

Statistics for Business and Economics

Dr. Ryan Safner

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ECMG 212
Rosenstock Trading Room
MW 10:50 AM-12:05 PM

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Hours: TuTh 3:30-5:00 PM

1 COURSE DESCRIPTION

“There are three kinds of lies: lies, damned lies, and statistics.” – Benjamin Disraeli, British P.M.
“The sexy jobs in the next ten years will be statisticians.” – Hal Varian, Chief Economist, Google

Statistics is the science of learning from data. Businesses, governments, academics, nonprofit organizations, consultants, and many other professions are using more data than ever. The rise of the internet and the ability for organizations to track many things about their users, known as “big data,” make statistical literacy and competency one of the most in-demand skills that most employers today are looking for.

This course is designed as an introduction to data and how it is collected, described, and used to make useful inferences about the world. I am an economist, not a business expert nor a mathematician. While we will be dealing with elementary statistical and probability theory, we will be keeping our eye towards applications in business and economics. If you want a more “pure” class in statistics or mathematics, they are offered by the department of mathematics. The formal prerequisites for this course are **MATH 120 or equivalent**. I assume that you have no background in statistics or probability (we will start from square one), but that you are *competent* in basic algebra and graphing skills (we may do a brief review as necessary).

I have three goals for everyone taking this course: (1) to understand and evaluate statistical and empirical claims; (2) to understand research design and hypothesis testing; (3) to gain experience working with, interpreting, and communicating real data. I am less concerned with forcing you to memorize and recite proofs of statistical estimator properties, and more concerned with the development of your intuitions and the ability to think critically as a businessperson, a social scientist, and a democratic citizen—although this will require you to demonstrate proficiency with some statistical and mathematical tools.

To these ends, in addition to lectures about statistical methods, you will be working on problem sets that use theory, as well as using Microsoft Excel to complete problem sets using data, and write a brief empirical paper using data. By the end, you should feel comfortable working with data and understanding the empirical claims of others. The best training is for you to learn by doing.

Fair warning: *Statistics, like any course intensive in math, may be hard.* I will do my best to make this class intuitive and helpful, if not interesting. If at any point you find yourself struggling in this course for any reason, please come see me. Do not suffer in silence! Coming to see me for help does not diminish my view of you, in fact I will hold you in *higher* regard for understanding your own needs and taking charge of your own learning. There are also a some fantastic resources on campus, such as the [Center for Academic Achievement and Retention \(CAAR\)](#) and the [Beneficial-Hodson Library](#).

In addition to Blackboard, you can find all course materials at ryansafner.com. This class has a private facebook group at <https://www.facebook.com/groups/1617761895185031/> where I encourage you to connect to ask questions, discuss the class, and get to know one another.

I reserve the right to modify this syllabus with proper advance warning.

2 COURSE MATERIALS

The following book is **required** and will be available from the campus bookstore.

1. OpenStax, (2014) *Introductory Statistics* OpenStax College, ISBN: 978-1938168208

This book is available free online as a PDF at the [OpenStax website](#). If you prefer a hard copy, it is available at the bookstore as well as [Amazon](#) for about \$34. I have no financial stake in requiring you to purchase this book.

Note that this book is a general introduction to Statistics, so for more business and economics oriented examples, I will draw from other resources.

You can also find a large amount of material and guides related to the topics we discuss in class on the internet (e.g. [Khan Academy for Statistics & Probability](#), googling the concept, etc), as well as help and documentation for Excel.

Throughout the course, I may post both required and supplemental (non-required) readings that enrich your understanding for each topic on Blackboard. Check Blackboard **frequently** for announcements and updates to assignments, readings, and grades.

Two other materials are **strongly recommended** but not necessarily required:

1. A graphing calculator (e.g. TI-83+)
2. A personal computer with Microsoft Excel

A high-powered calculator will be extremely useful for this course. I use a TI-83+, the same one since the early 2000s. Our textbook has guides for using the TI-83+ variants to solve many statistical problems. Calculator apps on smartphones and tablets, while they may help you for homework, may **not** be used on exams.

Lastly, we will make somewhat frequent use of Microsoft Excel spreadsheets in this course. While the Trading Room computers will be available to you during most normal business hours, I strongly recommend having Microsoft Excel on your own personal computers.

3 GRADING

Your final course grade is the weighted average of the following assignments, to be explained in further detail below:

Presentation	5%
Homework Average	15%
Project	20%
Exam 1	15%
Exam 2	15%
Final	30%

Grades for all assignments are based on the following traditional scale (in percentage terms):

	A	93-100	A-	90-92	
B+	87-89	B	83-86	B-	80-82
C+	77-79	C	73-76	C-	70-72
D+	67-69	D	63-66	D-	60-62
	F	0-59			

These grades are firm cutoffs, but I do round upwards (≥ 0.500) for *final course grades only*. In the event that the mean or median grade for an assignment is not to my satisfaction (typically lower than a 75), I reserve the right to fairly curve all grades at my discretion. An unfortunately necessary reminder: as an academic, I am *not* in the business of *giving* out grades, I merely report the grade that you *earn*. I will not alter any of your grades unless you provide a *convincing* argument that I am in error (which does happen from time to time).

Homeworks

There will be end-of-chapter problems from the textbook assigned for every lesson. They are due at the beginning of class *one week* after we finish a lesson (unless specified otherwise). The purpose of homework is not to test your understanding (that is what exams are for), but rather to develop it. The goal in grading homework is to reward the effort to understand, rather than immediate understanding itself. It is okay to make mistakes—sometimes you can learn a lot from them, provided you put in some thought and effort. In keeping with this, homework will be graded on the following scale:

- ✓ + (100%): complete homework mostly free of errors
- ✓ (85%): complete homework with some errors
- ✓ - (75%): incomplete homework and/or many errors
- o: homework not turned in

Some homework assignments may include a component on Microsoft Excel.

