

PSYC70 Syllabus (Summer 2020)

George S. Cree

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PSYC70: Advanced Research Methods

University of Toronto Scarborough
Summer Term, 2020

Introduction

Instructor: Prof. George S. Cree
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About Your Instructor

Dr. George Cree is an Associate Professor in the Department of Psychology at UTSC. He joined the department in 2003, and was Chair of the department from 2012-2018. He studies semantic memory with expertise in neural network models of word meaning computation. More generally, he is interested in knowledge representation, neural network modeling of cognition, cognitive science, and artificial intelligence. In line with this course, he is interested in how we can use computers to improve and enhance scientific communication and process, and in how we can use what we know about human cognition to improve scientific and statistical reasoning.

Learning Goals

This course is designed to transition you from being a **consumer** of psychological research to a **producer** of original psychological research findings. To accomplish this you will be introduced to a number of new skills. First, you will engage with readings, lectures, and exercises designed to improve your scientific and statistical thinking. You will learn about the cognitive biases and heuristics that influence all human thinking, and how they can be best avoided when working as a scientist. You will also be introduced to R, RStudio, and R Markdown, which you will learn are excellent tools for scientists of all stripes that help produce reproducible workflows and outputs. By the end of this course you will be ready to undertake a lab based course in the sub-area of psychology and/or neuroscience that most interests you (e.g., PSYC70 series), will be partially prepared to conduct an independent study research course (e.g., PSYC90 or PSYD98), and will be well

on your way to being an independent scientist who uses, and understands the importance and necessity of, modern, reproducible methods.

Course Content

Background Reading

There is no textbook required with this course. All readings will be provided as .pdf files available on Quercus, or as links to primary source articles that can be accessed through the University of Toronto library system.

If you are interested in a textbook that covers material similar to the content we will be covering, and ties the content together with one coherent voice, (and is Canadian to boot!), then I recommend:

Kline, R. B. (2019). *Becoming a behavioral science researcher: A guide to producing research that matters*. 2nd Ed. Guilford Press.

Topics

The lessons for each week will comprise a mixture of readings, online lectures, online screen captures, and R worksheets. You will find a full and up-to-date listing of these materials for each week in the weekly modules available on Quercus. The material listed below is to provide an outline of the topics to be covered, and is subject to change based on how the course progresses. Always check Quercus for the most up-to-date information.

Week 01: May 11-17, 2020

- Lecture: Introduction to the Course
- Reading: Engber, D. (2017). Daryl Bem proved ESP is real. Slate.
- Reading: Open Science Collaboration (2015). Research Summary of: Estimating the reproducibility of psychological science. *Science* 349, aac4716. p. 9. DOI: 10.1126/science.aac4716 (Just read the 1 page summary on the website.)
- Reading: Smaldino, P. (2019). Better methods can't make up for mediocre theory. *Nature*, 575(7781), 9.
- R Worksheet 1: W01-WS01-Intro.rmd: Introduction to Open Science, R, and RStudio Cloud

Week 02: May 18-24, 2020

- Reading: Wilson, G., et al. (2017). Good enough practices in scientific computing. *PLoS Computational Biology*, 13(6), 1-20.
- Lecture: Reproducible Research
- R Worksheet 1: Intro to R Markdown
- R Worksheet 2: Using R Markdown: The Ponzo Illusion

Week 03: May 25-31, 2020

- Reading: Wickham, H. (2014). Tidy data. *Journal of Statistical Software*, 59(10), 1-23.
- Lecture: Tidy Data
- R Worksheet 1: Intro to the Tidyverse: Is there a chastity belt on perception?
- R Worksheet 2: Data Wrangling: Analyzing the Autism Spectrum Quotient
- R Homework 1: The Ageing Brain

Week 04: June 1-7, 2020

- Reading: Vanderplas, S., Cook, D., & Hofman, H. (2020). Testing statistical charts: What makes a good graph? *Annual Review of Statistics and Its Application*, 7, 61-88.
- Reading: Newman, G. E., & Scholl, B. J. (2012). Bar graphs depicting averages are perceptually misinterpreted: The within-the-bar bias. *Psychonomics Bulletin and Review*, 19, 601-607.

