

PSYC 301: Advanced Statistical Inference  
Fall Term 2016

**Course Instructor**

Jill A. Jacobson

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*Office Hours:* Monday lunch or by appointment

**Head Teaching Assistant**

Haykaz Mangardich

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*Office:* Humphrey 219

*Office Hours:* Mondays 4:00 pm - 5:30 pm

**Location**

Stirling Hall, Theatre C

**Times**

Mondays 11:30 am - 1:00 pm

Thursdays 1:00 pm - 2:30 pm

**Intended Student Learning Outcomes**

After completing this course, students will be able to:

1. Evaluate the trustworthiness of the statistical inferences made in research reports
2. Identify research practices that make statistical inferences more or less reliable and valid
3. Program and work with data in R
4. Conduct statistical analyses (univariate tests through factorial ANOVA) in R
5. Interpret and communicate the results of their analyses

**Course Materials**

**Copyright**

The course material created by the instructor including lecture notes, quizzes, exams, lab activities, etc. is copyrighted and is for the sole use of students registered in PSYC 301. This material shall not be distributed or disseminated to anyone other than students registered in PSYC 301. Failure to abide by these conditions is a breach of copyright and may also constitute a breach of academic integrity under the University Senate's Academic Integrity Policy Statement.

**Required**

Navarro, D. J. (2015). *Learning Statistics with R: A Tutorial for Psychology Students and Other Beginners*. Retrieved from <http://health.adelaide.edu.au/psychology/ccs/docs/lsr/lsr-0.5.pdf>.

R software for Windows or Mac OS. R Core Team (2013). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. URL <http://www.R-project.org/>.

RStudio software for Windows or Mac OS. Studio Team (2015). *RStudio: Integrated Development for R*. RStudio, Inc., Boston, MA URL <http://www.rstudio.com/>.

*Top Hat* subscription. Go to <https://tophat.com/pricing/> or follow the instructions in the invite email sent to you. The app is available for computers, tablets, and/or smartphones, or you can log in to your account on the H219 computers.

Other readings and materials will be provided on onQ.

**Calculators**

No calculators will be needed for this course. All computations will be done in R.

**Accessibility**

Queen's is committed to an inclusive campus community with accessible goods, services, and facilities that respect the dignity and independence of persons with disabilities. Materials for this course will be made available in an accessible format or with appropriate communication supports upon request.

## Web Content

Additional information for the course will be available on onQ. As in PSYC 100, this message board is intended only as a forum for posting questions and discussing topics related to the PSYC 301 course material. Messages pertaining to inappropriate topics like mark changes, course complaints, or subjects unrelated to PSYC 301 content will be deleted, and if those messages are deemed harassing, abusive, or insulting, disciplinary action will be taken.

Because students' questions tend to be similar, **please post your queries in the appropriate onQ discussion board rather than emailing the Head TA or the instructor directly.** The Head TA and the instructor will check the discussion boards regularly and will respond to your questions there. This way everyone in the class has access to the same information. If you do email questions that should have been posted on onQ, your email will be returned unanswered or you will be directed to onQ for the reply.

## Office Hours/Appointments/Monday Lunch

We strongly recommend that you take advantage of the opportunity to meet with the instructor and the Head TA. You also should feel free to ask questions during class/lab and/or immediately before or after it. If you are having trouble understanding the course material, please see the instructor and/or TA well in advance of the exam. We want you to do well and learn the material in this course, but we can do little to help you if you do not take the initiative. Waiting until the last minute will not be a wise strategy.

Starting Week 2, the instructor will be available every Monday after class for lunch at MacCorry. You are free to join her (or not – you can just eat lunch there yourself without any obligation) to talk about the course, psychology, statistics, research, graduate school, future plans, etc. Borrowing from Professor Michael Wesch, the only rule of these conversations is no small talk. Just dive in.

## Exams

A take-home midterm exam worth 15% of your final grade will be due on Turnitin by 11:59 pm on Thursday, October 13, 2016, and the final exam worth 30% of your final grade will be held in a classroom on a date to be determined during the exam period. Both exams will receive letter grades. Students are expected to write all exams as scheduled, and you must write all exams to pass this course (i.e., if you do not write an exam, you will receive a failing mark for the class regardless of your performance on the other components of the course). If you are unable to write an exam, appropriate documentation of your reasons for deferring the exam must be submitted to and approved by the instructor **PRIOR** to the exam (specifically, by 5:00 pm the day before the scheduled exam). For more information, see the section *Missed Exams* below. Exams and assignments due in other courses will not be sufficient grounds for excusal, and the PSYC 301 exam dates will not be changed to accommodate conflicts with your other courses' schedules.

**Take-home midterm exam.** All written assignments in this course including the take-home exam must be originally and individually written and will be assessed via an online plagiarism prevention program, Turnitin. If you are uncertain about what constitutes plagiarism, please see the section below labeled *Academic Integrity*. All written assignments including the take-home midterm exam must be submitted to Turnitin in electronic format (e.g., Word, PDF, etc.). Late take-home exams and assignments will be penalized two letter grades per each day late (i.e., if you earn an A on the exam but handed in the take-home exam 1 day late, your grade will be a B+ once the penalty is applied).

**Location and timing of final examinations.** As noted in Academic Regulation 8.2.1, “the final examination in any class offered in a term or session (including Summer Term) must be written on the campus on which it was taken, at the end of the appropriate term or session at the time scheduled by the Examinations Office.” The exam period is listed in the key dates prior to the start of the academic year in the Faculty of Arts and Science Academic Calendar and on the Office of the University Registrar's webpage. A detailed exam schedule for the Fall Term is posted before the Thanksgiving holiday; for the Winter Term it is posted the Friday before Reading Week, and for the Summer Term the window of dates is noted on the Arts and Science Online syllabus prior to the start of the course. Students should delay finalizing any travel plans until after the examination schedule has been posted. Exams will not be moved or deferred to accommodate employment, travel /holiday plans, or flight reservations (also see above).

**Missed exams.** Students who cannot write an exam during the December or April exam period due to a serious, extenuating circumstance (illness, death in the family) must follow the steps below to be eligible to write a deferred exam during the PSYC department's *Make up Exam period* in January, April/May, and September.

1. Obtain permission from their instructor to write a deferred exam. This requires notifying your instructor in advance or, under extraordinary circumstances, within 72 hours after, the exam, with appropriate documentation.<sup>1</sup> Please use the *Request for an Exam Deferral* form found on the Psychology Department website or from the UG office and attach your documentation.
2. Complete and return the instructor-signed *Permission for an Incomplete Grade* form available on the Arts and Science website and return to the UG office.
3. Be available to write the makeup exam the PSYC Department's *Make up Exam period* in January, April/May or September or receive '0' on the exam.

NOTE: Students who do not write the makeup exam are advised to drop the course. If a student cannot write the makeup exam due to a serious extenuating circumstance for which they can provide new documentation, they will either be granted a second deferral by their instructor or be supported in their appeal to drop the course after the deadline though this decision rests with the Associate Dean (Studies).

**Accommodation after the fact.** Once a student has written an exam or submitted an assignment, they may not subsequently be granted accommodation such as being offered a second opportunity to write the exam or assignment or have it count for less than originally specified in the course syllabus (reweighted).

### **Accommodations**

Queen's University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability and think you may need accommodations, you are strongly encouraged to contact Student Wellness Services (SWS) and register as early as possible. For more information, including important deadlines, please visit the Student Wellness website at: <http://www.queensu.ca/studentwellness/accessibility-services/>. If you do qualify to receive special accommodations, please notify the instructor right away, so any special arrangements can be made as soon as possible. The instructor will inform your TA for you, so you do not have to have this discussion twice.

### **Laboratories**

All labs are held in Humphrey Hall Room 219 and will begin during the 2<sup>nd</sup> week of the term. No lab meetings will be held during the week of Thanksgiving (October 10-13). Laboratories will focus on: 1) weekly quizzes of the prior week's lecture material administered using the Top Hat app; 2) activities and demonstrations related to the lecture material; 3) learning to program in R via R Studio; 4) reviewing statistical techniques and conducting the tests in R; and 5) a weekly assignment to be uploaded to Turnitin at the end of the lab. Students are expected to attend their assigned laboratories for the full three hours and to participate in and complete all laboratory activities.

Students who cannot attend their regular lab one week due to a religious observance or with documentation of a serious, extenuating (beyond their control) circumstance such as an illness (physical or mental), a death in the family, etc. may attend an alternate lab as a visitor *for that week only*. Please contact the TA whose lab you are visiting in advance to let him or her know that you will be attending and to ensure that space is available. Also, please let your regular TA know that you will be attending another lab for that week only.

**Quizzes.** The weekly quizzes will consist of multiple choice, true-false, and short answer questions on the previous week's lecture material. The quizzes will be administered and graded using the Top Hat app, so feedback can be provided to you immediately. The TAs also will review question with the lab as necessary to

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<sup>1</sup> Appropriate documentation includes a signed letter from a registered health professional, Queens HC&DS, or documentation of a death such as a bulletin from a memorial service, obituary (newspaper or online) or funeral home letter. Official documents will be copied and originals returned to the student. Note that the PSYC department randomly checks document authenticity and that fraudulent documents will be grounds for a finding of a major departure from academic integrity

ensure that students understand the material before moving on to the next quiz question. Quizzes will be graded using numerical percentage marks, and your final quiz mark will be based on the best 8 out of 10 quizzes.

**Lab assignments.** The weekly lab assignments will consist of answering questions about activities or demonstrations intended to enhance understanding of material covered in lecture and/or completing exercises in R. These assignments will be completed during the lab, so your TA can assist you with any problems, and they must be submitted to Turnitin at the end of the lab. Lab assignments will receive letter grades, and late assignments will be penalized two letter grades per each day late (i.e., if you earn a B+ but handed the assignment in 1 day late, your grade will be a B- once the penalty is applied). Your final lab assignment mark will be based on the best 8 out of 10 assignments.

**Teaching assistants.** The TAs will be available for the full three hours of their scheduled lab time. Thus they are not required to hold any additional office hours, and you are strongly encouraged to take advantage of their availability at the lab times. Your TA is unlikely to monitor the onQ discussion board, but the Head TA and instructor will be able to answer questions about the lab material. The TAs want to help you, but bear in mind that the volume of emails generated even by one lab section in this course is enormous. So please use email conscientiously and sparingly. Unnecessary inquiries limit your TA's ability to respond to important emails. If you do have questions or need to meet with your TA, please contact him or her well in advance. If you wait until the last minute, you have no guarantee that your TA will have the opportunity to read your email and/or be able meet with you in time.

### Teaching Assistants

Section	Day	Time	TA	Email Address
002	Monday	5:30 pm - 8:30 pm	Haykaz Mangardich	12hm30@queensu.ca
008	Tuesday	8:30 am - 11:30 am	Suzette Fernandes	142f48@queensu.ca
004	Tuesday	5:30 pm - 8:30 pm	Andrew Nguyen	12aan3@queensu.ca
006	Wednesday	11:30 am - 2:30 pm	Suzette Fernandes	142f48@queensu.ca
005	Wednesday	2:30 pm - 5:30 pm	Mark Khei	12zamk1@queensu.ca
007	Wednesday	5:30 pm - 8:30 pm	Suhui Yap	12sy30@queensu.ca
003	Thursday	8:30 am - 11:30 am	Mark Khei	12zamk1@queensu.ca

### Academic Integrity

Academic Integrity is constituted by the six core fundamental values of honesty, trust, fairness, respect, responsibility and courage (see [www.academicintegrity.org](http://www.academicintegrity.org)). These values are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University (see the Senate Report on Principles and Priorities <http://www.queensu.ca/secretariat/policies/senate/report-principles-and-priorities>).

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments conform to the principles of academic integrity. Information on academic integrity is available in the Arts and Science Calendar (see Academic Regulation 1 <http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations/regulation-1>), on the Arts and Science website (see <http://www.queensu.ca/artsci/academics/undergraduate/academic-integrity>), and from the instructor of this course. Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions that contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

### Evaluation

You are responsible for all lecture and laboratory material and all corresponding material in the texts and on onQ. You are expected to write all exams as scheduled and submit assignments at the end of each lab.

Exceptions will be made only under relevant circumstances and when appropriate, written documentation is supplied. Penalties will be applied to late assignments and the take-home exam.

*Re-Marking.* If you believe that an error was made in grading one of your exams, quizzes, or lab assignments, you must complete the re-mark form available for download from onQ. Submit the form and the exam, quiz item, or lab assignment in question to the instructor. On the form, you must specify the nature of the error and, if necessary, supporting documentation to defend your position. The re-mark will stand as the final mark even if it is lower.

### Grading Scheme

EXAM TOTAL	2 Exams	45%
QUIZ TOTAL	Best 8 of 10 quizzes	20%
ASSIGNMENT TOTAL	Best 8 of 10 assignments	30%
PARTICIPATION TOTAL	Attendance/subscription to Top Hat	<u>5%</u>
GRAND TOTAL		100%

### Grading Method

In this course, some components will be graded using numerical percentage marks. Other components will receive letter grades, which for purposes of calculating your course average will be translated into numerical equivalents using the Faculty of Arts and Science approved scale (see below). Your course average will then be converted to a final letter grade according to Queen's Official Grade Conversion Scale (see below).

#### *Arts & Science Letter Grade Input Scheme*

Assignment mark	Numerical value for calculation of final mark
A+	93
A	87
A-	82
B+	78
B	75
B-	72
C+	68
C	65
C-	62
D+	58
D	55
D-	52
F48 (F+)	48
F24 (F)	24
F0 (0)	0

#### *Queen's Official Grade Conversion Scale*

Grade	Numerical Course Average (Range)
A+	90-100
A	85-89
A-	80-84
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	57-59
D	53-56
D-	50-52
F	49 and below

## Course Outline

Week	Lecture Dates	Lecture Topic	Background	Lab Schedule
1	September 12 September 15	Introduction Crisis in Science	LSR1 Why do we learn statistics?	Cancelled
2	September 19 September 22	Crisis (continued)	LSR2 A brief introduction to research design	TA Introduction Turnitin Quiz 1 LSR3 Getting started with R LSR4 Additional R concepts Assignment 1 Due
3	September 26 September 29	NHST and p values	LSR9 Introduction to probability LSR10 Estimating unknown quantities from a sample LSR11 Hypothesis testing	Quiz 2 Demonstration/activity related to the Crisis in Science LSR5 Descriptive statistics LSR6 Drawing graphs Assignment 2 Due
4	October 3 October 6	Likelihood and Bayes	LSR17 Bayesian statistics	Quiz 3 Demonstration/activity related to NHST and p values LSR7 Pragmatic matters LSR8 Basic programming Assignment 3 Due
5	October 10 October 13	No Lecture Take-Home Exam Due	Thanksgiving Uploaded to Turnitin by 11:59 pm	Cancelled
6	October 17 October 20	Power		Quiz 4 Demonstration/activity related to Likelihood and Bayes LSR12 Categorical data analysis Assignment 4 Due
7	October 24 October 27	Sample Size Planning and Optional Stopping		Quiz 5 Demonstration/activity related to Statistical Power LSR13 Comparing two means Assignment 5 Due
8	October 31 November 3	Confidence Intervals, Effect Size, and Meta- Analysis		Quiz 6 Demonstration/activity related to sample size determination LSR14 Comparing several means Assignment 6 Due
9	November 7 November 10	Multiple Comparisons and Error Control		Quiz 7 Demonstration/activity related to confidence intervals LSR16 Factorial ANOVA Assignment 7 Due

10	November 14 November 17	Replication		Quiz 8 Demonstration/activity related to error control LSR15 Linear regression Assignment 8 Due
11	November 21 November 24	QRP Detection Lecture Cancelled		Quiz 9 Demonstration/activity related to replicability LSR17 Bayesian statistics Assignment 9 Due
12	November 28 December 1	Best Practices		Quiz 10 StatCheck app p-checker app GRIM Test p-curve app Assignment 10 Due
EXAM	TBD	Final Exam		

*Note.* LSR = Learning Statistics with R