Exams

There will be three closed-book exams (two midterms and one comprehensive final at the college-appointed time), roughly one covering each major unit.

Project

You are required to write a short paper that uses statistics. The main purpose of this paper is to walk you through the process of collecting, analyzing, and presenting data to gain insight on a problem of interest. The most difficult part of this assignment is choosing a problem and collecting the data. I will discuss more about this paper at length in class, and briefly guide you through the craft of writing a good paper. I view this assignment as one of the primary demonstrations of your mastery of this class, and writing is a marketable skill you will need for any gainful employment. I strongly recommend starting early and discussing your topics with me, but this is not required.

Presentations

On the final week of class, we will hold a workshop for each of you to give a short presentation of your paper, and for everyone to provide comments and constructive criticism to help you improve and complete your paper.

No extra credit is available.

4 POLICIES & EXPECTATIONS

Attendance and Participation: I expect you to attend class and to come having already done the reading assigned for that day. I will remind you in class and possibly through Blackboard or email which readings I want you to read for the next class. You are all adults and I will treat you as such. I do not take attendance, nor do I grade formally for participation but I strongly recommend you attend class and participate for your sake and the sake of your classmates. If you are too distracted or are not prepared to learn, I suggest you stay home, where you can check Facebook more efficiently. I reserve the right to boost the final grades of students that I believe have made consistent, quality contributions above and beyond their peers in class conversations by up to 2.5 points.

Absences and Make-Ups: You generally do *not* need to let me know if you are unable to make class, *unless* it is on the day of an exam. It will however, be your responsibility to acquire the notes from a classmate for any missed classes. If you are unable to attend an exam for a legitimate reason (e.g. sports/club events, traveling, illness, family issues), please notify me at least *one week* in advance, and we will schedule a make-up exam date. If you are ill or otherwise unable to attend on the day of the exam, contact me ASAP to make arrangements. Failure to do so, including desperate attempts to make arrangements only *after* the absence will result in a grade of 0 and little sympathy. I reserve the right to re-weight other assignments for students who I believe are legitimately unable to complete a particular assignment.

Email Accounts: Students must monitor their Hood email accounts to receive important college information, including messages related to this class. Email is also the best means of contacting me. I will do my best to respond within 24 hours.

Office Hours: I am generally in my office Monday-Thursday during normal 'business hours.' You are always welcome to walk-in and chat about class, college, careers, or whatever you like. Please try to use the official office hours stated at the head of the syllabus if possible. If you

need to meet at a different time, I request that you send me an email or let me know after class so I know when to expect you. If you want to go over material from class, please have *specific* questions you want answered.

Enrollment: Students are responsible for verifying their enrollment in this class. The last day to add or drop this class **Tuesday, January 31**.

Honor Code: Hood College has an Academic Honor Code which requires all members of this community to maintain the highest standards of academic honesty and integrity. Cheating, plagiarism, lying, and stealing are all prohibited. All violations of the Honor Code are taken seriously, will be reported to appropriate authority, and may result in severe penalties, including expulsion from the college. See [here](#) for more detailed information.

Students With Disabilities: Hood College complies with the Americans with Disabilities Act of 1992. Students who are in need of special assistance/accommodation should contact me by the end of the first week of classes. Appropriate reasonable assistance/accommodation will be provided for such students.

5 CLASS SCHEDULE

The following schedule is a tentative outline of topics covered in the course. Expect to spend a week, on average, on each topic. The readings come from the textbook, along with scholarly journal articles that can be found on Blackboard under “Course Readings.” I may remove or post additional required readings, to be announced in advance.

Unit 1: Descriptive Statistics

1 SAMPLING AND DATA

Concepts Statistics, data, variables, probability, frequency, experimental design, sampling

Readings Ch.1

2 DESCRIPTIVE STATISTICS

Concepts Stem-and-leaf plots, line graphs, bar graphs, histograms, time series, box plots, mean, median, mode, skewness, variance, standard deviation, percentiles, outliers

Readings Ch. 2

EXAM 1

Unit 2: Probability

3 PROBABILITY

Concepts Probability, independence, replacement, addition rule, multiplication rule, contingency tables, venn diagrams, tree diagrams, conditional probability, Bayes’ rule

Readings Ch. 3

4 DISCRETE RANDOM VARIABLES

Concepts Random variable, probability density function (PDF), cumulative density function (CDF), expected value, binomial distribution, geometric distribution, hypergeometric distribution, Poisson distribution

Readings Ch. 4

5 CONTINUOUS RANDOM VARIABLES

Concepts Exponential distribution

Readings Ch. 5

EXAM 2

6 THE NORMAL DISTRIBUTION

Concepts Normal distribution, Standard normal distribution, Z-score, percentiles

Readings Ch. 6

7 THE CENTRAL LIMIT THEOREM

Concepts Central limit theorem (CLT), sampling distribution, standard error of the mean

Readings Ch. 7

Unit 3: Inferential Statistics

8 CONFIDENCE INTERVALS

Concepts Point estimate, confidence interval, confidence level, degrees of freedom (df), parameter, statistic, Student's t -distribution

Readings Ch. 8

9 HYPOTHESIS TESTING

Concepts Null hypothesis, alternative hypothesis, Type I error, Type II error, significance level (α) p -value

Readings Chs. 9-10

10 CORRELATION & LINEAR REGRESSION

Concepts Scatterplot, linear equation, line-of-best-fit, regression equation, covariance, correlation

Readings Ch. 12

FINAL EXAM