

CARLETON UNIVERSITY
DEPARTMENT OF SOCIOLOGY AND ANTHROPOLOGY

SOCI 5104 W
WINTER 2026
ADVANCED MULTIVARIATE ANALYSIS

Instructor: Dr. Rania Tfaily

Office Hours: Wednesdays 1 – 2 pm or by appointment

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Brightspace course page link: <https://brightspace.carleton.ca/d2l/home/367673>

Method of Delivery: In-person on Thursdays 11:35 am – 2:25 pm

In this course, you are expected to learn from your texts, your teacher and from one another. This requires striving towards understanding each other, but it does not imply striving towards finding agreement. Our class will be racially, religiously, politically, culturally, generationally, and economically diverse. We will be of different gender identifications and sexual orientations and our lived experiences and reactions to the course material will reflect this diversity. Sharing our perspectives and interpretations on the course material will enhance everyone's learning experience and you are encouraged to openly express any disagreements with the authors you will read, with your fellow classmates, or with the Professor in the Brightspace discussion forum that is available for this course. However, you are expected to conduct yourself in such a way that shows the utmost respect to others who may – or may not – share your views.

Carleton University acknowledges the location of its campus on the traditional, unceded territories of the Algonquin nation. In doing so, Carleton acknowledges it has a responsibility to the Algonquin people and a responsibility to adhere to Algonquin cultural protocols.

Course Description and Objectives:

In this course, we will learn about key statistical techniques commonly used in social sciences, including multilevel models and logistic models. We will discuss when and how to apply these methods, the assumptions underlying each approach, and how to interpret the results. We will assess and critique selected journal articles that employ these statistical techniques. In addition, the course includes an applied component in which we use the statistical software *Stata* to analyze survey data and estimate various models. Stata is available through Carleton University. To download Stata SE on your laptop, see <https://i.carleton.ca/its-software/stata-se/> and follow the instructions. Please bring your laptop to each class.

Learning Outcomes:

After completing this course, you are expected to be able to:

- Identify when to apply various multilevel models and logistic models
- Use the software *Stata* to analyze survey data

- Estimate various multilevel models and interpret the results
- Critically assess journal articles that employ multilevel models
- Estimate various types of logistic regression models and interpret the results
- Critically assess journal articles that use logistic models
- Write an empirical research paper using one of the statistical techniques covered in the course

Suggested Textbooks:

- Rabe-Hesketh, Sophie, and Andres Skrondal. 2022. *Multilevel and Longitudinal Modeling Using Stata, Volume I: Continuous Responses*. College Station, Texas: Stata Press. (Print: USD 82; eBook: USD 67)
- Long, J. Scott, and Jeremy Freese. 2014. *Regression Models for Categorical Dependent Variables Using Stata*. College Station, Texas: Stata Press. (eBook: USD 58).

Used copies of the textbooks are acceptable. Additional required readings are available through the Carleton University Library website.

Course Requirements & Methods of Evaluation:

It is important that you attend every class, regularly review the lecture notes, and complete the *Stata* exercises. Be sure to work on the assignments and research project early and consistently. I encourage you to ask questions in class or to meet with me, particularly if you are having difficulty with the content.

The due dates and grade distributions for this course are as follows:

• Class participation & article critiques (ongoing)	10%
• Assignment 1 (due Feb 12)	20%
• Research proposal (due March 5)	10%
• Presentation (due March 26)	5%
• Assignment 2 (due April 6)	20%
• Take-home research paper (due April 23)	35%

Class participation and article critiques: Class attendance and participation are critical for understanding statistical analysis. Every student is expected to participate in class discussions and critiques of journal articles. We will evaluate and critique a couple of journal articles that employ statistical techniques discussed in this course. You are expected to do a thorough reading and assessment of each (e.g., whether the paper adequately addressed the research question(s); whether the conclusions are aligned with the evidence presented; whether the author(s) explored alternative explanations; and whether the author(s) acknowledged any relevant limitations in the data and statistical techniques used).

Assignments: There are two assignments in this course; each is worth 20% of the final grade. The assignments will be available on Brightspace and will involve data analysis and interpretation using *Stata* with assigned datasets.

Research proposal and research paper: You are required to write an empirical research paper using a suitable dataset and applying multilevel and/or logistic models. The first step is to submit a research proposal specifying your topic, providing a brief literature review, and identifying your research questions, hypotheses, dataset, variables, and methods. Your project must be original (i.e., it is not merely a replication of existing work) and should be based on an interesting and doable research questions and a suitable dataset.

You will then develop this proposal into an empirical research paper by conducting statistical analysis and reporting and discussing the findings. The final paper should be approximately 15 double-spaced pages (excluding tables, figures, and references) and must include the following sections: abstract, introduction and research question(s); literature review; data, methods and hypotheses; results; discussion and conclusions; references, tables, and figures.

