assigned work. Only you choose whether or not to succeed by doing these things.

Workload Expectations

This course meets for a total of 2.5 hours per week. For each hour of lecture equivalent, students should expect to have a minimum of two hours of work outside of class.

Artificial Intelligence (AI) Policy: AI Use only with acknowledgment

Students are allowed to use advanced automated tools (artificial intelligence or machine learning tools such as ChatGPT, Co-Pilot, or Dall-E) on assignments in this course if that use is properly documented and credited. For example, text generated using ChatGPT-3 should include a citation such as: "Chat-GPT-4. (YYYY, Month DD of query). "Text of your query." Generated using OpenAI. <https://chat.openai.com/>" Material generated using other tools should follow a similar citation convention.

University Syllabus

Students are responsible for reading and understanding all university-wide policies and resources pertaining to all courses (for instance: accommodations, care resources, policies on discrimination or harassment), which can be found in the **university syllabus**.

Tentative Schedule

Week 1	Jan 7, Jan 9		Introduction and Review
Week 2	Jan 14, Jan 16		Point Estimation and Confidence Intervals
Week 3	Jan 21, Jan 23		
Week 4	Jan 28, Jan 30	Quiz 1	Programming Foundation
Week 5	Feb 4, Feb 6		Hypothesis Testing
Week 6	Feb 11, Feb 13		
Week 7	Feb 18, Feb 20	Midterm	Analysis of Variance
Week 8	Feb 25, Feb 27		
Week 9	Mar 4, Mar 6		Multifactor Analysis of Variance
SPRING BREAK			
Week 10	Mar 18, Mar 20	Quiz 2	Simple Linear Regression
Week 11	Mar 25, Mar 27		
Week 12	Apr 1, Apr 3		Multiple Linear Regression
Week 13	Apr 8, Apr 10		
Week 14	Apr 15, Apr 17	Quiz 3	Advanced Topics
Week 15	Apr 22, Apr 24		Presentation
UNIVERSITY FINAL WEEK			