- Reading: Rougier, N. P., Droetboom, M., & Bourne, P. (2014). Ten simple rules for better figures. *PLoS Computational Biology*, 10(9), 1-7.
- Lecture: Reproducible Figures
- R Worksheet 1: Data Visualization: ggplot2
- R Worksheet 2: Data Visualization: Mental Rotation

Week 05: June 8-14, 2020

- Reading: Tversky & Kahneman (1974). Judgment under uncertainty: heuristics and biases. *Science*, 185(4157), 1124-1131.
- Lecture: When Decision Heuristics and Science Collide (Yu et al., 2014)
- R Worksheet 1: Probability & Distributions
- R Worksheet 2: The Binomial and Normal Distributions
- R Homework 2: Distributions

Week 06: June 15-21, 2020

- Reading: Gawande (2016). The mistrust of science. *The New Yorker*.
- Reading: Haggstrom, O. (2012). Why the empirical sciences need statistics so desperately. *Proceedings of the European Mathematics Society*. 1-14.
- Reading: Sutherland, W. J., Spiegelhalter, D., & Burgman, M. A. (2013). Twenty tips for interpreting scientific claims. *Nature*, 503, 335-337.
- Lecture: Small Samples
- R Worksheet 1: Skills Needed for Running Permutation Tests
- R Worksheet 2: Permutation Tests of Hypotheses

— Reading Week (June 23-27) —

Week 07: June 29 - July 5, 2020

- Reading: Nelson, L. D., Simmons, J. & Simonsohn, U. (2018). Psychology's renaissance. *Annual Review of Psychology*, 69, 511-534.
- Reading: Nuzzo, R. (2015). How scientists fool themselves – and how they can stop it. *Nature*. 526(7572), 182-185.
- Lecture: The science of Bad Science
- R Worksheet 1: The Binomial and One-Sample T-tests
- R Homework 3: Comparing Means of Two Samples: The Sound of Intellect

Week 08: July 6-12, 2020

- Reading: Cumming, G. (2014). The new statistics: Why and how. *Psychological Science*, 25(1), 7-29.
- Lecture: The New Statistics 1
- R Worksheet 1: Within Subjects T-test: Juror Decision Making

Week 09: July 13-19, 2020

- Reading: Coe, R. (2002). It's the Effect Size, Stupid: What effect size is, and why it is so important. Paper presented at the *Annual Conference of the British Educational Research Association*, University of Exeter, England, 12-14, September 2002.
- Reading: Calin-Jageman, R. J., & Cumming, G. (2019). The new statistics for better science: Ask how much, how uncertain, and what else is known. *The American Statistician*, 73(S1), 271-280.
- Reading: Kass et al. (2016). Ten simple rules for effective statistical practice. *PLoS Computational Biology*, 1-8.
- Lecture: The New Statistics 2
- R Worksheet 1: APES: Alpha, Power, Effect Sizes, and Sample Size
- R Homework 4: APES

Week 10: July 20-26, 2020

- Reading: Kline, R. B. (2020). *Becoming a Behavioral Science Researcher: A guide to producing research that matters*. 2nd Edition. New York: The Guilford Press. Chapter 9: Practical Data Analysis.
- Reading: Erren, T. C., Cullen, P., Erren, M., & Bourne, P. E. (2007). Ten simple rules for doing your best research, according to Hamming. *PLoS Computational Biology*, 3(10), 1839-1840.
- Lecture: Tips for Planning Your Experiment
- R Worksheet 1: Research Project Analysis Guide

Week 11: July 27 - Aug 2, 2020

- Reading: Morey, R. D., Homer, S., & Proulx, T. (2018). Beyond statistics: Accepting the null hypothesis in mature sciences. *Advances in Methods and Practices in Psychological Science*, 1(2), 245-258.
- Reading: Lin, H., Werner, K. M., & Inzlicht. (2020). Promises and perils of experimentation: Big-I triangulation offers solutions.
- Reading: Guest, O. & Martin, A. E. (2020). How computational modeling can force theory building in psychological science. PsyArXiv.
- Lecture: Theory Building

Week 12: August 3-9, 2020

- Reading: Farrell, S. & Lewandowsky, S. (2018). *Computational Modeling of Cognition and Behavior*. Cambridge University Press. Chapter 1: Introduction to Modeling. pp. 2-23.
- Lecture: Introduction to Computational Modeling
- Reading: Farrell, S. & Lewandowsky, S. (2018). *Computational Modeling of Cognition and Behavior*. Cambridge University Press. Chapter 2: From Words to Models. pp. 24-43.

— *Final Exams (August 18-30)* —

Other Important Dates

- Victoria Day Holiday: May 18
- Canada Day Holiday: July 1
- Last day to drop without academic penalty: July 27
- Civic Holiday: August 3
- Last day to submit term assignments: August 13
- Study Break: August 14-17

Course Requirements and Grading

Requirement	Weight	Due
R Homework 1-4	10%	Four Thursdays at 1pm
Assignments 1-12	50%	Every Friday at 1pm
Final Exam	40%	Final Exam Period

Summary of Homework, Assignments, and Due Dates

Task	Weight	Due Date
Assignment 01	1%	Friday May 15, 1 pm
Assignment 02	1%	Friday May 22, 1 pm
R Homework 01	2.5%	Thursday May 28, 1 pm
Assignment 03	2%	Friday May 29, 1 pm
Assignment 04	2%	Friday June 5, 1 pm

Task	Weight	Due Date
R Homework 02	2.5%	Thursday June 11, 1 pm
Assignment 05	2%	Friday June 12, 1 pm
Assignment 06	2%	Friday June 19, 1 pm
R Homework 03	2.5%	Thursday July 2, 1 pm
Assignment 07	4%	Friday July 3, 1 pm
Assignment 08	2%	Friday July 10, 1 pm
R Homework 04	2.5%	Thursday July 16, 1 pm
Assignment 09	2%	Friday July 17, 1 pm
Assignment 10	10%	Friday July 24, 1 pm
Assignment 11	2%	Friday July 31, 1 pm
Assignment 12	20%	Friday August 7, 1 pm
Final Exam	40%	Final Exam Period

Note: The schedule, due dates, and nature of assignments are subject to change due to extenuating circumstances beyond our control. I would normally say that this is extremely unlikely, but given what we've all been living through the last few months, it is now entirely possible. The University could, for example, mandate that changes are made. Any other changes will be subject to a class vote, where a simple majority of those enrolled in the course must vote in favour of the change.

Note 2: It is critical that you abide by the submission policies for homework and assignments. Failure to follow submission requirements will likely result in a grade of 0, unless there are documented extenuating circumstances. Submission requirements include file naming conventions and file format requests. These will all be clearly explained in assignment descriptions and course materials.

Course Policies

UTSC Department of Psychology Missed Term Work due to Medical Illness or Other Emergency

All students citing a documented reason for missed term work must submit their request for accommodations **within three (3) business days** of the deadline for the missed work.

What Should You Do? Submit via email to: Keely Hicks, Departmental Assistant, keely.hicks@utoronto.ca

Students must submit **BOTH** of the following:

1. A completed Request for Missed Term Work Accommodations form, and
2. Appropriate documentation to verify your illness or emergency, as described below.

Appropriate Documentation: For missed **ASSIGNMENTS** or **TERM TESTS** due to **FLU-LIKE SYMPTOMS** or **SELF-ISOLATION REQUIREMENTS**:

- * Email the Request for Missed Term Work Accommodations form to Keely, and
- * Declare your absence on ACORN (Profile & Settings > Absence Declaration)

For missed **ASSIGNMENTS** due to **OTHER ILLNESS**:

- * Email the Request for Missed Term Work Accommodations form to Keely, along with the Self-Declaration of Student Illness Form.

For missed **TERM TESTS** due to **OTHER ILLNESS**:

- * Email the Request for Missed Term Work Accommodations form to Keely, along with a scan/photo of the original copy of the official UTSC Verification of Illness Form or an original copy of the record of visitation to a hospital ER.
- * Forms are to be completed in full, clearly indicating the start date, anticipated end date, and severity of illness. The physician's registration # and business stamp are required.