Presentation: You are expected to give a conference-like presentation based on your research paper. The presentation should be approximately 10 minutes long and provide an overview of your topic, with a focus on your research questions, methods, preliminary findings, and conclusions. The main objective of the presentation is to receive constructive feedback from me and your peers before submitting the final paper.

Course Policies:

Submission procedures: The assignments, research proposal, and research paper must be typed and submitted via Brightspace. Grading Rubrics will be used to evaluate class participation and article critiques, assignments, research proposal, research paper, and presentation.

Extensions: Requests for extensions or academic consideration must be discussed with me before the due date.

Late penalty: Late submissions will incur a penalty of 2.5% per day, unless the student has provided a valid explanation prior to the due date or has been granted an extension.

Collaboration and group work: All work in this course must be completed individually. Students may collaborate to clarify concepts or seek guidance, but all submitted work must reflect their own independent effort and understanding.

Grade appeals process: For grade appeals, please note the following:
<https://carleton.ca/registrar/appeal-of-grade/>

Reuse of previously submitted work: You may not submit a research proposal or research paper that was previously completed for another course. However, you may use a dataset that you have previously worked with.

Use of generative AI tools: The use of generative artificial intelligence tools to write any part of the assignments, research proposal or research paper is strictly prohibited. The use of such tools to create or generate content constitutes a violation of academic integrity standards. Submitted work must reflect your own ideas and your understanding of the course content. You may use

tools such as Grammarly or similar platforms to check and correct spelling and grammatical errors and/or improve the clarity of your sentences.

If you would like to access additional resources to better understand concepts and statistical models, I strongly recommend making use of the [Stata YouTube channel](#) and other similar resources.

Citation Style: The Chicago author-date citation style (17th edition) is to be used in the assignments and papers of this course. For more information, please see: https://www.chicagomanualofstyle.org/tools_citationguide/citation-guide-2.html. Although the citation style does not require page numbers except for direct quotations, you are required to include relevant page number(s) whenever citing sources in the assignments, presentations or paper.

Additional Information

In accordance with the Carleton University Undergraduate Calendar Regulations, the letter grades assigned in this course will have the following percentage equivalents:

A+ = 90-100	B+ = 77-79	C+ = 67-69	D+ = 57-59
A = 85-89	B = 73-76	C = 63-66	D = 53-56
A - = 80-84	B - = 70-72	C - = 60-62	D - = 50-52
F = Below 50	WDN = Withdrawn from the course		DEF = Deferred

Academic Regulations, Accommodations, Plagiarism, Etc.

University rules regarding registration, withdrawal, appealing marks, and most anything else you might need to know can be found on the university's website, here:

<https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/>

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes, including information about the Academic Consideration Policy for Students in Medical and Other Extenuating Circumstances, are outlined on the Academic Accommodations website (<https://students.carleton.ca/course-outline/>). For an accommodation request, the processes are as follows:

Academic Accommodations for Students with Disabilities

The Paul Menton Centre for Students with Disabilities (PMC: <https://carleton.ca/PMC/>) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at **613-520-6608 or pmc@carleton.ca** for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send your ***Letter of Accommodation*** at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (*if applicable*).

*The deadline for contacting the Paul Menton Centre regarding accommodation for February/March examinations is **February 1, 2026** and **March 15, 2026** for April examinations.

For Religious Obligations:

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: www.carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

For Pregnancy:

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: www.carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

For Survivors of Sexual Violence:

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: www.carleton.ca/sexual-violence-support

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

Plagiarism

Plagiarism is the passing off of someone else's work as your own and is a serious academic offence. For the details of what constitutes plagiarism, the potential penalties and the procedures refer to the section on Instructional Offences in the Undergraduate Calendar. Students are expected to familiarize themselves with and follow the Carleton University Student Academic Integrity Policy (See <https://carleton.ca/registrar/academic-integrity/>). The Policy is strictly enforced and is binding on all students. Academic dishonesty in any form will not be tolerated. Students who infringe the Policy may be subject to one of several penalties.

What are the Penalties for Plagiarism?

A student found to have plagiarized an assignment may be subject to one of several penalties including but not limited to: a grade of zero, a failure or a reduced grade for the piece of academic work; reduction of final grade in the course; completion of a remediation process; resubmission of academic work; withdrawal from course(s); suspension from a program of study; a letter of reprimand.

What are the Procedures?

All allegations of plagiarism are reported to the faculty of Dean of FASS and Management. Documentation is prepared by instructors and departmental chairs. The Dean writes to the student and the University Ombudsperson about the alleged plagiarism. The Dean reviews the allegation. If it is not resolved at this level, then it is referred to a tribunal appointed by the Senate.

