



# APMA 0650

## Essential Statistics

### Spring 2018

H-Hour  
TTh 9:00 – 10:20am  
Salomon Center 001

## *Statistics: A Technology, Tool, Science, or an Art form?*

At its core, statistics is about making meaning out of data. The computer and the Internet have transformed our lives by allowing us to store and manipulate data in unprecedented ways. The study and careful practice of statistical analysis is crucial to helping us understand the multitude of data around us as well as the effects that various manipulations have on data.

In this course, you will be introduced to the fields of statistics and probability, with a focus on developing the habits of mind of a statistician. The topics that we will explore include: descriptive statistics, conditional probability, random variables, confidence intervals, hypothesis testing, and the Central Limit Theorem. Contextual meaning for statistics will be a continuous highlight of our work. We will use the popular R language and the Rstudio environment to support our exploration of the field of statistics.

Our journey begins with this syllabus, which contains crucial information about this course and how we will accomplish all that we plan to. In this document, you will find a syllabus quest (with 5 tasks, including how to submit your quest), which should be completed for the second day of class, but must be completed in order to get an account for submitting homework or participate in badge challenges.

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“Central to my teaching philosophy is the belief that everyone can be successful in statistics; they just may not know it yet”

*My approach to teaching has two distinct, but intertwined components: one focused on your statistical knowledge and a second invested in your total education.*

I believe that, as your statistics instructor, my job is to create an environment for you to push the bounds of your statistics knowledge, to discover and hone your statistics skill set, and to incorporate your statistics knowledge with your goals.

Our classroom will be a place of active learning, where experimenting with concepts is highly encouraged. Contact with course material will come in a variety of forms and will often use multiple modalities.

My teaching methods focus on your learning cycle and how I can best support your learning cycle. For example, I require that you keep a stats notebook to help you synthesize the various topics and tailor the course to your own learning. This notebook should act as your home base for the course. Your stats notebook could contain reading notes, printouts, multiple colors, scratch work, post-it notes, and warnings of common mistakes. Your stats notebook should support your learning and be unique to your learning.

Second, I believe that, as your instructor, I should help you grow into the student, citizen, and professional that you envision.

My teaching methods reach beyond course material and seek to help you develop your professional skills. For example, I view homework assignments as opportunities to practice your writing and presentation skills as well as your statistics skills. Since collaboration is a crucial part of any career, you will have several chances to work in small groups.

Central to my teaching philosophy is the belief that everyone can be successful in X; they just may not know it yet. In our course, this X could be statistics, writing, collaborative work, or something else. Know that you have skill in X and that if you want, you will discover and nurture your skill in X.

## What is a learning cycle?

To me, the learning cycle is the cyclic process of 1) engaging with new material, 2) incorporating that new material into your knowledge base, and 3) reflecting on the new material and your broader knowledge.

Every person has a unique implementation of the learning cycle. In our course, activities will engage one or more parts of your learning cycle and will help you develop and hone your own learning techniques.

## Locating Prof. Kinnaird

Office: Room 322, 182 George St. The Castle  
 Email: [katherine\\_kinnaird@brown.edu](mailto:katherine_kinnaird@brown.edu)  
 Office Hours: Tuesdays 11am-1pm, location TBD  
 By appointment, in office

As part of your syllabus quest, find Prof. Kinnaird's office and take a selfie, showing that you found it! Be sure that your face is clearly visible as well as some notable feature of her door.

## COURSE LEARNING GOALS

There are four learning goals for this class. We will not address these goals in order; instead, you should regard these as themes for the course's activities. By the end of the course, you should be able to:

1. Responsibly use sample data to learn about a larger population using exploratory and inferential techniques
2. Detail the power and limitations of statistical concepts, and use this understanding to evaluate statistics from various contexts
3. Explain the connection between probability and inferential statistics
4. Work collaboratively, responsibly, and reflectively to create and present statistics to a wide variety audiences

## COURSE OUTLINE

The following is a *tentative* course outline of topics that we will address. On our Canvas site, there is a detailed course schedule that lists the topics and activities for each day. All significant updates to the detailed course schedule will be announced in-class.

Week	Topics
1-2	Sampling Bias & Statistical Summaries
3	Standard Deviations & Regression
4	Models and Model Quality
6	Probability
7	Random Variables & Expected Values
8 - 9	Central Limit Theorem
10 - 11	Confidence Intervals
11 - 13	Hypothesis Testing
13	Chi-Squared Tests
Final Badge Challenge May 12 at 9am	

## Required Materials

### Textbooks

- Freedman, Pisani, Purves. *Statistics*. 4<sup>th</sup> Ed. (\$150 for new book)
- Horton, Pruium, and Kaplan. *A Student's Guide to R*. (\$20 for new book)
- Supplemental readings will be posted to the detailed course schedule

### Software & Materials

- R installed on a computer that you have access to (freely available)
- Rstudio, an R programming environment (free license)
- *Statistics Notebook* – **Stitch bounded** notebook such as a Composition Notebook. (Between \$1 and \$8 per notebook)

## What is a statistics notebook?

You will be expected to maintain a statistics notebook throughout the term. This bounded notebook should help you synthesize and organize material from the course. You may include reading and class notes, scratch work, post-it notes, warnings of common mistakes, and more.