* Note: If an end date of “ongoing” is specified, the medical note will be assumed to cover a period of two weeks. If no end date / an “unknown” end date is specified, the note will be assumed to cover a period of three business days (starting from illness start date.)

For missed **TERM TESTS** due to **ACCESSABILITY REASONS**:

* Meet with your AccessAbility consultant and have them email Keely detailing accommodations required.

For missed **ASSIGNMENTS** due to **ACCESSABILITY REASONS**:

* If your desired accommodation is within the scope of your Accommodation Letter (e.g., your letter includes “extensions of up to 7 days” and you need 1-7 more days), email the Request for Missed Term Work Accommodations form to Keely, and attach a copy of your letter. Specify how many days extension you are requesting in your email.

* If your desired accommodation is outside the scope of your Accommodation Letter (e.g., your letter includes “extensions of up to 7 days” but you need more time than that) you will need to meet with your AccessAbility consultant and have them email Keely detailing the accommodations required.

For missed **ASSIGNMENTS** or **TERM TESTS** in **OTHER CIRCUMSTANCES**: Email the Request for Missed Term Work Accommodations form to Keely, along with:

* For the death of a family member/friend, provide a copy of the death certificate.

* For U of T varsity-level or professional athletic commitments, an email from your coach or varsity administrator should be sent directly to Keely (keely.hicks@utoronto.ca) well in advance of the missed work, detailing the dates and nature of the commitment.

* For religious accommodations, please email Keely well in advance of the missed work.

* For circumstances outside of these guidelines, please email Keely on or before the date of the test / assignment deadline to describe your circumstances and determine appropriate documentation.

Documents covering the following situations are NOT acceptable: medical prescriptions, personal travel, weddings, personal/work commitments.

As stated above, your documents must be submitted within three (3) business days of the deadline for the missed work.

After Submitting Your Documentation: Within approximately one to five business days, you will receive a response from your instructor detailing the accommodations to be made (if any). You are responsible for checking your official U of T email and Quercus course announcements daily, as accommodations may be time-critical. You should continue to work on your assignments to the best of your ability, as extension accommodations may be as short as one business day, depending on the nature of the illness/emergency. If an accommodation has been granted but you are unable to meet the conditions of the accommodation (e.g., you need a longer extension, or you missed a make-up test), you will need to repeat the missed term work procedure and submit additional forms to request further accommodation. Note that in the case of a missed make-up test, an opportunity to write a second make-up test may not be provided. Completion of this form does NOT guarantee that accommodations will be made. The course instructor reserves the right to decide what accommodations (if any) will be made. Failure to adhere to any aspect of this policy may result in a denial of your request for accommodation.

Missed Accommodations

If an accommodation is granted but a continued illness/emergency prevents you from meeting the requirements of your accommodation, you must repeat the missed term work procedure to request additional accommodations. For example, if you miss a make-up midterm, you would need to submit another Request for Missed Term Work Accommodations form. If your original medical note / documentation included the date of the make-up midterm, then only the Request form is required. If the date of the make-up midterm fell outside of the dates indicated on your original medical note/other documentation, then a new medical note/other appropriate documentation must also be submitted.

Importance of Three Business Day window:

If you are unable to submit your documents within the three business day window, you must email Keely within the three business day window to explain the nature of the delay, and when you will be able to

provide your documents. Exceptions to the documentation deadline will only be made under exceptional circumstances.

NOTE: Assignments due at end of term

Instructors cannot accept term work any later than five business days after the last day of class. Beyond this date, you would need to file a petition with the Registrar's Office.

NOTE: Final Exams

This policy applies only to missed assignments and term tests. Missed final exams are handled by the Registrar's Office.

Late Assignments Policy

A penalty of 5% will be deducted from the final grade for every 24 hour period that an assignment is late.