Statement on Student Mental Health:

“As a student you may experience a range of mental health challenges that significantly impact your academic success and overall well-being. If you need help, please speak to someone. There are numerous resources available both on- and off-campus to support you. For more information, please consult [https://wellness.carleton.ca/”](https://wellness.carleton.ca/)

Emergency Resources (on and off campus)

- Crisis/Urgent Counselling Support: 613-520-6674 (Mon-Fri, 8:30-4:30)
- Suicide Crisis Helpline: call or text 9-8-8, 24 hours a day, 7 days a week.
- For immediate danger or urgent medical support: call 9-1-1

Carleton Resources

- Mental Health and Wellbeing: <https://carleton.ca/wellness/>
- Health & Counselling Services: <https://carleton.ca/health/>
- Paul Menton Centre: <https://carleton.ca/pmc/>
- Academic Advising Centre (AAC): <https://carleton.ca/academicadvising/>
- Centre for Student Academic Support (CSAS): <https://carleton.ca/csas/>
- Equity & Inclusivity Communities: <https://carleton.ca/equity/>

Off Campus Resources

- Distress Centre of Ottawa and Region: call 613-238-3311, text 343-306-5550, or connect online at <https://www.dccottawa.on.ca/>
- Mental Health Crisis Service: call 613-722-6914 or toll-free 1-866-996-0991, or connect online at <http://www.crisisline.ca/>
- Good2Talk: call 1-866-925-5454 or connect online at <https://good2talk.ca/>
- The Walk-In Counselling Clinic: for online or on-site service <https://walkincounselling.com>

Important Information:

- Student or professor materials created for this course (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s).
- Students must always retain a hard copy of all work that is submitted.
- Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean.

- Carleton University is committed to protecting the privacy of those who study or work here (currently and formerly). To that end, Carleton's Privacy Office seeks to encourage the implementation of the privacy provisions of Ontario's *Freedom of Information and Protection of Privacy Act* (FIPPA) within the university.
- In accordance with FIPPA, please ensure all communication with staff/faculty is via your Carleton email account. To get your Carleton Email you will need to activate your [MyCarletonOne account](#) through Carleton Central. Once you have activated your MyCarletonOne account, log into the [MyCarleton Portal](#).
- Please note that you will be able to link your MyCarletonOne account to other non-MyCarletonOne accounts and receive emails from us. However, for us to respond to your emails, we need to see your full name, CU ID, and the email must be written from your valid MyCarletonOne address. Therefore, it would be easier to respond to your inquiries if you would send all email from your connect account. If you do not have or have yet to activate this account, you may wish to do so by visiting <https://students.carleton.ca/>.

Course Schedule and Reading List

January 8 – Introduction & Review

January 15 – Introduction to Multilevel Models
Rabe-Hesketh and Skrondal, chapter 1

January 22 – Random Intercept Multilevel Models
Rabe-Hesketh and Skrondal, chapter 2

January 29 – Random Intercept Multilevel Models
Rabe-Hesketh and Skrondal, chapter 3

February 5 – Random Coefficient Multilevel Models
Rabe-Hesketh and Skrondal, chapter 4

February 12 – Article Critique & Models for Panel Data
Rabe-Hesketh and Skrondal, chapter 5

February 19 – No Class, Winter Break

February 26 – Models for Binary Outcomes
Long and Freese, chapter 5

March 5 – Models for Binary Outcomes
Long and Freese, chapter 6

March 12 – Models for Binary Outcomes
Long and Freese, chapter 3, 4

March 19 – Models for Ordinal Outcomes
Long and Freese, chapter 7

March 26 – Presentations & Article Critique

April 2 – Models for Nominal Outcomes & (if time permits) Missing Data
Long and Freese, chapter 8

WINTER TERM 2026 – Important Dates and Deadlines

Date	Activity
WINTER TERM 2026	
December 29, 2025	Deadline for course outlines to be made available to students registered in full winter and early winter term courses.
January 5, 2026	University reopens.
	Winter term begins. Full winter and early winter classes begin.
January 9, 2026	Last day for registration and course changes (including auditing) in early winter courses.
January 16, 2026	Last day for registration and course changes (including auditing) in full winter and late winter courses.
	Last day to withdraw from early winter courses with a full fee adjustment.
	Graduate students who have not electronically submitted their final thesis copy to Graduate Studies will not be eligible to graduate in winter 2026 and must register for the winter 2026 term.
January 23-25, January 30-February 1, 2026	Full fall and late fall term deferred final examinations will be held.
January 31, 2026	Last day to withdraw from full winter courses and the winter portion of fall/winter courses with a full fee adjustment.
February 1, 2026	Last day for academic withdrawal from early winter courses.
	Last day to request Formal Examination Accommodations for Feb/Mar final examinations from the Paul Menton Centre for Students with Disabilities. Note that it may not be possible to fulfil accommodation requests received after the specified deadlines.
February 6, 2026	Last day for summative tests or examinations, or formative tests or examinations totaling more than 15% of the final grade, in early winter undergraduate courses, before the official Feb/Mar final examination period

