SYLLABUS

STAT 3850

Foundations of Statistical Analysis

MWF, 9:00-9:50 Ritter Hall 323

Darrin Speegle

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euler.slu.edu/~speegled/Spring2017/3850
Ritter Hall 139
Office Hours: SEE WEB PAGE!!!
(314) 977-2440

Course Description: STAT 3850 is a calculus based introduction to probability and statistics, using R. We will spend about 25% of the course developing necessary probability prerequisites, 50% learning inferential statistics using R, and 25% doing programming in R. We will cover applications and theory of probability distributions, random variables, expectation, independence, confidence intervals, hypothesis testing, regression and ANOVA.

Prerequisite(s): MATH 1520.

Note(s): A minimum grade of C- is required in this course to progress to further probability and statistics courses.

Credit Hours: 3

Texts: stat.slu.edu/~speegle/_book

Course Objectives:

At the completion of this course, students will be able to:

1. compute probabilities of an event, given a description of the experiment that defines the event.
2. use conditional probabilities; in particular, Bayes Rule and the Law of Total Probability.
3. recognize the type of random variable that an experiment describes.
4. determine whether random variables are independent, and make computations based on independence.
5. compute expected values of random variables, from the definition and from formulas.
6. find confidence intervals for means and proportions.
7. perform hypothesis testing of means and proportions.
8. perform and interpret single and multiple regression using R.
9. perform and interpret ANOVA using R.
10. write R code which simulates an experiment in order to compute a probability.
11. use R to wrangle data.
12. use R to visualize data.
Grade Distribution:

- Homework 10%
- Exam 1 20%
- Projects 40%
- Final Exam 30%

Letter Grade Distribution:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>77.5 - 80</td>
</tr>
<tr>
<td>A-</td>
<td>72.5 - 77.5</td>
</tr>
<tr>
<td>B+</td>
<td>68 - 72.5</td>
</tr>
<tr>
<td>B</td>
<td>60 - 68</td>
</tr>
<tr>
<td>B-</td>
<td>&lt; 60</td>
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Course Policies:

- **General**
  - The programming language R is allowed on all assignments, except possibly for exams.
  - Exams will either be open everything or closed book, notes and computer.
  - **No makeup exams will be given.** If a student misses an exam due to a university approved absence, then the grade on the final exam will be used for the student’s exam grade.

- **Grades**
  - Grades in the C range represent performance that **meets expectations**; Grades in the B range represent performance that is **substantially better** than the expectations; Grades in the A range represent work that is **excellent**.
  - Grades will be maintained by the professor. Graded assignments will be returned to students, who are responsible for keeping track of their own grades should they wish to know how they are doing during the semester.

- **Homework**
  - There will be both individual assignments and group assignments. Students may choose to do the group assignments as individuals. On individual homework assignments, students may still work with other students, consult books, and consult online resources. However, help obtained from any source other than the textbook, the professor, or the R help pages should be documented — especially if it was help from another student. (It is sufficient to write “I worked with X on this assignment,” or “X helped me with this assignment.”) It is not acceptable to search for solutions to the problems assigned, nor to ask someone not in this class specifically about a homework problem. It is OK to ask for or search for general help on math or statistics. For example, searching for help in computing the sum of an infinite geometric series is fine. Searching for the solution to problem 16 on homework 1, is not fine. In any case, please document your sources. I do not expect this to be a problem, and unless there is an egregious case, the first offense will receive only a reminder to do a better job of documenting sources.
  - **Late** assignments will be docked 10% if between 0 and 7 days late, 50% if 7-30 or more days late, and 100% if more than 30 days late.
- **Projects** There will be two projects. Project one will be a data wrangling project, where you are required to analyze a large-ish data set, and will be worth 15%. Project two will extend the ideas presented in the course in a new direction, and will be worth 25%. There will also be a **checkpoint** date on project two, where you will be required to submit a part of your project for a grade.

- **Attendance and Absences**
  - Attendance is expected. I reserve the right to lower a student’s grade by one letter for poor attendance.
  - Students are responsible for all missed work, regardless of the reason for absence. It is also the absentee’s responsibility to get all missing notes or materials.

**College Policies and Statements**

**Academic Integrity Syllabus Statement**

Academic integrity is honest, truthful and responsible conduct in all academic endeavors. The mission of Saint Louis University is "the pursuit of truth for the greater glory of God and for the service of humanity." Accordingly, all acts of falsehood demean and compromise the corporate endeavors of teaching, research, health care, and community service via which SLU embodies its mission. The University strives to prepare students for lives of personal and professional integrity, and therefore regards all breaches of academic integrity as matters of serious concern.

The governing University-level Academic Integrity Policy was adopted in Spring 2015, and can be accessed on the Provost’s Office website at:


Additionally, each SLU College, School, and Center has adopted its own academic integrity policies, available on their respective websites. All SLU students are expected to know and abide by these policies, which detail definitions of violations, processes for reporting violations, sanctions, and appeals. Please direct questions about any facet of academic integrity to your faculty, the chair of the department of your academic program, or the Dean/Director of the College, School or Center in which your program is housed.

Specific College of Arts and Sciences Academic Honesty Policies and Procedures may be found at: http://www.slu.edu/x12657.xml

**Title IX Syllabus Statement**

Saint Louis University and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. If you have encountered any form of sexual misconduct (e.g. sexual assault, sexual harassment, stalking, domestic or dating violence), we encourage you to report this to the University. If you speak with a faculty member about an incident of misconduct, that faculty member must notify SLU’s Title IX coordinator, Anna R. Kratky (DuBourg Hall, room 36; akratky@slu.edu; 314-977-3886) and share the basic fact of your experience with her. The Title IX coordinator will then be available to assist you in understanding all of your options and in connecting you with all possible resources on and off campus.

If you wish to speak with a confidential source, you may contact the counselors at the University Counseling Center at 314-977-TALK. To view SLU’s sexual misconduct policy and for resources, please visit the following web pages:


www.slu.edu/here4you.
Student Success Center Syllabi Statements
In an effort to be inclusive of students’ learning styles and needs with regard to academic support, the following statement has been developed for use in course syllabi which identifies resources for student support in various areas of learning. As faculty members construct their syllabi for future courses, it is requested that they update materials to include new language regarding academic and career related support offered to students through the Student Success Center.

The syllabus statement will be available throughout the year by visiting the following websites, but we encourage you to place these resources on any departmental websites you feel necessary:
Student Success Center: www.slu.edu/success
Reinert Center for Transformative Teaching & Learning: www.slu.edu/cttl

Student Success Center Syllabus Statement: In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. The Student Success Center, a one-stop shop, which assists students with academic and career related services, is located in the Busch Student Center (Suite, 331) and the School of Nursing (Suite, 114). Students who think they might benefit from these resources can find out more about:
Course-level support (e.g., faculty member, departmental resources, etc.) by asking your course instructor.
University-level support (e.g., tutoring services, university writing services, disability services, academic coaching, career services, and/or facets of curriculum planning) by visiting the Student Success Center or by going to www.slu.edu/success.

Disability Services Academic Accommodations Syllabus Statement
Students with a documented disability who wish to request academic accommodations are encouraged to contact Disability Services to discuss accommodation requests and eligibility requirements. Please contact Disability Services, located within the Student Success Center, at Disability_services@slu.edu or 314.977.3484 to schedule an appointment. Confidentiality will be observed in all inquiries. Once approved, information about academic accommodations will be shared with course instructors via email from Disability Services and viewed within Banner via the instructor’s course roster.

Academic Integrity and Honesty
Students are expected to be honest in their academic work. The University reserves the right to penalize any student whose academic conduct at any time is, in its judgment, detrimental to the University. Such conduct shall include cases of plagiarism, collusion, cheating, giving or receiving or offering or soliciting information in examinations, or the use of previously prepared material in examinations or quizzes. Violations should be reported to your course instructor, who will investigate and adjudicate them according to the policy on academic honesty of the College of Arts and Sciences. If the charges are found to be true, the student may be liable for academic or disciplinary probation, suspension, or expulsion by the University. Students should review the College of Arts and Sciences policy on Academic Honesty (http://www.slu.edu/x16363.xml).

Declaration
Online submission of, or placing one’s name on an exam, assignment, or any course document is a statement of academic honor that the student has not received or given inappropriate assistance in completing it and that the student has complied with the Academic Honesty Policy in that work.

Consequences
An instructor may impose a sanction on the student that varies depending upon the instructor’s evaluation of the nature and gravity of the offense. Possible sanctions include but are not limited to, the following: (1) Require the student to redo the assignment; (2) Require the student to complete another assignment; (3) Assign a grade of zero to the assignment; (4) