Course Information

Teaching team:

Professor	**Dr. Çetinkaya-Rundel (http://stat.duke.edu/~mc301)**	**mine@stat.duke.edu (mailto:mine@stat.duke.edu)**
TAs	David Clancy (head TA)	djc37@duke.edu (mailto:djc37@duke.edu)
	Lindsay Berry	lrb38@stat.duke.edu (mailto:lrb38@stat.duke.edu)
	Patrick Cardel	patrick.cardel@duke.edu (mailto:patrick.cardel@duke.edu)
	Anthony Hung	anthony.hung@duke.edu (mailto:anthony.hung@duke.edu)
	Eidan Jacob	eidan.jacob@duke.edu (mailto:eidan.jacob@duke.edu)
	John Pura	john.pura@duke.edu (mailto:john.pura@duke.edu)
	Sarah Zimmerman	sarah.zimmermann@duke.edu (mailto:sarah.zimmermann@duke.edu)

Required materials:

- Textbook: OpenIntro Statistics (http://openintro.org/os) - Diez, Barr, Çetinkaya-Rundel CreateSpace, 3rd Edition, 2015 (ISBN: 978-1943450039)
  The textbook is freely available online (http://openintro.org/os). 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 $10) on Amazon (http://openintro.org/os). The textbook store will not carry copies of this text.

- Clicker: i>clicker2 (http://www.amazon.com/I-Clicker-2-I-Clicker/dp/1429280476) (ISBN: 1429280476)
  If you would like to purchase a used clicker from a former student, see the list of students selling their clickers at this Google Doc (https://docs.google.com/spreadsheet/ccc?

key=0AkY2lFgS9uiDdE1fMkZUZnp6alJDSG9tYllwTFJWdnc#gid=0). You can contact them directly, or leave your name on the list under "Wants to buy clicker". The clickers will also be available at the Duke textbook store, or you can get them for slightly cheaper on Amazon (http://www.amazon.com/I-Clicker-2-I-Clicker/dp/1429280476). Note that this is i>clicker2, and not i>clicker+.

- Calculator (optional): You will be allowed to use a calculator in this class. There is no restrictions on the type of calculator. A simple calculator that can take square roots should be sufficient.

Class meetings:

- Lectures: Mondays and Wednesdays, 1:25pm - 2:40pm, LSRC ROOM B 101
- Labs:
  - 8:30am - 9:45am - Link Classroom 3 - TA: David Clancy
  - 10:05am - 11:20am - Link Classroom 3 - TA: David Clancy
  - 11:45am - 1:00pm - Link Classroom 4 - TA: Lindsay Berry
  - 1:25pm - 2:40pm - Link Classroom 3 - TA: Lindsay Berry
  - 3:05pm - 4:20pm - Link Classroom 4 - TA: John Pura
  - 4:40pm - 5:55pm - Link Classroom 4 - TA: John Pura

Exams:

- Midterm 1: Feb 24, Wed, in class
- Midterm 2: Mar 30, Wed, in class
- Final: May 5, Thu - 7-10pm

Office Hours:

- Professor Cetinkaya-Rundel:
  - Discussion section: Tuesdays, 4 - 5:30pm, Soc Sci 139
  - Office hours: Thursdays, 10:30am - 12pm, Old Chem 213 (my office)
- Teaching Assistants:

TA	Day / time	Location
Sarah Zimmerman	Sun 11am - 1pm	Old Chem 211A
David Clancy	Sun 7:30pm - 9:30pm	Old Chem 025

Drew Jordan	Mon 4:30pm - 5:30pm + 7pm - 8pm	Old Chem 211A
Anthony Hung	Mon 6pm - 8pm	Old Chem 025
Andrew Wong	Mon 7:30pm - 9:30pm	Old Chem 025
Anne Driscoll	Tue 9:30am - 11:30am	Old Chem 211A
Katherine Ahn	Tue 11am - 1pm	Old Chem 211A
Andy Cooper	Tue 2pm - 4pm	Old Chem 211A
Patrick Cardel	Thu 12pm - 2pm	Old Chem 211A
John Pura	Thu 2pm - 3pm + 6pm - 7pm	Old Chem 211A
Lindsay Berry	Thu 3pm - 5pm	Old Chem 211A
Eidan Jacob	Fri 9:30am - 11:30am	Old Chem 211A

Holidays:

- Jan 18, Mon - Martin Luther King, Jr. Day
- Mar 12, Sat - Mar 20, Sun - Spring Break

Green Classroom

This course has achieved Duke's Green Classroom Certification. The certification indicates that the faculty member teaching this course has taken significant steps to green the delivery of this course. Your faculty member has completed a checklist indicating their common practices in areas of this course that have an environmental impact, such as paper and energy consumption. Some common practices implemented by faculty to reduce the environmental impact of their course include allowing electronic submission of assignments, providing online readings and turning off lights and electronics in the classroom when they are not in use. The eco-friendly aspects of course delivery may vary by faculty, by course and throughout the semester. Learn more at http://sustainability.duke.edu/action/certifications/classroom/index.php (http://sustainability.duke.edu/action/certifications/classroom/index.php).

Syllabus

Course goals & objectives:

This course introduces students to the discipline of statistics as a science of understanding and analyzing data. Throughout the semester, 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. Model numerical response variables using a single or multiple explanatory variables.
6. Interpret results correctly, effectively, and in context without relying on statistical jargon.
7. Critique data-based claims and evaluate data-based decisions.
8. Complete a research project demonstrating mastery of statistical data analysis from exploratory analysis to inference to modeling.

Tips for success:

- Complete the reading before a new unit begins, and then review again after the unit is over.
- Be an active participant during lectures and labs.
- Ask questions - during class or office hours, or by email. Ask me, your TAs, and your classmates.
- Do the problem sets - start early and make sure you attempt and understand all questions.
- Start your project early and and allow adequate time to complete it.
- Give yourself plenty of time time to prepare a good cheat sheet for exams. This requires

going through the material and taking the time to review the concepts that you're not comfortable with.

- 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 structure:

The course is divided into seven learning units. For each unit a set of learning objectives and required and suggested readings, videos, etc. will be posted on the course website. You are expected to watch the videos and/or complete the readings and familiarize yourselves with the learning objectives. We will begin the unit with a readiness assessment: 10 multiple choice questions that you answer using your clickers in class. You will then re-take this assessment in teams. The rest of the 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 the schedule (/) page before each class. Videos and other relevant prep materials for each unit are also available on that page. Within each unit you will complement your learning with problem sets and labs, and wrap up each unit with a performance assessment.

Videos:

All videos and learning objectives as well as learning supplementary materials that you will need for preparing for the readiness assessments are hosted on the Duke/Coursera page. Follow these steps to access them:

- Go to https://duke.coursera.org (https://duke.coursera.org)
- Click "Enter with your Duke University ID". This should bring up the familiar login for Duke (NetID authentication), and, after a pause, a Coursera page saying "Your Duke University Courses"
- Click "Courses" in the upper right to get a list of courses. Enroll in "Data Analysis and Statistical Inference"

Grading:

Attendance & participation + peer evaluation	7.5%
Problem sets	10%

Labs	10%
Readiness assessments	7.5% (75% individual, 25% team)
Performance assessments	5%
Project	10%
Midterm 1	12.5%
Midterm 2	12.5%
Final	25%

Grades may be curved at the end of the semester. 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-, however the exact ranges for letter grades will be determined after the final exam. The more evidence there is that the class has mastered the material, the more generous the curve will be.

Work load:

You are expected to put in about 4-6 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:

To construct highly functional teams of learners, you are asked to complete a short survey as well as a pre-test to gauge your previous exposure to statistics and statistical literacy. If you haven't yet done so please complete these items as soon as possible.

You will be assigned to teams of 3-5 students based on the results of the survey and the pre-test. 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 team portions of the readiness assessments. 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.

Clickers:

Throughout the lectures you will use clickers to both answer conceptual questions and for data collection/class surveys. In order to receive credit for the clicker questions you must register your clicker here (http://iclicker.com/support/registeryourclicker). In the Student ID field enter your Net ID, and in the Remote ID field enter the alphanumeric code printed below the barcode on the back of your clicker.

These questions are on material introduced in class that day, and you get credit for clicking in, regardless of whether you have the correct answer. To get credit for the day you must respond to at least 75% of the questions. The objective of these questions is to help make you an active participant and gauge the class' mastery of the material. Participation data from clickers will become a part of your attendance/participation grade.

You are required to bring your clicker to every lecture and it is your responsibility to show up to class on time. Most importantly, it is your responsibility to come to class. I realize that occasionally you may be late, forget your clicker, or need to miss class. *Up to three* unexcused late arrivals or absences will not affect your clicker grade. If one person is simultaneously using two or more clickers, the all owners of the clickers will receive a 0 for an overall clicker grade, and will be reported to the Office of Student Conduct (http://www.studentaffairs.duke.edu/conduct).

Attendance, participation, and peer evaluation:

You are expected to be present at class meeting and actively participate in the discussion. Your attendance and participation during class, as well as your activity on the discussion forum on Sakai will make up a non-insignificant portion of your grade in this class. While I might sometimes call on you during the class discussion, it is your responsibility to be an active participant without being called on.

Throughout the semester you will also be asked to complete a few peer evaluations. 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 TA's attention.

Problem sets:

These will be assigned (approximately) weekly on the course webpage and will be comprised of problems from the textbook. Each assignment will list roughly five to seven problems from the book to be turned in for grading, and roughly 10 practice problems. You do not need to turn in the practice problems, and the solutions can be found in the back of the book.

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 and the project. Grading will be based on completeness as well as accuracy. In order to receive credit you must show all your work.

You are welcomed, and encouraged, to work with each other on the problems, but you must turn in your own work. If you copy someone else's work, both parties will receive a 0 for the problem set grade as well as being reported to the Office of Student Conduct (http://www.studentaffairs.duke.edu/conduct). Work submitted on Sakai will be checked for instances of plagiarism prior to being graded.

Submission instructions: You will turn in your problem sets on Sakai. We strongly recommend working in a word processor of your choice (Word, Google Docs, etc.), saving your work as PDF, and submitting the PDF. This will ensure that what we read is exactly what you intended to submit. You are also welcomed to submit your document as a Word file as well, however if we cannot open your file you will receive a 0 on the problem set (so it is worth taking that risk!). Alternatively, you can type your answers in the text box in Sakai however if you lose internet connection and you haven't saved, you might lose your work (so if you'll use this approach make sure to save often!).

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

Lowest score will be dropped.

Labs:

The objective of the labs is to give you hands on experience with data analysis using modern statistical software. The labs will also provide you with tools that you will need to complete the project successfully. 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 class 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 (which will be the following lab session).

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 (for any reason) but who still contribute to the week's lab report will lose 20 pts 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.

Submission instructions: Always submit the Rmd and the HTML files for your lab. One submission per team.

Lowest score will be dropped.

Readiness assessments:

Readiness assessments will be given at the beginning of a unit. These are 10 question multiple choice assessments comprised of conceptual questions addressing the learning objectives of the new unit. You are not expected to master all topics in the unit ahead of time, but you are responsible for completing the reading assignment, understanding how the material fits in the greater framework of the course, and acquire a conceptual understanding of the learning objectives. As described above, you will first take the individual readiness assessment using your clickers, and then re-take the same assessment in teams using scratch off sheets. Your performance on both assessments will factor into your final grade (3/4 individual score, 1/4 team score). In addition, your input during the team portion will factor into your participation grade.

Lowest score will be dropped.

Performance assessments:

Performance assessments will be given at the end of a unit. These are very similar to the readiness assessments in format, however you will be taking them outside of class on Sakai. Outstanding performance will require mastery of all topics in the unit.

Lowest score will be dropped.

Project:

The objective of the project is to give you independent applied research experience using real data and statistical methods. You will complete the semester long project in teams. There will be a mid-checkpoint where you write a proposal for your research direction and present results from exploratory data analysis. At this stage you will also describe your collaborative approach outlining each team member's past and planned contribution and a plan for how the work will come together.

Note that each student **must complete the project and score at least 30% of total possible points on each project in order to pass this class**.

Team members will provide feedback on percentage contribution to the final product, and grades for each student will be determined based on the quality of the product and their contribution to the work. If everyone contributes equally, all members will get full credit. Team members who do not contribute sufficiently will be deducted points.

Exams:

There will be two midterms and one final in this class. See course info (/info/#exams) for dates and times of the exams. Exam dates cannot be changed and no make-up exams will be given. If you can't take the exams on these dates you should drop this class. You can't pass the class if you do not take the final exam.

You are allowed to use one sheet of notes (`cheat sheet") to the midterm and the final. This sheet must be no larger than 8 1/2 x 11, and **must be prepared by you**. You may use both sides of the sheet.

Email & Forum (Piazza):

I will regularly send announcements by email, please make sure to check your email daily.

Any non-personal questions related to the material covered in class, problem sets, labs, project, etc. should be posted on Piazza. Before posting a new question please make sure to check if your question has already been answered. 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.

Note that it is more efficient to answer most statistical questions ``in person" so make use of OH.

Other learning resources:

Aside from the your TAs' and the professor's office hours (/info/#oh), you can also make use of the Academic Resource Center (http://web.duke.edu/arc).

Students with disabilities:

Students with disabilities who believe they may need accommodations in this class are encouraged to contact the Student Disability Access Office (http://www.access.duke.edu/students/requesting/index.php) at (919) 668-1267 as soon as possible to better ensure that such accommodations can be made.

Academic integrity:

Duke University is a community dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability. Citizens of this community commit to reflect upon and uphold these principles in all academic and non-academic endeavors, and to protect and promote a culture of integrity. Cheating on exams and quizzes, plagiarism on homework assignments and project, lying about an illness or absence and other forms of academic dishonesty are a breach of trust with classmates and faculty, violate the Duke Community Standard (https://studentaffairs.duke.edu/conduct/about-us/duke-community-standard), and will not be tolerated. Such incidences will result in a 0 grade for all parties involved as well as being reported to the Office of Student Conduct (http://www.studentaffairs.duke.edu/conduct). Additionally, there may be penalties to your final class grade. Please review the Duke's Academic Dishonesty policies (https://studentaffairs.duke.edu/conduct/z-policies/academic-dishonesty).

Excused Absences:

Students who miss graded work due to a scheduled varsity trip, religious holiday or short-term illness should fill out an online NOVAP (https://trinity.duke.edu/undergraduate/academic-policies/athletic-varsity-participation), religious observance notification (https://trinity.duke.edu/undergraduate/academic-policies/religious-holidays), or short-term illness notification (http://trinity.duke.edu/academic-requirements?p=policy-short-term-illness-notification) form respectively.

If you cannot complete an assignment on the due date due to a short-term illness, you have **until noon the following day** to complete it at no penalty. Then the regular late work policy will kick in.

If you are faced with a personal or family emergency or a long-range or chronic health condition that interferes with your ability to attend or complete classes, you should contact your academic dean's office. See more information on policies surrounding these conditions here (https://trinity.duke.edu/undergraduate/academic-policies/personal-emergencies). Your academic dean can also provide more information.

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
- Late work policy for the project: 10% off for each day late.

- There will be no make-ups for readiness or performance assessments, labs, problem sets, project, 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 and turn in the project in order to pass this course.

- Regrade requests must be made **within one week** of when the assignment is returned, and must be submitted in writing. These will be honored if points were tallied incorrectly, or if you feel your answer is correct but it was marked wrong. No regrade will be made to alter the number of points deducted for a mistake. There will be no grade changes after the final exam.

- Clickers may not be shared, and the clicker registered to a person may only be used by that person. Failure to abide by this will result in a 0 clicker grade for everyone involved.

- Use of disallowed materials (textbook, class notes, 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 Office of Student Conduct (http://www.studentaffairs.duke.edu/conduct). If you have any questions about whether

something is or is not allowed, ask me beforehand.

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