Class activities and prep work will not be printed. So you may want to develop a system in your notebook that allows you to look back on previous course work.

As part of your syllabus quest, how would you like to use **your** statistics notebook in this course in a new way than you have for previous courses?

# COURSE POLICIES

**TECHNOLOGY:** Responsible, class-focused use of laptops is welcome in our course. Phones should be not used during class and should be silenced.

**ATTENDANCE:** Attendance and participation in class is expected. Students are responsible for all material assigned and discussed in and for class.

**INCLUSIVITY FOR ALL STUDENTS:** Brown University is committed to *full inclusion* of all students. Please inform me early in the term if you have a disability or other conditions that might require accommodations or modification of any of these course procedures. You may speak with me after class, during office hours, or during an appointment. For more information contact Student and Employee Accessibility Services at 401-863-9588 or SEAS@brown.edu.

Students in need of short-term academic advice or support can contact one of the deans in the Dean of the College office.

If you require an accommodation for religious or cultural purposes, please do not hesitate to contact me about this.

**BADGE CHALLENGES:** All badge challenges will be given as listed on the *Detailed Course Schedule*.

**LATE WORK:** All work is due by the date and time indicated on the *Detailed Course Schedule*. Late work is **NOT** accepted. There are weekly assignments for this class and handing in an assignment late will take time from the next one. Instead, I encourage you to do your best to start assignments *early*. If needed, please make use of the flexibility system built into the class, but note that this system should be used sparingly and that abusing it will inhibit your progress in this course.

**TEACHING ASSISTANTS:** We have a team of teaching assistants (TAs) supporting our course. They are extensions of your instructor and should be given the same respect. While they are assisting with grading, the instructor handles all grading disputes. However, you are encouraged to ask the TAs for clarification on markings and any other questions that support your learning of statistics.

**FLEXIBILITY SYSTEM FOR HOMEWORK:** There is a cushion built into the final grade calculations. You may choose to use this policy to not hand-in some of your homework, or you may turn in all questions allowing small mistakes on several of them to be "waived."

**OFFICE HOURS:** Office hours are open to every student. They can be used to discuss material from the course, ask questions about statistics more broadly, investigate major requirements, or to talk about future plans and how you Brown University education can support those plans.

Office hours are drop-in hours. You are welcome to come in without invitation during those hours, regardless of the number of students in my office. I encourage you to add these office hours to your weekly calendar.

**INDIVIDUAL APPOINTMENTS:** You are welcome and encouraged to make individual appointments with me. To make an appointment, please check my appointments calendar (linked on our Canvas site) and select a time that works for you. If none of the times work for you, please ask me for an appointment before or after the next class meeting.

**COMMUNICATIONS:** Emails about this course should have "APMA 0650 - " subject line along with a brief title about the contents of the email. Emails sent after 6pm will be received on the next business day. Emails without a salutation and a signature will not be returned. Submit your syllabus quest by sending me an email with the information requested in this document, and your name and your gender pronouns.

With the exception of questions regarding course grades and emails that I ask you to send me, emails should detail at least 3 resources (included your TAs) that you have used in your attempt to resolve the situation or question discussed in your email.



# Academic Code

The work you submit should be your own creation. I do encourage you to ask for help from your peers, teaching assistants, or myself when you have questions or are stuck; however, copying is **not** allowed. The line between copying and helping is subtle. Below are a few guidelines:

- *Do not share or give your work with other students*; instead, offer to discuss the big ideas of the task at hand.
- Do not look at someone else's work (including online solutions); instead, ask if you could talk with them about your ideas and where you're getting stuck.
- Do not communicate with each other during badge challenges; instead, write as much of your thought process as possible to demonstrate what you understand.

You must *acknowledge those you talk or work with at the top of each assignment*. You will not be docked your assignment for getting acknowledged help from others.

The action of turning in work that is obviously not your own individual effort (even with some revisions) or answers from classmates or outside sources is a violation of Brown's Academic Code and is subject to disciplinary action according to University rules.

If you think you may have crossed the line between getting helping and copying, please come to talk to me about it. Do not let me discover that you have crossed this line. If you are unsure about how Brown's Academic Code applies to our course, please consult an academic dean or myself. We are happy to talk with you about the code and how it applies.

As part of your syllabus quest, describe how the Academic Code applies to badge challenges and how it applies to homework questions in our course and find the name of one dean with whom you could discuss the Academic Code.

## FREQUENTLY ASKED QUESTIONS

### **CAN I OPT TO HAVE MY WORK GRADED WITH POINTS INSTEAD OF THE BADGE SYSTEM?**

No, the badge system is the grading scheme for this course. This grading method preferences mastering material incrementally instead of the "cramming and dumping" material on certain dates. In addition, this grading method clearly communicates what material you need to focus on for the next exam.

### **INSTEAD OF GETTING A CHOCOLATE BAR, CAN I HAND IN HOMEWORK LATE?**

Unfortunately no. Chocolate bars are the only reward for finding the Statistician of the Week.

### **I HAVE TO MISS A BADGE CHALLENGE, CAN I TAKE IT AT ANOTHER TIME?**

Likely, you cannot. With the exception of *extreme* extenuating circumstances, badge challenges are given as listed on the *Detailed Course Schedule*. With the badge system, you are working to demonstrate mastery by the end of the term. So you can miss a challenge for any reason knowing that you can attempt the standards from the missed challenge on a later badge challenge.

In your future, you will have to balance many commitments. In finding that balance, you will make choices that cause you to miss out on things. Making these choices and owning them is a normal part of life.

## GRADING POLICIES

Your final grade is comprised of 100 points as detailed below with the relevant grading policies.

To earn an A, one must earn at least 90 points.

To earn a B, one must earn at least 80 points.

For a C or an S, one must earn at least 70 points.

**BADGE CHALLENGES (70 POINTS)** There are 4 badge challenges, during which you can collect statistics badges. There are 15 badges, each representing core skills for the course. During each badge challenge, you can attempt as many or as few badges as you would like. Your goal, by the end of the semester, is to collect all 15 badges.

The first badge challenge will have the first 5 badges available, the second will have the first 10, and the third and fourth badge challenge will have all 15 badges. As a reminder, you do not need to (nor should you) attempt all badges on each challenge, but you do need to collect all 15 badges by the end of the term.

There are four levels for each badge: **G** – Gold, **S** – Silver, **B** – Bronze, and **X** – cannot be assessed. The most recent level for each badge is the recorded level. This means that if you earn a gold level for badge 1 on the first challenge, then you never have to attempt this badge again. But, if you earn silver for badge 4 on the first challenge and then a bronze for badge 4 on the second challenge, your current level for badge 4 is bronze. Below are the minimum badge levels associated to point cutoffs equated to traditional letter grades:

<i>Points</i>	<i>G</i>	<i>S</i>	<i>B</i>	<i>X</i>
<b>70 pts</b>	15	0	0	0
<b>63 pts</b>	11	3	1	0
<b>56 pts</b>	7	5	2	1
<b>49 pts</b>	3	5	4	3
<b>42 pts</b>	1	4	5	5

**HOMEWORK (30 POINTS)** Homework be on the main concepts of the course and should challenge you. Homework assignments will be individual that you are proud of, both in terms of the statistics learned and in terms of presentation. The *Homework Guidelines*, posted on Canvas, are designed to help you achieve these goals.

There are 60 homework questions for the term given out in 10 batches of 6 questions each. Each batch will suggest questions for further practice. There are 2 reflective writing assignments will help you track your progress throughout course.

Homework will be graded using a version of the badge level system. With **3** – Gold, **2** – Silver, **1** – Bronze, and **0** – can't be assessed. Your grade is computed using your top 48 question scores. Below are the minimum badge levels associated to point cutoffs equated to traditional letter grades:

<i>Points</i>	<i>G</i>	<i>S</i>	<i>B</i>	<i>X</i>	
<b>30 pts</b>	48	0	0	0	IWA 1 & 2
<b>27 pts</b>	30	12	6	0	IWA 1 & 2
<b>24 pts</b>	24	14	8	2	IWA 1 or 2
<b>21 pts</b>	18	16	10	4	IWA 1 or 2
<b>18 pts</b>	12	18	12	6	

**GRADING NOTE** Higher levels can count for lower level totals, but not vice versa. For example, a silver level can count towards your bronze total but a silver level cannot count towards your gold total.

## 180 HOURS OF COURSEWORK

Over 15 weeks, you will spend a *minimum* of 180 hours on this course in keeping with the NEASC standard. You will be in class for 45 hours. Over the term, you will do about 28 hours of reading and preparation for class, spend about 70 hours on homework and writing assignments, and spend about 40 hours preparing for the batch challenges.

Last syllabus task: Share you favorite Brunonian spring activity or spring tradition.