Psychology 2500: Statistics and Research Design *v 1.4*
Fall 2022, MWF 2:45-4:00 pm
132 Goldwin Smith Hall (Hollis Cornell Auditorium)

Instructor: Thomas Cleland
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Office hours: Tuesdays 9:30 – 11:30 am, or by appointment

Teaching Assistants:

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Review sessions / office hours:	Mondays, 9:00-11:00 am, or by appointment	Thursdays, 2:00-4:00 pm, or by appointment

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Learning Goals:
After completion of this course, students should have gained:

(1) An intuitive understanding of the purpose and foundational properties of statistical analysis,

(2) The ability to critically interpret statistical claims and assertions based on probability when they are encountered in the literature or media, and

(3) The skills to choose appropriate statistical tests based on the nature of the data and the questions to be asked, to set up and administer these tests, and to interpret the results.

(4) The ability to perform basic statistical analyses of real data using the R software package, and to have learned the groundwork for how to teach themselves to perform more complex analyses in R when the need arises.

Required text:
Gravetter FJ & Wallnau LB. *Statistics for the behavioral sciences*. Belmont, CA: Wadsworth. 10th edition.
A (temporary) copy of this book will be automatically available via the course Canvas site (via the *Course Materials* menu item on the sidebar) as part of the university-wide Cornell Academic Materials Program.

You may also want to purchase a hardcopy of the book. In this case, the 10th, 9th, and 8th editions of this textbook are all supported. The 7th edition should also be fine. Textbook copies also will be on 2-hour reserve at Uris Library.

Please install the cross-platform statistical software package R and its easy-to-use interface RStudio. This is required for the 4-credit version of the course, and recommended for those taking the 3-credit version. Instructions for obtaining and installing both software packages are available from the *Course Information* module on our Canvas site. Both packages are free, open-source, and cross-platform (Windows, MacOS, Linux).

Website:
http://canvas.cornell.edu/courses/42073 "PSYCH 2500 Statistics and Research Design (2022FA)"

Announcements, readings, assignments, quizzes, lecture notes, changes to the syllabus, and other important information will be posted on the class Canvas site. Assignments will be collected via Canvas using Gradescope, and quizzes will be taken directly on Canvas. Annotated slides from lectures will be posted after class.

Enrollment in the course will automatically add you to the course Canvas site. If you do not have access to the course Canvas site or associated Gradescope site after enrolling, please let the instructor know immediately.

Assignments:
Written assignments will be posted on Canvas, both in the module where they are first assigned and also in the "Assignments" module. Assignments will be downloadable from Gradescope, and will be turned in by uploading PDF files back to Gradescope. Please be humane in your handwriting; illegibility will count against you if we cannot parse what you write. Assignments also may contain further information regarding how to turn them in. Assignments must be turned in on time to receive full credit.

For some assignment questions, particularly full statistical analyses, you will be provided with the final answer along with the question. The goal of these questions is for you to ensure that you know how to do the problem from start to finish, so that if you do not get the same answer as the one provided, then you need to figure out what went wrong and do it again before turning it in. Your grade for these questions will be based on you showing your work logically, neatly, and clearly, including tables where appropriate, so that I know that you know what to do to get from start to finish. The idea here also is to prevent small arithmetic errors or misremembered details from spoiling your answers. Be sure that you allow adequate time for these problems.

R Assignments:
R assignments also will be posted on Canvas, with links provided in the module where they are first assigned and also in the "R Assignments" module.

Quizzes:
There will be a quiz almost every week, focused on the textbook readings. Each quiz should be completed by the end of the day on Friday. (There is an automatic grace period until the end of the day on Saturday; please do not ask for further extensions). You will take these quizzes entirely on Canvas (available in the relevant class module and also in the "Quizzes" module) and they will be automatically scored for quick feedback. Answers will become available after the due date, and the quizzes will remain available for study. They will include multiple choice questions as well as numerical answer questions (numerical answers will tolerate a small range of variability, so you don't need to worry about rounding errors). Your one lowest quiz score will be dropped.

Exams:
There will be two prelim exams and one final exam. Prelim exams will take place during class time. Exams are cumulative, and will emphasize a broad spectrum of material. You MUST bring a calculator to every exam! You will only need a simple calculator, but most graphing calculators are fine. However, devices that communicate (such as smart phones) are not allowed. The instructor may have some calculators available that you are welcome to borrow for a small fee that is payable in exam points. Audible electronic events during class, and especially during exams, may also incur a cost in points. If you have a conflict with an exam date (e.g., an athletic event or religious holiday), please discuss it with the instructor by the third week of the semester. There will be no make-up exams after the fact except in the case of documented health emergencies.

Students with Disabilities:
Please give me your Student Disability Services (SDS) accommodation letter early in the semester so that I have adequate time to arrange your approved academic modifications. Meeting with me in my office hours will help ensure confidentiality. If you need an immediate accommodation for equal access, please speak with me after class or send an email message to me at tac29@cornell.edu and/or SDS at sds_cu@cornell.edu. If the need arises for additional accommodations during the semester, please contact SDS.

Discussion Board:
There is a discussion board on our course Canvas site for questions and discussions regarding course topics and material. There is a forum there entitled *Feedback/Requests to Instructor* that you are welcome to use to deliver feedback about any aspect of the course, particularly things that can be quickly improved. Of course, I'd welcome your comments and requests in person as well. Please feel free to create and/or participate in discussion threads about the course material that may arise for any reason. I and the TAs will check the discussion boards regularly and will try to answer any questions that may arise.

Extra credit:
To learn more about how research is conducted, I encourage you to participate in ongoing experiments for extra credit. Experiment signup is accessible via SONA at http://cornellpsych.sona-systems.com. Some information about SONA credit is available under the "Course Materials" module on the course Canvas site. You will receive one point of extra credit for each SONA point you earn, up to a maximum of 5 points; these extra credit points will be added to the score you receive on the final exam. The last day that you can participate to earn extra credit is the day before the final exam period begins. **Please keep separate proof of your completion of any extra credit work in case there is a glitch with the SONA system.**

Plagiarism and Academic Integrity:
I encourage you to work together so as to better understand the material presented in this course. However, the work you turn in must be your own. Plagiarism also includes slight paraphrasing of another's words or sentence structure. This is an excellent way to earn a disturbingly low grade on an assignment; penalties for plagiarism can be of any magnitude up to a grade of zero plus further academic penalties. Honestly, just don't do this; it's a waste of an education.

All course materials are intellectual property belonging to the author, usually meaning Prof. Cleland, hence the © notices. Students are not permitted to buy or sell any course materials without the express permission of the instructor. Such unauthorized behavior constitutes academic misconduct. So don't do this either. University policies regarding plagiarism and academic integrity can be found at http://cuinfo.cornell.edu/aic.cfm and https://plagiarism.arts.cornell.edu/tutorial/index.cfm.

Grades:
Psych 2500 is not graded on a curve, for the specific reason that I want you to help each other to learn the material (and hence do not want to instill any contrary motivations). It is possible for everyone to earn an A. If you have a question about how an assignment, exam, or quiz was graded, you may contact the TAs for clarification, but any changes in grades are ultimately decided by the instructor. Requests for grade changes must be made in writing, presented within one week of the assignment/exam/quiz being returned, and must include a rationale for the change. The entire assignment, exam, or quiz in question will be re-graded; thus, the final score could increase or decrease.

Please do not make a habit of grade grubbing for small points. It makes little difference in the end and annoys us all. If you legitimately think that a substantive mistake has been made, of course, please feel free to query the TAs or instructor. We want to be genuinely fair without creating a nightmare scenario.

Estimated Contributions to Final Grade:

Assignments (also participation, discussion board, etc.)	**~50%**
Quizzes (lowest score dropped and remaining scores averaged)	**~10%**
Midterm/prelim exams (two)	**~20%**
Final Exam (including SONA extra credit points for participation in research)	**~20%**

PSYCH 2500 Estimated Course Schedule 2022 (v 1.4)

Date	*Quiz	Topic	Chapters 9/10E (8E)	
M 8/22		1- Introduction, bootstrapping, operational def'ns		
W 8/24		2- Sampling, sampling error, methods, pitfalls	Ch. 1	
F 8/26		R: Orientation and installation		
M 8/29		3- Variables, scales of measurement, real limits, percentile ranks	Ch. 1-2	
W 8/31	***1**	4- Measures of central tendency in distributions	Ch. 3	
F 9/2		R 01: Essentials and Q/A; RMarkdown → PDF		
M 9/5		LABOR DAY – NO CLASS		
		9/6 is the Change deadline for 3 vs 4 credits		
W 9/7	***2**	5- Variability in populations and samples	Ch. 4	
F 9/9		6- Standardized scores, probability, unit normal table	Ch. 5-6	
M 9/12		7- Distribution of sample means; central limit theorem, standard error	Ch. 7	**HW1**
W 9/14	***3**	8- Introduction to hypothesis testing; critical values; Z as test ratio, *p*-values	Ch. 8	
F 9/16		R 02: Dataframes, sampling, functions, pnorm/pt		**R1**
M 9/19		NO CLASS		
W 9/21	***4**	9- Statistical power; frequentist vs Bayesian statistics	Ch. 8, *Readings*	
F 9/23		10- Introduction to the *t* statistic; one-sample *t* test, confidence intervals, effect sizes	Ch. 9	
M 9/26		11- Independent measures *t*-tests (Petrov Day)	Ch. 10	**HW2**
W 9/28		Catchup / Review session		
F 9/30		**PRELIM EXAM #1** (in class); Chapters 1-8		
M 10/3		12- Repeated measures *t* test; multiple comparisons	Ch. 11	
W 10/5	***5**	13- One-way ANOVA	Ch. 12 (13)	
F 10/7		R 03: Q-Q plots, *t* tests, *tidy* dataframe format		**R2**
M 10/10		INDIGENOUS PEOPLES' DAY – NO CLASS		
W 10/12	***6**	NO CLASS (illness)		
F 10/14		NO CLASS		
M 10/17	**(DROP*)**	14- Post hoc tests (Tukey, Scheffe)	Ch. 12 (13)	
W 10/19		15- Repeated-measures ANOVA	Ch. 13 (14)	
F 10/21		16- Factorial design and interactions	Ch. 14 (15)	
M 10/24		17- Factorial (two-factor, two-way) ANOVA	Ch. 14 (15)	
W 10/26	***7**	18- Simple main effects; intro to correlation	Ch. 15 (16)	
F 10/28		R 04: One-way ANOVA with afex()		**HW3**

M 10/31		Catchup / Review session		**R3**
W 11/2		**PRELIM EXAM #2** (in class)		
F 11/4		NO CLASS		
M 11/7		19- Pearson correlation; hypothesis testing	Ch. 15 (16)	
W 11/9	***8**	20- Spearman correlation; intro to ranked tests	Ch. 16 (17)	
F 11/11		R 05: Two-way ANOVA with afex()		
M 11/14		21- Linear regression	Ch. 17 (18)	
W 11/16	***9**	22- Chi-square tests (goodness-of-fit; independence)	Ch. 17 (18)	
F 11/18		R 06: Correlation, regression, chi-square, ranked tests:		**R4**
M 11/21		NO CLASS		**HW4**
W 11/23		**THANKSGIVING BREAK – NO CLASS**		
F 11/25 (TDAY)		**THANKSGIVING BREAK – NO CLASS**		
M 11/28		23- Ranked Tests: Wilcoxon tests		
W 11/30	***10**	24- Ranked Tests: Kruskal-Wallis; Friedman	App. E (20)	
F 12/2		R 07: Unstructured help session	App. E (20)	
M 12/5		25- Review session		**HW5, R5**
M 12/12, 9:00 AM		**FINAL EXAM** (Klarman Hall Auditorium KLR KG 70)		