Accommodation for Personal Reasons

There may be times when you are unable to complete coursework, including completing readings, viewing lectures, or completing worksheets, due to non-medical reasons. If this occurs during the term you should contact the course instructor as soon as possible to discuss a strategy for completing or dropping the course. It is also a very good idea to speak to an academic advisor.

Religious Accommodations

The University has a commitment concerning accommodation for religious observances. We will make every reasonable effort to avoid scheduling tests, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. According to University Policy, if you anticipate being absent from class or missing a major course activity due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two weeks), so that we can work together to make alternate arrangements.

Academic Integrity

The University treats cases of cheating and plagiarism very seriously.

The University of Toronto's Code of Behaviour on Academic Matters outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences in papers and assignments include using someone else's ideas or words without appropriate acknowledgement, submitting your own work in more than one course without the permission of the instructor, making up sources or facts, and obtaining or providing unauthorized assistance on any assignment. On tests and exams cheating includes using or possessing unauthorized aids, looking at someone else's answers during an exam or test, misrepresenting your identity, or falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

Disability-Related Accommodation Request

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. AccessAbility Services staff (located in Rm SW302, Science Wing) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. Please contact 416-287-7560 (tel/TTY) or email: ability@utsc.utoronto.ca for more information. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

Course Management System Information: Quercus

This course uses the University of Toronto's learning management system, Quercus, to post information about the course. This includes readings, recorded lectures, worksheets, assignment rubrics, access to tests

and exams, and other materials required to complete class activities and course assignments, as well as sharing important announcements and updates. The site is dynamic and new information and resources will be posted regularly as we move through the term, so please make it a habit to log in to the site on a regular, even daily, basis. To access the course website, go to the U of T Quercus log-in page at q.utoronto.ca. Once you have logged in to Quercus using your UTORid and password, you should see the link or “card” for PSYC70. You may need to scroll through other cards to find this. Click on the PSYC70 link to open our course area, view the latest announcements, and access your course resources. There are Quercus help guides for students that you can access by clicking on the “?” icon in the left side column.

Special note about grades posted online: Please note that any grades posted are for your information only, so you can view and track your progress through the course. No grades are considered official, including any posted in Quercus at any point in the term, until they have been formally approved and posted on ACORN at the end of the course. Please contact me as soon as possible if you think there is an error in any grade posted on Quercus.

Online Communication Policy

You are required to use your utoronto email address for all course-related communications with the instructor and/or TA, and are expected to check this email address regularly throughout the course to ensure timely access to important information. I will only respond to emails received from a utoronto account, as this is the only way I can verify who I am talking with.

I reserve the right to remove Discussion Board posts that do not remain on topic. Harrasment and bullying will not be tolerated, and will be dealt with swiftly.

Harassment/Discrimination Policy

The University of Toronto is a richly diverse community and as such is committed to providing an environment free of any form of harassment, misconduct, or discrimination. In this course, I seek to foster a civil, respectful, and open-minded climate in which we can all work together to develop a better understanding of key questions and debates through meaningful dialogue. As such, I expect all involved with this course to refrain from actions or behaviours that intimidate, humiliate, or demean persons or groups or that undermine their security or self-esteem based on traits related to race, religion, ancestry, place of origin, colour, ethnic origin, citizenship, creed, sex, sexual orientation, gender identity, gender expression, age, marital status, family status, disability, receipt of public assistance or record of offences.

Privacy/FIPPA Statement

Personal information is collected pursuant to section 2(14) of the University of Toronto Act, 1971 and at all times it will be protected in accordance with the Freedom of Information and Protection of Privacy Act. Please note that this course requires presentations of one’s work to the group. For more information, please refer to www.utoronto.ca/privacy.

Copyright of Course Materials

Course materials are provided for the exclusive use of enrolled students. You do not have permission to share them or sell them to anyone outside of the course. The materials should not be posted on websites, uploaded to social media sites, printed and distributed or sold to others, nor sold to companies that intend to package them to sell or distribute to other people in print or via the internet. The University will support me in asserting and pursuing my rights, and my copyrights, in such matters.

You do have my permission to make your own recordings of any lectures for your own personal use. These may not be distributed, shared, sold, or posted on the internet without my permission.