Date	Activity
<p>(see examination regulations in the Academic Regulations of the University section of the Undergraduate Calendar/General Regulations of the Graduate Calendar).</p>	
February 13, 2026	Last day of early winter classes.
	<p>Last day for final take-home examinations to be assigned in early winter courses, with the exception of those conforming to the examination regulations in the Academic Regulations of the University section of the Undergraduate Calendar/General Regulations of the Graduate Calendar.</p>
<p>Last day that can be specified by an instructor as a due date for term work for early winter courses.</p>	
	April examination schedule available online.
February 16, 2026	Statutory holiday. University closed.
	<p>Deadline for course outlines to be made available to students registered in late winter courses.</p>
February 16-20, 2026	Winter break, no classes.
February 21-22, February 28-March 1, 2026	Final examinations in early winter undergraduate courses will be held.
February 23, 2026	Late winter classes begin.
February 27, 2026	Last day for registration and course changes (including auditing) in late winter courses.
March 1, 2026	<p>Last day for receipt of applications for admission to an undergraduate degree program for the fall/winter session from applicants whose documents originate outside Canada or the United States.</p>
	Last day for receipt of applications to Bachelor of Architecture, Bachelor of Industrial Design, Bachelor of Information Technology (Interactive Multimedia

Date	Activity
<p>and Design), Bachelor of Music, Bachelor of Science in Nursing and Bachelor of Social Work degree programs for the fall/winter session.</p>	
	<p>Last day for receipt of applications for admission from candidates who wish to be guaranteed consideration for financial assistance (including Carleton fellowships, scholarships and teaching assistantships) administered by Carleton University. Candidates whose applications are received after the March 1 deadline may be considered for the award of a fellowship, scholarship or teaching assistantship (Graduate students only).</p>
March 6, 2026	Last day to withdraw from late winter term courses with a full fee adjustment.
March 13-15, 2026	Early winter undergraduate deferred final examinations will be held.
March 15, 2026	<p>Last day for academic withdrawal from full winter, late winter, and fall/winter courses.</p>
	<p>Last day to request Formal Examination Accommodations for April full winter, late winter, and fall/winter final examinations from the Paul Menton Centre for Students with Disabilities. Note that it may not be possible to fulfil accommodation requests received after the specified deadlines.</p>
March 25, 2026	<p>Last day for summative tests or examinations, or formative tests or examinations totaling more than 15% of the final grade, in full winter term or fall/winter undergraduate courses, before the official April final examination period (see examination regulations in the Academic Regulations of the University section of the Undergraduate Calendar/General Regulations of the Graduate Calendar).</p>
April 1, 2026	<p>Last day for graduate students to submit their supervisor-approved thesis, in examinable form to the department.</p>
	<p>Last day for receipt of applications from potential spring (June) graduates.</p>
	<p>Last day for summative tests or examinations, or formative tests or examinations totaling more than 15% of the final grade, in late winter term undergraduate courses, before the official final examination period (see examination regulations in the Academic Regulations of the University section of the Undergraduate Calendar/General Regulations of the Graduate Calendar).</p>
April 3, 2026	Statutory holiday. University closed.

Date	Activity
April 8, 2026	Winter term ends.
	Classes follow a Friday schedule.
	Last day of full winter, late winter, and fall/winter classes.
	Last day for final take-home examinations to be assigned, with the exception of those conforming to the examination regulations in the Academic Regulations of the University section of the Undergraduate Calendar/General Regulations of the Graduate Calendar.
	Last day that can be specified by an instructor as a due date for term work for full winter, late winter, and fall/winter courses.
April 9-10, 2026	No classes or examinations take place.
April 11-23, 2026	Final examinations in full winter, late winter, and fall/winter courses will be held. Examinations are normally held all seven days of the week.
April 23, 2026	All final take-home examinations are due on this day, with the exception of those conforming to the examination regulations in the Academic Regulations of the University section of the Undergraduate Calendar/General Regulations of the Graduate Calendar.
May 1, 2026	Last day for receipt of applications for undergraduate internal degree transfers to allow for registration for the summer session.
May 15-27, 2026	Full winter, late winter term, and fall/winter deferred final examinations will be held.
June 1, 2026	Last day for receipt of applications for admission to an undergraduate program for the fall/winter session except for applications due March 1.
June 15, 2026	Last day for receipt of applications for undergraduate degree program transfers for the fall term.