

STAT 010: Introduction to Statistics

James M. Flegal

Basics

- Lecture: MWF 8:00-8:50 linked here (Zoom ID 967 2517 6213 Passcode: 462703)
- Discussions are Monday or Tuesday (see weekly schedule)
- Labs are Wednesday or Thursday (see weekly schedule)
- Office Hours scheduled throughout the week (see weekly schedule)
- Instructor: James M. Flegal, jflegal@ucr.edu
- TAs
 - Changxin Xie cxie007@ucr.edu
 - Tianjian Yang tyang115@ucr.edu
 - Sichen Chen schen311@ucr.edu
 - Yutong Huang yhuan074@ucr.edu
 - Queen Ikhelowa qikhe001@ucr.edu
 - Yun Mo yimo011@ucr.edu
- Canvas: <https://elearn.ucr.edu/courses/23000>

Textbook

Diez, Barr, Cetinkaya-Rundel, OpenIntro Statistics, 4th Edition, 2019. The textbook is freely available online. You're welcomed to read on screen or print it out. If you prefer a paperback version you can buy it at the cost of printing (around \$20) on Amazon. The university bookstore will not carry copies of this text.

Description

This class is an introduction to descriptive and inferential statistics. Topics include histograms; descriptive statistics; probability; sampling distributions; hypothesis testing; and confidence intervals.

Goals and Objectives

Students will learn how to effectively make use of data in the face of uncertainty: how to collect data, how to analyze data, and how to use data to make inferences and conclusions about real world phenomena.

The course goals are as follows:

1. Recognize the importance of data collection, identify limitations in data collection methods, and determine how they affect the scope of inference.
2. Use statistical software to summarize data numerically and visually, and to perform data analysis.
3. Have a conceptual understanding of the unified nature of statistical inference.
4. Apply estimation and testing methods to analyze single variables or the relationship between two variables in order to understand natural phenomena and make data-based decisions.
5. Interpret results correctly, effectively, and in context without relying on statistical jargon.
6. Critique data-based claims and evaluate data-based decisions.

Tips for Success

1. View the course videos before lectures and labs.
2. Be an active participant during lectures and labs.
3. Ask questions - during lecture, in office hours, or by email. Ask me, your TAs, and your classmates.
4. Do the problem sets - start early and make sure you attempt and understand all questions.
5. Give yourself plenty of time to prepare for exams. This requires going through the material and taking the time to review the concepts that you're not comfortable with.
6. **DO NOT PROCRASTINATE** - don't let a unit go by with unanswered questions as it will just make the following unit's material even more difficult to follow.

Course Mechanics

Learning objectives, readings, videos, etc. will be posted on canvas. You are expected to watch the videos, complete the readings, and familiarize yourselves with the learning objectives. Class time will be split between discussion of the material and application exercises that you'll complete in teams. Slides and other relevant materials for each class and lab will be available on canvas before each class. Videos and other relevant prep materials for each unit are also available on that page.

Grading

Problem sets

10%

Labs

10%

Application exercises

10%

Peer assessment

3%

Performance assessments

15%

Embedded video quizzes

2%

Midterm

20%

Final

30%

Cumulative numerical averages of 90-100 are guaranteed at least an A-, 80-89 at least a B-, and 70-79 at least a C-. Grades **may** be curved at the end of the semester. Exact ranges for letter grades will be determined after the final exam.

Work Load

You are expected to put in about 6-8 hours of work / week outside of class. Some of you will do well with less time than this, and some of you will need more.

Teams

You will be assigned to teams of 4-5 students. Once team assignments have been made there is no option for changing teams, other than under extraordinary circumstances. You will work in these teams during application exercises and lab assignments. In addition, your team members will be your first point of contact in this class.

You are encouraged to study with your team members and other classmates. But remember that anything that is not explicitly a team assignment must be your own work.

Attendance, Participation, and Peer Evaluation:

You are expected to be present at class meeting and actively participate in the discussion with your team. Your attendance and participation during class will make up a non-insignificant portion of your grade in this class.

Twice during the quarter you will be asked to complete a peer evaluations (3% of your overall grade). These will be used to ensure that all team members contribute to the success of the group and to address any potential issues early on. If you feel that there are issues within your team, you are encouraged to discuss it with your team members and to bring it to my or your TAs attention.

Application Exercises

The objective of the application exercises is to help you gain a better understanding of statistical thinking and concepts. These will be completed in teams during synchronous lecture time. Team members who fail to attend a lecture will not be eligible for any points on that application exercise.

Submission instructions: One submission per team submitted via Canvas.

The lowest application exercise score will dropped.

Problem Sets

These will be assigned weekly via WebAssign. You will hopefully enroll via canvas to create an account (\$45). Each assignment will list roughly ten problems to be turned in on Friday.

The objective of the problem sets is to help you develop a more in-depth understanding of the material and help you prepare for exams. Grading will be automatic via WebAssign. You are welcomed, and encouraged, to work with each other on the problems, but you must turn in your own work.

All assignments will be time stamped and late work will be penalized based on this time stamp (see late work policy below).

Labs

The objective of the labs is to give you hands on experience with data analysis using modern statistical software. We will use a statistical analysis package called RStudio, which is a front end for the R statistical language.

In class your TAs will give a brief overview of the lab and learning goals, and guide you through some of the exercises. You will start working on the lab during the lab session, but note that the labs are designed to take more than just the class time, so you will meet up with your team at a later time to finish the lab before the due date.

With each lab you will also be asked to note team members' attendance in lab session and percentage contribution. Team members who fail to attend a lab section but who still contribute to the week's lab report will lose points on the lab. Team members who both don't attend lab and also do not contribute to that week's lab report will not be eligible for any points on that lab.

You must attend the lab you are registered for.

Submission instructions: Submit either a PDF or HTML file for your lab. One submission per team.

The lowest lab score will dropped.

Discussions

The objective of discussion is to review material from lecture and provide examples similar to those on the the problem sets. This time should be used to ask questions regarding the problem sets. Additionally, there will be some breakout room activities during discussion sections.

You must attend the discussion you are registered for.

Performance assessments

Performance assessments will be given three or four times during the quarter. These are approximately 10 question multiple choice assessments comprised of conceptual questions addressing the learning objectives. Outstanding performance will require mastery of all topics covered in the assessment.

Exams

There will be one midterm and one final in this class. Exam dates cannot be changed and no make-up exams will be given.

Slack

You can join the slack workspace for this class here (this will expire). I will regularly send announcements by slack, please make sure to check slack daily. Note that it is more efficient to answer most statistical questions **directly** so make use of office hours.

Any non-personal questions related to the material covered in class, problem sets, labs, etc. should be posted on slack. The TAs and myself will be answering questions on the forum daily and all students are expected to answer questions as well. Please use informative titles for your posts. Please only use 'direct messages' for confidential questions.

Policies

- Late work policy for the problem sets and labs reports:
 - next day: lose 30% of total possible points
 - later than next day: lose all points

- There will be no make-ups for performance assessments, labs, problem sets, or exams. If the midterm exam must be missed, absence must be officially excused **in advance**, in which case the missing exam score will be imputed using the final exam score. This policy only applies to the midterm. All other missed assessments will receive a grade of 0. The final exam must be taken at the stated time. You must take the final exam to pass this course.
- Use of disallowed materials (web references, any form of communication with classmates or other persons, etc.) during exams will not be tolerated. This will result in a 0 on the exam for all students involved, possible failure of the course, and will be reported to the Student Conduct & Academic Integrity Programs (SCAIP). If you have any questions about whether something is or is not allowed, ask me beforehand.

Calendar and Topics

Date	Lecture	Topic
Week 1	1	Introduction
-	2	Exploratory Data Analysis
-	-	Discussion - Meet your TA!
-	3	Data Collection: Observational Studies & Experiments
-	-	Lab 1 Intro to R and RStudio
-	-	No Class (October 1st)
Week 2	4	More Exploratory Data Analysis
-	-	Discussion
-	5	Introduction to Statistical Inference
-	-	Lab 2 Introduction to Data
-	6	Performance Assessment 1
Week 3	7	Randomization Testing
-	-	Discussion
-	8	Two-variable Relationships
-	-	Lab 3 Inference via Randomization
-	9	Simple Linear Regression
Week 4	10	Intro to Probability
-	-	Discussion
-	11	Counting Techniques
-	-	Lab 4 Probability
-	12	Addition Rule and Performance Assessment 2
Week 5	13	Contingency Tables and Conditional Probabilities
-	-	Discussion
-	14	Law of Total Probability
-	-	Lab (Review for Midterm)
-	15	Midterm Friday, October 29th, 8:00 - 8:50 AM
Week 6	16	Probability Distributions
-	-	Discussion
-	17	Normal and Binomial Distributions
-	-	Lab 5 Distributions
-	18	Standardization and Area Under the Curve
Week 7	19	Sampling Distributions and CLT
-	-	Discussion
-	20	Confidence Intervals
-	-	Lab 6 Intro to Inference
-	21	Hypothesis Tests and Performance Assessment 3

Date	Lecture	Topic
Week 8	22	CI and Hypothesis Tests for Single Proportions
-	-	Discussion
-	23	Sample Size Calculations
-	-	Lab 7 Confidence Intervals
-	24	Inference for Difference of Proportions
Week 9	25	Goodness of Fit
-	-	Discussion
-	26	Testing for Independence
-	-	Happy Thanksgiving
-	27	Black Friday
Week 10	28	CI and Hypothesis Tests for Mean
-	-	Discussion
-	29	Inference for Difference of Means
-	-	Lab 9 Inference for Numerical Data
-	30	Review for Final
Week 11		Final Exam Monday, December 6, 8:00 a.m -11:00 a.m.