Statistics 250 Syllabus Fall 2017

Statistics are ubiquitous in life, and so should be statistical reasoning.
Alan Blinder, former Federal Reserve vice chairman and Princeton academic. Inside the List, NYTimes.

Think analytically, rigorously, and systematically about a problem and come up with a solution that leverages the available data.
Michael O'Connell, Sr. Director of Analytics, TIBCO,
What Is a Data Scientist?: Michael O'Connell of TIBCO Spotfire, Forbes

Welcome ~ Course Info available through Canvas https://umich.instructure.com/courses/165790

Lectures

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About Lectures, Labs, and Office Hours

- During **lectures**, the instructors work with you to first interact with concepts. This first interaction with the content is critical to be ready to work on homework and engage in lab material. Thus, c*oming to lecture to engage in the content through iClicker questions regularly will lead to extra credit points toward your HW total.* There are 10 'full' weeks of lecture (those with a full set of M-F classes, excluding exam weeks and weeks with a holiday or fall break). For each of these weeks, you can earn lecture participation by engaging with at least 50% of the iClicker questions polled during at least one lecture that week. You can receive up to a maximum of 4 extra credit points toward your HW total (0.5 point for each week you participate in lecture).
- During **labs**, GSIs will discuss examples, answer questions, and guide interactive in-lab group projects. You will have the opportunity to work with statistical software (R and R Commander) to perform statistical data analyses. **Why R?** The ability to use R is a valuable skill recognized by employers. R is a free, open source software that can be downloaded onto student machines for access at any time. R is available at all campus computing sites (so having your own device is not required).
- **Your first lab will meet the week of September 11.** Attendance in labs is **required**, and it is important to attend the lab for which you are enrolled (see your Lab Syllabus, received in your first lab). You are responsible for having a solid core knowledge about the lecture material ***before*** coming to your lab each week.
- Most **labs** meet in computer classrooms, most are held in G444B or G444C Mason Hall in the Angell Hall Courtyard; a few are held in B760 or B254 East Hall. If your lab meets in 2244 USB it is a *BYOL (bring your own laptop) lab,* and you are required to bring your own laptop to lab each week with R and R Commander installed.
- We enjoy using technology to facilitate learning in our class. **Be respectful** in your use of technology during lecture and lab so as not to disrupt the learning process for yourself and those around you.
- We enjoy working with you to help you connect with the content. All Stats 250 Instructors and GSIs will have **office hours.** A full schedule will be available September 11. **Most hours will be held in the Science Learning Center (SLC) 1720 Chem**, and a few will be held in the Stats department (4th floor of West Hall, near the Randall Lab/Weiser end of West Hall). All office hours are open for any Stats 250 student to attend.
- **Email** correspondence: including "Stats 250" in the subject line helps us find your messages readily. But do check the Canvas course site first as you might find your answer there! If you do not receive a response within 48 hours, please send a gentle reminder to the person you emailed.

What do you need?

Required 1. Stats 250 Fall 2017 Lecture Notes and Lab Workbook Course Pack: Required and available either from Dollar Bill https://www.dollarbillcopying.com/STAT-250-P2396.aspx at 611 Church St (665-9200), **Bin #6011-F17, ~$21** OR print yourself (in full or by section) from your Canvas course site. **Note: Must be the F17 version (earlier version will not work with the many updates from previous terms).**

Required 2. Course.Work Online Homework tool ($36): Through this tool you receive required and recommended HW, answer questions, and receive graded HW with feedback. Purchase at https://www.course.work (not bookstores).

Required 3. Statistical Software R/R Commander ($0 free): The ability to use R is a valuable skill recognized by employers. R is a free, open source software that can be downloaded to your machine for access any time. **Check out Canvas for R Info and times of drop in help sessions.** R is also available on all campus computing machines.

Required 4. i>clicker: The i>clicker System will be used regularly in all lectures and all labs. For student i>clicker information see https://ltc.iss.lsa.umich.edu/iclicker/student-qa/. You may purchase a clicker at the Computer Showcase (Union or Pierpont). Be sure to register your iClicker using the link on the Stats 250 Canvas page.

Required 5. Calculators: Used for HW and exams. Any basic scientific (raise to power, take square root) is fine (see calculator policy on Canvas for details). No phones/devices with communication functions allowed during exams.

Required 6. ECoach for Stats 250 ($0 free): Large lecture classes are different from other classes you may have taken, and achieving the final grade you want may be challenging. ECoach (https://ecoach.ai.umich.edu/coach/13/home/) is designed using advice from previous students, education research, and tips from your stats professors to "coach" you through the class - and it works! Sign up today!

Productive, Necessary Practice through Homework, Prelabs, and M-Write

Weekly online HW available through Course.Work:

- When a HW assignment is posted, you will have seen *most* corresponding material. Start HW early when it opens. Past students have found that starting HW the day it is due means too little time to review the material, to do computer analysis questions, or to ask questions. So, do not wait until the night before.
- **HW assignments must reflect your own work**—you can talk to others, but calculations and final answers must be your own, explanations must be in your own words. Copying past HW solutions or submitting work identical to others are considered violations of academic integrity. Do not share your Course.Work login information as doing so might open yourself up to academic misconduct on the part of another student (see the Academic Integrity section).
- You can revisit your HW unlimited times and edit it up until the due date/time. All saved work will be submitted for you at the due date/time. So, **you are encouraged to save after you answer each question** and to **print the questions with your answers (save as pdf)** after each main work session **as back up**.
- **Do not** open two versions or browsers with Course.Work as it can cause one to overwrite the other. Be sure to log out if your connection will change, if your work session is done, or if you are working on a public machine.
- Although **no late HW** will be accepted, we do know things can come up. So, your **one lowest HW score will be dropped** before computing the HW part of your lab grade.
- Some **HW problems are to be done using a computer package** (R and R Commander). Be sure you include/upload only the relevant parts. Any graphs **must include an appropriate descriptive title *AND your name***.
- Once the HW due date/time has passed, the solutions will become available through Course.Work. Your HW will be graded and scores along with some personalized feedback will be available the following week.
- **Recommended problems** (with solutions) will be available and *highly* recommended. Statistics is learned by doing.
- For any Course.Work technical issues, contact **support@course.work** and **CC your GSI.**

Weekly Prelab Assignments available through Canvas:

Each week you will have a **PreLab Assignment** to help get you ready for your computer lab with R. Many of these assignments will have you work with a Shiny App. **Shiny** is a package from RStudio that allows us to create web applications with R to help you better visualize and understand various statistical concepts for this class.

Two M-Write Writing To Learn (WTL) Assignments available through Canvas:

M-Write is a project that aims to deepen your understanding of key ideas in statistics through the use of writing. There will be **two Writing to Learn (WTL) assignments** (#1: Oct 20 to Nov 4 and #2: Nov 17 to Dec 6). Each involves an initial submission to a writing prompt, peer review of fellow students' initial submissions, and a revised final submission of your work. We have some great prompts to work with: one on Pizza, and the other on Chocolate.

Exams Details

There are two semester exams and a cumulative final exam.

Exam 1: Thursday, October 19, 6:00 – 7:30 PM
Exam 2: Thursday, November 16, 6:00 – 7:30 PM
Final Exam: Thursday, December 14, 7:30 – 9:30 PM

Exam Policy: All exams are closed book but you are provided with a Stats 250 Help Card with tables. There will be **no make-ups for the exams, so check your calendars now**. You must take the final exam to pass this course.

For exam conflicts or special (documented) accommodations for testing, send an email to stats250altexam@umich.edu **before Wednesday, September 27.** For exam conflicts: the email should include details for the class or UM event that is in conflict (course number, course instructor and email, time of the class/event). For special accommodations: the email should include the verified individual services accommodation (VISA) form documentation issued by the Services for Students with Disabilities (SSD) Office (G664 Haven Hall, 734-764-3000).

Overall Full Credit Policy: Full credit for problems (on HW, labwork, and exams) can only be earned through showing justification. *Answers that require work but have none will receive no credit*. With all assignments in Stats 250, *show any work beyond trivial calculations*, and, when appropriate, *round final answers to 4 decimal places*. Also make sure to *include units* and to *make statements and conclusions in the context of the problem*, where appropriate. Finally, be sure it is your own work (see Academic Integrity section later).

How will your Grade be Determined?

Performance on exams will account for 80% of your final course grade; the remaining 20% will come from Homework, Labwork (prelabs, lab tickets, lab iClicker participation), and M-Write assignments. There are three methods for computing your final course grade:

	Exam 1	Exam 2	Final Exam	Homework	LabWork	M-Write
Method 1	25%	25%	30%	10%	6%	4%
Method 2	10%	25%	45%	10%	6%	4%
Method 3	25%	10%	45%	10%	6%	4%

- For each student, all three methods will be computed and **the method that produces the higher grade will be used**.
- **Lab attendance is important. Each missed lab will reduce your final course percentage by 1%** (see lab syllabus).
- **Lecture attendance is vital.** Coming to lecture to engage in the content regularly will not only help you in the course, but can lead to extra credit points toward HW. See Canvas for details on all extra credit opportunities.
- **Canvas will provide scores for individual assignments, but it will NOT reflect your final course percentage.** Canvas does not drop the lowest HW score nor add in any Extra Credit; Canvas does not look at the various methods for weighting of exams (described above); and Canvas does not incorporate the lab attendance policy.

Your final course grade will be assigned by taking your percentage of points received to the following fixed scale:

97 and up = A+	[86, 89) = B+	[74, 78) = C+	[60, 65) = D+	Below 50 = E
[93, 97) = A	[82, 86) = B	[70, 74) = C	[55, 60) = D	
[89, 93) = A-	[78, 82) = B-	[65, 70) = C-	[50, 55) = D-	

We follow these cut points for all students, for example, a final percentage of 85.99% will result in a final course grade of B.

What are Some of Your Responsibilities?

It is your responsibility: to be aware of course policies (as laid out in this syllabus, the lab syllabus, presented on Canvas), to check announcements and email messages *sent to your UM email*, and to communicate with your instructor and GSI in a *timely manner* regarding any conflicts or issues. You are responsible for your learning; this includes:

- attending lectures and labs and, if you should miss (not skip) a class, making up the missed work;
- reviewing lecture and lab material regularly and often and asking questions when you have them;
- doing the assigned homework and labwork on time and participating in the class; and contacting your instructor and/or GSI if you are having difficulties (earlier, rather than too late).

Mental Health and Wellbeing

University of Michigan is committed to advancing the mental health and wellbeing of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact **Counseling and Psychological Services (CAPS)** at (734) 764-8312 and https://caps.umich.edu/ during and after hours, on weekends and holidays, or through its counselors physically located in schools on both North and Central Campus. You may also consult **University Health Service (UHS)** at (734) 764-8320 and https://www.uhs.umich.edu/mentalhealthsvcs, or for alcohol or drug concerns, see www.uhs.umich.edu/aodresources. For a listing of other mental health resources available on and off campus, visit: http://umich.edu/~mhealth/.

Our Stats 250 Canvas site has a link on the homepage called "Student Support Services at Michigan." You will find info for several offices on campus that are classified as Academic Support and Tutoring, Counseling and Health and Wellness, Services for Students with Disabilities, and Support for a Diverse Community. It is important to us that you know the resources available to you as a student, so we wanted to make sure that you have quick links to these resources.

Academic Integrity

"The LSA undergraduate academic community, like all communities, functions best when its members treat one another with honesty, fairness, respect, and trust. The College holds all members of its community to high standards of scholarship and integrity. To accomplish its mission of providing an optimal educational environment and developing leaders of society, the College promotes the assumption of personal responsibility and integrity and prohibits all forms of academic dishonesty and misconduct. Academic dishonesty may be understood as any action or attempted action that may result in creating an unfair academic advantage for oneself or an unfair academic advantage or disadvantage for any other member or members of the academic community. Conduct, without regard to motive, that violates the academic integrity and ethical standards of the College community cannot be tolerated. The College seeks vigorously to achieve compliance with its community standards of academic integrity. Violations of the standards will not be tolerated and will result in serious consequences and disciplinary action." www.lsa.umich.edu/academicintegrity/

So, do not cheat. The penalties for cheating are very steep, and the potential rewards are very minor. For example, there have been academic misconduct cases when students had written interpretive statements phrased very similarly to other students' answers. Being honest and leaving questions to which you don't know the answer either unanswered or blank, or taking a zero on a homework that you are in a time crunch to complete, will result in more favorable consequences than cheating. And, while we encourage you to discuss concepts behind homework questions, remember that your submitted answers must always be in your own words. See www.lsa.umich.edu/academicintegrity/examples.html for more examples.

If we suspect academic misconduct on any graded elements of the course, you will receive an email from the instructor team that indicates the suspected academic misconduct and how the case will be handled. University policy dictates that we must report suspected academic dishonesty to the Assistant Dean for Undergraduate Education, **no matter how small**. If you have a question or concern about what may be considered academic misconduct in Stats 250 and/or if you have any questions regarding the Stats 250 academic integrity policy, please contact your instructor.

