

# QUANTITATIVE METHODS 830:200:H2

SUMMER 2020

## Instructor

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Office Hours: Monday and Wednesday after class

## Course Description

This course is an algebra-based introduction to Statistics. You already know all the math you need to succeed in the course! Nothing more than addition, subtraction, multiplication and division; so, no need to worry.

While the mathematical tools will be nothing new, some of the *statistical concepts* that we will consider may be novel, or a bit counterintuitive. It will take some time for those concepts to sink in. That's normal, so do not worry about that either. Just do your best to keep up with the readings and the assignments, ask questions, and at some point, all the pieces of the puzzle will fall into place.

The course will cover the foundational principles of Classical Statistics (probability, sampling, regression), the most common hypothesis testing techniques (t-tests, analysis of variance, etc.) and will serve as an introduction to Bayesian Statistics and to the R statistical software. Because this is not a programming class, all the R code needed for the exercise will be provided. We will use the platform Datacamp to learn about the basics of R programming for Statistics.

We will follow the book very closely: again, it is very important that you keep up with the readings.

In fact, the core of the course is not so much the lecture but your own work engaging with the material. To learn, you need to read the textbook actively, asking questions and reflecting on statistics' concepts and core issue.

The readings are assigned ahead of class. I recommend that you take some time to read the physical book on your own, highlight, take notes, digest the material. If a passage is not clear, go back to it later and read it again. Take advantage of the fact that there is no commuting required and dedicate some extra time to daily reading. Once you have done all of the above, please log into the online platform Perusall and post your comments and questions. You may also reply to your classmates' comments and questions.

If there is one take home message from this class is that Statistics is not "those formulas in the book" but a live subject matter that is used and debated every day within our society.

## Logistics

This is a synchronous online course. Class lectures, homework, and exams are identical to the ones in the course taught in person in previous semesters, and so are the requirements to pass the class.

The class meets on Zoom:

<https://bit.ly/3eucXxe>

Meeting ID: 342 450 4695

Password: 237643

Find your local number:

<https://bit.ly/2NnWz5k>

DAY/TIMES: M, T, W, R 2:00 PM - 4:30 PM

Assignments and announcements will be posted on Sakai. Logging into Sakai, you can see all the previous announcements.

For questions of general interest about assignments, logistics, and anything related to the course please use Piazza (always on Sakai). For questions that concerns you personally please email me directly.

## Attendance

An online class presents its own set of challenges. While avoiding the commute is convenient, it's also easier to skip classes thinking that "nobody will notice" or that one can catch up watching the video recording at a later time. Unfortunately, too often that "later time" never comes and before not too long one risks falling by the wayside. To prevent this from happening, attendance is mandatory and active participation is required.

Because I know that following two and half hours of daily online lectures on Statistics is not easy, I will assign 20% of the grade to attendance. If you expect to miss one or two classes, please use the University absence reporting website <https://sims.rutgers.edu/ssra/> to indicate the date and reason for your absence. An email is automatically sent to me.

## Textbook

Required:

*Stats: Data and Models*, 4th

Edition De Veaux, Velleman,

Bock Pearson, 2016

ISBN-13: 9780321986498

The lectures will be based on this book. The text cover all the principles of Classical Statistics from a general point of view.

The third edition of *Stats: Data and Models* is also OK

Recommended:

*Introduction to Statistics and Data Analysis For the Behavioral Sciences*, 1st

Edition Robert S. Lockhart

W.H. Freeman and Company, 1997

ISBN-13: 978-0716729747

This is an excellent book that covers all the principles of Classical Statistics in a more conceptual way, in the context of psychological sciences.

## Lectures Schedule

Date	Topic	Book Chapters	Homework Due
<b>Week 1</b>			
Mon 7/6	1) Introduction - Data - Samples – Variables – Categorical Data	CH 1,2	
Tue 7/7	2) Quantitative data – Comparing distribution	CH 3, 4	
Wed 7/8	3) The normal model 1	CH 5	HW (CH 1,2,3)
Thu 7/9	4) The normal model 2 - Scatterplots - Using R	CH 6	
<b>Week 2</b>			
Mon 7/13	5) Linear regression 1	CH 7	
Tue 7/14	6) Linear regression 2 – Eugenics	CH 8	HW (CH 4,5,6)
Wed 7/15	7) Re-expression and randomness	CH 9,10	
Thu 7/16	8) Surveys and study design	CH 11,12	HW (CH 7,8,9,10)
<b>Week 3</b>			
Mon 7/20	9) Probability	CH 13,14	
Tue 7/21	10) Random variables - Probability models	CH 15,16	HW (CH 11,12,13,14)
Wed 7/22	Review		
Thu 7/23	MIDTERM		CH 1-14
<b>Week 4</b>			
Mon 7/27	11) Sampling Distributions and CI for proportions	CH 17,18	
Tue 7/28	12) Testing Hypotheses: proportions and means	CH 19,20	HW (CH 15,16)
Wed 8/29	13) Tests review - Comparing groups	CH 21,22	
Thu 8/30	14) Paired samples – Comparing counts	CH 23, 24	
<b>Week 5</b>			
Mon 8/3	16) Regression Inference / Eugenics	CH 25	
Tue 8/4	17) Analysis of Variance	CH 26,27	HW (CH 21,22,23,24)
Wed 8/5	18) Multiple Regression	CH 28,29	
Thu 8/6	19) Bayesian Statistics		HW (CH 25,26,27,28,29)
<b>Week 6</b>			
Mon 8/10	20) Extensions - Current Topics		HW (Bayesian Statistics)
Tue 8/11	Review		
Wed 8/12	FINAL EXAM		CH 15-29, Bayesian Statistics

