

# **Graduate Seminar: Advanced Quantitative Methods** **(990402)**

**Spring Semester 2023**

**Instructor:**

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Office Hours: Thursdays, 2:00-4:00pm

**Course Times and Location:**

March 15<sup>th</sup> – June 7<sup>th</sup>, 2023

Wednesdays, 9:45am-12:30pm

Constructor University, South Hall, Seminar Room East

**Official Course Description:**

This course aims to provide an overview and understanding of some of the more commonly applied statistical techniques. It will cover methods for both continuous data as well as categorical data. The standard setting will be the supervised learning situation in which there is one target variable, the behavior of which is to be predicted by some other variables. We will briefly revise the essentials of confirmatory statistics, including hypothesis testing, significance and power, as well as the ideas behind data reduction, prediction and explanation. The course is 'advanced' in terms of concepts and methods, rather than statistical theory or algebra. The focus will be on real-world applications, discussing the assumptions, limitations and interpretations of a wide range of statistical techniques.

**Intended Learning Outcomes:**

By the end of this seminar, students should gain:

- familiarity with common multivariate statistical procedures;
- an ability to link theoretical concepts and empirical operationalization;
- an ability to conduct state-of-the-art statistical analyses using R;
- experience in replicating, understanding, and critically commenting on empirical studies in the field of international relations; and

- an ability to assess appropriateness of quantitative techniques for empirical studies in international relations.

### Course Organization:

The course is organized into lectures, tutorials, and occasional lab sessions. The **lectures** will cover the content relevant to the aims of the course and demonstrate how to carry out analytical techniques using R. The **tutorials** give you the chance to practice your new knowledge directly in R by completing specific analytical tasks in class. You will receive feedback on these tasks from the instructor. Online quizzes will also be available to help you test your understanding of the materials. Neither the analytical tasks nor the online quizzes will be graded, but they are intended to provide constant feedback on your progress.

Towards the end of the semester, the lectures and tutorials will be replaced with **lab sessions** (see session plan below). These are intended to offer you dedicated class time to work solely on your research project, while also having the opportunity to consult with the instructor if needed. For these lab sessions, you can choose to work wherever is most convenient – it does not necessarily need to be in the classroom or on Teams. However, the instructor will be available on Teams for consultation if needed.

Please see the session plan below for more details:

Session	Date and Time	Type	Location	Topic and Literature
Week 1, Sessions 1-2	Wednesday, March 15 <sup>th</sup> 9:45am-12:30pm	Lecture	South Hall, Seminar Room East	Introduction to the course and each other + Introduction to quantitative methods <i>Suggested Reading:</i> Field et al. Ch. 1
Week 2, Sessions 3-4	Wednesday, March 22 <sup>nd</sup> 9:45am-12:30pm	Lecture	South Hall, Seminar Room East	Fundamentals and assumptions of statistical modeling <i>Suggested Readings:</i> Field et al. Ch. 2
Week 3, Sessions 5-6	Wednesday, March 29 <sup>th</sup> 9:45am-12:30pm	Lecture + Tutorial	South Hall, Seminar Room East	Introduction to R <i>Suggested Reading:</i> Field et al. Ch. 3
<b>Spring Break – No Class on April 5<sup>th</sup></b>				
Week 4, Sessions 7-8	Wednesday, April 12 <sup>th</sup> 9:45am-12:30pm	Tutorial	South Hall, Seminar Room East	Exploring assumptions + Exploring data graphically <i>Suggested Readings:</i> Field et al. 4 and 5

Week 5, Sessions 9-10	Wednesday, April 19 <sup>th</sup> 9:45am-12:30pm	Lecture + Tutorial	South Hall, Seminar Room East	Comparing two means <i>Suggested Reading:</i> Field et al. Ch. 9
Week 6, Sessions 11-12	Wednesday, April 26 <sup>th</sup> 9:45am-12:30pm	Exam + Lecture	South Hall, Seminar Room East	<b>Exam 1</b> Comparing several means <i>Suggested Reading:</i> Field et al. Ch. 10 Hinton (2004). Chapter 10 Hinton (2004). Chapter 11
Week 7, Sessions 13-14	Wednesday, May 3 <sup>rd</sup> 9:45am-12:30pm	Lecture + Tutorial	South Hall, Seminar Room East	Correlation <i>Suggested Reading:</i> Field et al. Ch. 6
Week 8, Sessions 15-16	Wednesday, May 10 <sup>th</sup> 9:45am-12:30pm	Lecture + Tutorial	South Hall, Seminar Room East	Regression I <i>Suggested Reading:</i> Field et al. Ch. 7
Week 9, Sessions 17-18	Wednesday, May 17 <sup>th</sup> 9:45am-12:30pm	Lecture + Tutorial	South Hall, Seminar Room East	Regression II <i>Suggested Reading:</i> Field et al. Ch. 7
Week 10, Sessions 19-20	Wednesday, May 24 <sup>th</sup> 9:45am-12:30pm	Exam + Lab	South Hall, Seminar Room East	<b>Exam 2</b> Group Work + Instructor Consultation
Week 11, Sessions 21-22	Wednesday, May 31 <sup>st</sup> 9:45am-12:30pm	Lab	Choose your own location	Group Work + Instructor Consultation (over Teams)
Week 12, Session 23-24	Wednesday, June 7 <sup>th</sup> 9:45am-12:30pm	Lecture	South Hall, Seminar Room East	Research Project Presentations
<b>Research Project Presentation slides due by Wednesday, June 7<sup>th</sup> at 9:00am</b> <b>Research Project Report due by Friday, June 28<sup>th</sup> at 12:00pm (noon)</b>				

