

STAT 303 A, Fall 2021: Experimental Design

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Class Meetings Mondays, Wednesdays, Fridays: 2:20 PM - 3:20 PM in Trexler 263

Office Hours Mondays, Wednesdays, Fridays: 1:10-2:10 PM in Trexler 270G or on Zoom. You can also schedule an appointment through email.

Course Information The objective of this course is to investigate techniques for designing effective and informative experiments. We will discuss statistical methods for analyzing data from various types of designs and determine in which circumstances each design is appropriate. In our discussion, we will encounter simple comparative designs, the analysis of variance, completely randomized designs, randomized block designs, factorial designs, fractional factorial designs, and Latin-square designs.

Intended Learning Outcomes By the end of this course, successful students will be able to:

- use statistical software to organize, describe, and screen data.
- understand how to select an appropriate experimental design for a given set of constraints and goals.
- articulate the importance and limitations of using data and statistical methods in decision making.
- advise scientists how to interpret their findings using statistical methods.
- express themselves clearly and effectively in writing the concepts and language of statistics.

Required Materials Textbook: *Design and Analysis of Experiments*; Douglas C. Montgomery; Wiley, 7th Edition; ISBN 978-0-470-12866-4
Technology: You will also need to have R and Rstudio on your personal computer.

Course Grades The following table lists the weights for the various forms of assessment for this class.

Assignments and Quizzes	30%
Tests (16% each)	48%
Final Exam	22%

A grade scale will be determined after final grades are computed, but will be no worse than the scale given below. Attendance and class participation will be considered when determining marginal grades.

B+ 87-89 C+ 77-79 D+ 67-69

A 93-100 B 83-86 C 73-76 D 63-66 F 0-59
A- 90-92 B- 80-82 C- 70-72 D- 60-62

Participation

The key to learning a topic in mathematics is participation. We will strive to have an active, rather than passive, classroom environment. This means that questions are welcome in class, and the instructor will ask for your help in completing problems presented in class. Depending on your learning style, you may prefer to see a topic in class, and then read the textbook, or perhaps read the textbook before class and then see it explained further in class; either way you prefer, *reading the textbook* and paying close attention will be key in your success.

Assignments and Quizzes

There will be regular homework in this class, though it may not be given, or due, on a daily basis. A detailed list of homework that is assigned for this class will always be available on Inquire, but it will be announced and discussed in class as well. Unless otherwise specified, you are highly encouraged to work with your classmates on the homework problems; discussing mathematics and statistics with each other is a highly valued skill by future employers! What you turn in to me, though, should be written on your own and not with others around.

There may also be written quizzes in this class. They may either be in-class quizzes or take-home quizzes. I may occasionally warn you about an upcoming quiz but you should be prepared to take a quiz on any given day. Staying current with the material and being active in class is a great way to avoid surprise quizzes!

Tests and Final

There will be three tests in this class along with a final exam. While the tests themselves are not designed to be cumulative, because of the cumulative nature of mathematics and its progression of material, mastery of previous material will be beneficial to success on future tests. Please take time to learn from your homework feedback and previous test feedback throughout this class. The instructor is always more than happy to discuss feedback in more detail.

Each test given will have an in-class component and a take-home component. Unless otherwise specified, the take-home component will be due at the time of the in-class portion of the test. More information about each test will be given as the date for those tests approaches. Unless possibly modified by weather closings and/or delays, the three in-class test days will be **Friday, September 24, Wednesday, November 3, and Wednesday, December 8**. Any deviation from this schedule will be announced in class, distributed through email, and corrected on a revised syllabus on Inquire.

The final exam is scheduled, per the Roanoke College Academic Calendar for block 4 classes, on Tuesday, December 14 from 2:00 PM to 5:00 PM.

MCSP Conversations

As you are aware, the MCSP Department offers a series of discussions that appeal to a broad range of interests related to these fields of study. These co-curricular sessions will engage the community to think about ongoing research, novel applications and other issues that face our discipline. You are invited to be involved with all of these meetings; however participation in at least two of these sessions is mandatory. After attending, you will submit a one page paper reflecting on the discussion. This should **not** simply be a regurgitation of the content, but rather a personal contemplation of the experience. These reaction papers will be counted as a quiz and must be submitted using our Inquire website.

Class Safety

The College has issued a mask mandate for the start of the semester that requires masks to be worn in indoor common spaces such as our classroom. You must wear a mask in this class. If you arrive without a mask, you will not be allowed to stay and may lose credit for attendance or in-class work. The Bookstore sells masks if you need to make a quick purchase. If the mandate is extended, you will be required to continue to wear a mask.

If you have a temperature of 100.4 or higher or other COVID symptoms, don't come to class. Call Health Services IMMEDIATELY. Do not come to class or go to any public area on campus.

In order for your absence to be excused, you must give Health Services permission to notify me that you have consulted them about COVID symptoms. If Health Services informs you that you should isolate and not attend class for multiple days, inform me so that we can make a plan to keep you current in the course. All absences caused by consultation with Health Services about coronavirus symptoms or isolation ordered by Health Services will be excused but you will need to do the work and graded assignments even if we extend a deadline for you.

Attendance & Make-Up Work

Attendance is critical to the understanding of the material in the course; it is both required and expected. Any absence that is not discussed with the instructor *prior* to the missed class is considered unexcused. When absent, excused or unexcused, you are responsible for all material covered in class. You will not be allowed to make up any work missed due to an unexcused absence. Late homework will be accepted within 48 hours of the due time and will be subject to a 50% penalty. Afterwards, late homework will be accepted for the purpose of providing you feedback only; credit will not be given for late homework beyond the 48 hours. Assignments and take-home portion of tests will have their own penalties for late work.

Study Room

The MCSP Study Room, Trexler 271, can be used by you and your friends to meet up so that you can work on homework together or prepare for tests. It is open virtually 24 hours a day, 7 days a week (very occasionally there are meetings in that room). Your student ID card should grant you access to Trexler Hall any time of day if the doors happen to be locked (use the card access point located by the first floor entrance facing the parking lot). Take advantage of this area and time, especially during weekdays when I am around (which is generally a lot)!

Community

Please feel free to become an active member of our department's community. Each of the three disciplines in our department has a student club and you should join! The Roanoke College Student Chapter of the Mathematical Association of America (or "Math Club" for short) meetings every other week, plays and learns about games and hosts evening events and the annual Pi-Day celebration! Membership in our Math Club also grants membership into the MAA itself; one of the premiere professional mathematical organizations in the world.

In addition, our department offers MCSP Tea every week so come by Trexler 271 to talk to and meet other students as well as chat with the MCSP faculty members in a casual setting! The time is yet to be determined and will be posted on fliers around Trexler Hall and also advertised in class.

Academic Integrity

Students are expected to adhere to the Academic Integrity policies of Roanoke College. All work submitted for a grade is to be your own work! No electronic devices can be used during any class or testing period (this includes cell phones; please silence or turn them **off** before class). Note that looking at or using your cell phone during a quiz is considered a violation of Academic Integrity regardless of your purpose or intent in doing so.

Course Work Load

At a bare minimum, this course expects you to spend at least 12 hours of work each week inside and outside of class.