## Equity

Academic and professional excellence can flourish only when each member of our community is assured an atmosphere of mutual respect. All members of the University community are responsible for the maintenance of an academic and work environment in which people are free to learn and work without fear of discrimination or discriminatory harassment.

## Homework

There will be different types of assignments:

- Readings (plus comments and questions on Perusall) are due on the evening before class
- Sakai submission of HW assignment (multiple choice), are due twice a week at 1:30PM before class. In addition to submitting the answers on Sakai, you should email me a screenshot of your own write-up of the homework.
- R assignments on Datacamp are due once a week

Collaboration in solving the homework assignments is allowed and encouraged. Late assignments are not accepted, unless in case of a serious illness or family emergency: arrangements must be made BEFORE the homework due date. Late homework cannot be accepted for any reason once the answer key is posted, usually one day after the assignment deadline.

## Exams

There will be one midterm and one final exam, both multiple-choice. The final is non-cumulative. A calculator and a cheat sheet are allowed for both the midterm and the final. The exams will have a conceptual part (definitions, principles, etc.) and a computational part. Except for the actual numbers, the structure and the process involved in solving the computational problems will be identical to those used in class. Make-up exams may be scheduled in case of a serious illness or family emergency: again, arrangements must be made BEFORE your exam date.

**IMPORTANT - GET READY NOW FOR TESTS**

Please take the Onboarding Quiz for ProctorTrack as soon as possible. This ensures that there is plenty of time to resolve technical issues well before it is time to use it for taking a test. Review the [online student guide](#) and take the Onboarding Quiz. You will need to be alone in a quiet room, sitting before a webcam, and have your student photo ID or a Driver's License at hand. You may need to turn off the Anti-Virus software on your computer. Please visit the [Support and Knowledge base](#) for more information.

## Tutoring

There will be tutoring available on Webex, offered by the Rutgers Learning Center, on Mondays and Wednesdays from 2pm to 6pm.

You may check the schedule online at the following link (see the bottom of the page, "Quant Meth in Psych"): [https://rlc.rutgers.edu/remote\\_tutoring](https://rlc.rutgers.edu/remote_tutoring)  
Webex link: [https://rutgers.webex.com/meet/echo-rlc\\_psych](https://rutgers.webex.com/meet/echo-rlc_psych)

## Classroom policies

I am asking all students to keep their camera on during lectures and to actively participating during class, by asking questions, giving a constructive contribution when called on and collaborating with classmates in solving exercises. I would like everybody to participate, so if after answering a question addressed to the class you happen to know the answer to the next question as well, please hold back a bit and give someone else the chance to respond.

## Grading

Homework: 25%, distributed as:

Readings

- Homework problems: 10%, multiple choice
- Datacamp and R: 10%
- Comments on the readings (Perusall): 5%

Attendance: 20%

Midterm: 20%

Final: 30%

Extra Credit: 5%

## Special Accommodations

Students requesting special accommodations must follow the procedures outlined at <https://ods.rutgers.edu/students/registration-form>

## How to get an A in this class

Pay attention to details! Don't miss lectures or assignments. Always treat your work as an opportunity to improve yourself and your performance. Take advantages of extra credit opportunities ("take care of the pennies, and the pounds will look after themselves"). Collaborate with other students and do not hesitate to ask for help.

Above all, do not disappear ("80% of success is showing up"). Stay engaged.

## Core Curriculum Learning Goals

This course has been certified as satisfying both Quantitative and Formal Reasoning Learning Outcome Goals (QQ and QR) of the SAS Core Curriculum. Specifically, students will be able to

- a) formulate, evaluate, and communicate conclusions and inferences from quantitative information (QQ),
- b) apply effective and efficient mathematical or other formal processes to reason and to solve problems.

## Academic integrity

Current Academic Integrity Policy: <http://academicintegrity.rutgers.edu/academic-integrity-policy/>