### Assessment for the 9 CP Version:

The assessment in this version of the course consists of three components: (1) Two short exams; (2) a Research Project Presentation; and (3) a Research Project Report.

*Two short in-class exams (25%)*

- Format: The exams will be open-book and multiple choice. You can make use of any of the materials from the course (e.g., slides, notes, readings) in order to complete the exams.
- Aims: The exams will assess the content of weeks 1 to 5 (Exam 1) and the content of weeks 6 to 9 (Exam 2)
- Submit: Exam 1 will take place during Session 11 in Week 6 (**Wednesday, April 26<sup>th</sup>**). Exam 2 will take place during Session 19 in Week 10 (**Wednesday, May 24<sup>th</sup>**).

*Research project presentation (25%)*

- Format: Students will work in groups of three of your own selection.
- Aims: Work on one research project per group using R. Design a research question, search for relevant information in the dataset. Operationalize one dependent variable, operationalize independent variables, provide descriptive statistics (e.g., measures of central tendency, measures of dispersion), and provide graphics (e.g., histograms, box plots) concerning the descriptive statistics. Decide on an appropriate statistical analysis (e.g., ANOVA, OLS, logistic regression). Prepare the data and variables for the statistical analysis and run the analysis in R. Provide outputs and graphics concerning the statistical analysis. Report and discuss findings.
- Present: Prepare a 12-minute presentation using PowerPoint or a similar presentation software that demonstrates your skills related to: (1) managing data, (2) analyzing data, and (3) interpreting and reporting results. Be prepared to answer questions from the instructor and classmates about your research project. Presentations will take place in class on June 7<sup>th</sup>.
- Submit: Please submit the slides from your presentation in pdf form. These are due using the Assignments feature of Teams prior to the final class session. There are not a suggested number of slides, but they should be appropriate for a 12-minute presentation. Please note that the submission of slides without a presentation will not be considered.
- Evaluation: This is a group achievement, with all group members receiving the same grade. The quality of the slides, oral presentation, and ensuing discussion will be considered for the grade.
- Due: **Wednesday, June 7<sup>th</sup> at 9:00am** via Assignments on Teams.

*Research Project Report (50%)*

- Format: Students will work with the same groups of three as above, or can instead choose to work individually. You can decide whether you will work as a group or as an individual until the final submission date.
- Aims: This is a continuation of the work you did for your research project presentation, but now translated into the format of a typical empirical paper: Introduction, Methods, Results, Discussion, and References. Please make use of the APA-style template provided for more information on what types of information go where, how to report results, and how to format the report according to APA style guidelines.
- Submit: For a group report, please submit a report of approximately 1,500 words per person. For an individual report, please submit approximately 2,500 total. Please do your best to be

both comprehensive and concise, and not exceed the word limit. These are due as a Word or pdf document via Turnitin.

- **Evaluation:** For those choosing to work in groups, it is a group achievement, with all group members receiving the same grade. Those working individually will receive an individual grade. The evaluation will consider the quality of each of the section of the report, as well as the appropriateness and accuracy of both the statistical analysis carried out and its interpretation.
- **Due: Wednesday, June 28<sup>th</sup> at 12:00pm (noon)** via Turnitin.
  - Turnitin is an online software that allows you to upload your report and for me to provide electronic feedback. It also checks the level of similarity to other texts that exist in its repository, online, and in publication databases (i.e., plagiarism).
  - Your “Similarity Score” will be available about an hour or so after you upload the report. I would recommend allowing enough time to upload and check your Similarity Score. You can revise and resubmit as many times prior to the deadline as you wish.
  - You can familiarize yourself with the software here if you wish: <https://help.turnitin.com/feedback-studio/turnitin-website/student/student-category.htm>
  - Whichever group member is responsible for submitting the report should create a Turnitin account (<https://www.turnitin.com/>) and register for our “classroom” using the following information:
    - **Class ID:** 38050144
    - **Enrollment Key:** MAIR\_AQtM23

### **Assessment for the 6 CP Version:**

The assessment in this version of the course consists of two components: (1) Two short exams; and (2) a Research Project Presentation.

#### *Two short in-class exams (50%)*

- **Format:** The exams will be open-book and multiple choice. You can make use of any of the materials from the course (e.g., slides, notes, readings) in order to complete the exams.
- **Aims:** The exams will assess the content of weeks 1 to 5 (Exam 1) and the content of weeks 6 to 9 (Exam 2)
- **Submit:** Exam 1 will take place during Session 11 in Week 6 (**Wednesday, April 26<sup>th</sup>**). Exam 2 will take place during Session 19 in Week 10 (**Wednesday, May 24<sup>th</sup>**).

#### *Research project presentation (50%)*

- **Format:** Students will work in groups of three of your own selection.
- **Aims:** Work on one dataset per group using R. Design a research question, search for relevant information in the dataset. Operationalize one dependent variable, operationalize independent variables, provide descriptive statistics (e.g., measures of central tendency, measures of dispersion), and provide graphics (e.g., histograms, box plots) concerning the descriptive

statistics. Decide on an appropriate statistical analysis (e.g., ANOVA, OLS, logistic regression). Prepare the data and variables for the statistical analysis and run the analysis in R. Provide outputs and graphics concerning the statistical analysis. Report and discuss findings.

- **Present:** Prepare a 12-minute presentation using PowerPoint or a similar presentation software that demonstrates your skills related to: (1) managing data, (2) analyzing data, and (3) interpreting and reporting results. Be prepared to answer questions from the instructor and classmates about your research project. Presentations will take place in class on June 3rd.
- **Submit:** Please submit the slides from your presentation in PDF form. These are due using the Assignments feature of Teams prior to the final class session. There are not a suggested number of slides, but they should be appropriate for a 12-minute presentation. Please note that the submission of slides without a presentation will not be considered.
- **Evaluation:** This is a group achievement, with all group members receiving the same grade. The quality of the slides, oral presentation, and ensuing discussion will be considered for the grade.
- **Due: Wednesday, June 7<sup>th</sup> at 9:00am** via Assignments on Teams.

### **How to Do Well in the Course:**

This course covers a lot of information in a relatively short time, with the goal of allowing you to gain practical skills related to advanced quantitative methods. A variety of materials, resources, and learning formats will be offered to help you make the most of the course. It is expected that you take an active role in your learning by preparing the materials in advance, thinking critically about the tasks to be done, and participating in class discussions.

In order to practice these skills related to the course, you have the opportunity to work in groups of three on conducting out a small research project together. Group work can sometimes be a challenge, but being able to collaborate, bounce ideas off each other, and share the workload will be to your advantage. A private group channel will be created for each group to help you structure your work so that it is fair and productive, and to ease communication both with each other and with me.

### **Course Materials:**

The course is organized primarily using MS Teams. You will find all materials, including the syllabus, slides, quizzes, suggested readings and tasks organized according to session channels. All relevant announcements and information will be shared via Teams.

This course does not have required readings, but there are suggested readings for lecture sessions which are recommended for your benefit and understanding. Please refer to the session plan for exact information. The suggested readings will be posted to their respective sessions on Teams. The readings come from the following book, which is also on reserve at the Constructor University library:

Field, A., Miles, J., & Field, Z. (2012). *Discovering statistics using R*. Thousand Oaks, CA: Sage.

### **Course Equipment and Software:**

Please make sure you have a laptop with you during every class session. Please make sure you have MS Teams installed since it will be where the entire course is organized and stored. You will be working with R software throughout the course, but we will discuss how to install this in Week 3 of the course.

For those submitting a Research Project Written Report, it must be submitted via Turnitin, a software that checks for possible plagiarism. At least one person in your group is responsible for registering for the Turnitin classroom and ensuring that Turnitin is set-up and functioning properly. In order to avoid last minute technical problems, make sure to submit the Research Project Written Report well in advance of the deadlines.

### **Course Communication:**

You are always welcome to send me an email or a chat message via Teams if you have any questions, and I will do my best to answer in a timely manner (Monday through Friday, during normal working hours). But please consider the following questions before doing so:

- Have you included your name and which course you have a question about?
- Have you been specific about the question you are asking?
- Have you double-checked to make sure that the answer to your question is not on the syllabus or Teams?