General Advice

- **Perseverance pays off.** Most students need to go over an idea more than once to properly understand it.
- **Be an active learner in the classroom**. Don't waste your time by not learning in class.
- **Be respectful** of your peers and instructors in class. Talking during lecture and/or lab is distracting to the students around you and may negatively impact their learning experiences.
- When you don't understand something **just ask for clarification** in lecture, in labs, in office hours. We are here to help you. It's very likely that other students have the same questions that you do.
- **Do the homework problems.** Start them early, try them first all on your own, then come in with questions. Do the recommended problems. By far the best way to learn statistics is to review and do many problems.
- **Stay current**. Statistical knowledge is cumulative. New skills generally depend on ones you learned earlier.
- **Use resources.** You have a lot of great resources available ~ ECoach, Problem Roulette (actual past exam questions in fun practice format), name that scenario, recommended homework, practice exams, and more.

Stats 250 Lecture Outline – Fall 2017

Come to lecture, be an active co-author of your interactive lecture notes so they can become your own personal study resource.

Week	Lecture Topic(s)
1 (Sept 5-8)	Syllabus, Introduction, Summarizing Data
2 (Sept 11-15)	Summarizing Data, Gathering Useful Data, and Probability
3 (Sept 18-22)	Probability, Random Variables
4 (Sept 25-29)	Random Variables, Learning about a Population Proportion (SD)
5 (Oct 2-6)	Learning about a Population Proportion (CI and HT)
6 (Oct 9-13)	Learning about the Difference in Two Population Proportions (SD, CI, HT), Learning about a Population Mean (SD)
Oct 16-17	***Fall Break: No labs Mon-Wed, No Lectures Mon-Tue***
Wed Oct 18	***Exam 1 Review (evening time/location tbd)***
7 (Oct 18-20)	Learning about a Population Mean (SD) ***M-Write #1 Begins Fri, Oct 20***
Thu Oct 19	***Exam 1 ~ 6 – 7:30 pm (locations tbd)***
8 (Oct 23-27)	Learning about a Population Mean (CI, HT)
9 (Oct 30-Nov 3)	Learning about a Population Mean Difference (Paired) (SD, CI, HT) Learning about the Difference in Two Population Means (Independent) (SD)
10 (Nov 6-10)	Learning about the Difference in Two Population Means (Independent) (CI, HT)
Sun Nov 12	***Exam 2 Review (afternoon time/location tbd)***
11 (Nov 13-17)	Analysis of Variance (ANOVA) ***M-Write #2 Begins Fri, Nov 17***
Thu Nov 16	***Exam 2 ~ 6 – 7:30 pm (locations tbd)***
12 (Nov 20-22)	Relationships (Linear Regression)
Nov 23-24	***Thanksgiving Break: No Lectures Thu-Fri***
13 (Nov 27-Dec1)	Relationships (Linear Regression)
14 (Dec 4-8)	Relationships (Chi-Square Tests)
15 (Dec 11-12)	***No Labs this week Mon-Tue*** Mon-Tue Lecture = Wrap Up
Wed, Dec 13	***Final Exam Review (morning time/location tbd)***
Thu, Dec 14	***Final Exam ~ 7:30 – 9:30 pm (locations tbd)***

Your First Stats 250 Review Questions ~ Try it!

Here is a set of questions that demonstrate the level of math/algebra skills used in Stats 250. **Try them out for some review.** As with all assignments in Stats 250, to receive credit you must show all work and where appropriate, carry out work to (at least) 4 decimal places. You may use (and likely need) a calculator for some computations. **Bring your completed answers to your first lab, Sept 11-13, and you will use R as a calculator to check your work.** Solutions will be available on your Canvas Site (under Files -> Review Info). Feel free to bring any questions to any GSI or instructor.

1. What is the value of $(4 + 3)\times 7$?

2. What is the value of $\sqrt{\frac{1}{10} + \frac{1}{20}}$?

3. Solve for the value of x where $2x + 17 = 23$.

4. Solve for the value of *n* where $0.03 = \frac{1}{\sqrt{n}}$.
   For this example, round up your answer to the next integer value.

5. Suppose $x_1 = 3, x_2 = 6, x_3 = -2, and\ x_4 = 8$. Then find the value of $\sum_{i=1}^{4} x_i$.
   Note the symbol ∑ just means to add them all up, and in this case, start with *i* = 1 and go up to *i* = 4.

6. Suppose we have five probabilities that must sum up to 1 (for 100%)
   and we know $p_1 = 0.3,\ p_2 = 0.1,\ p_3 = 0.3$, with p_4 and p_5 unknown.
   If we know that p_4 is twice the value of p_5, what must be the values of p_4 and p_5?

7. Fractions and Decimals: Is $\frac{2}{7} < 0.27$?

8. What is the mean (or average) of these responses: 3, 8, 6, -4?

9. Provide the range of values represented by 0.72 ± 0.04.

10. Plot the following line,
    including axes labels and
    at least 3 values on each axis.
    $y = 2x - 1$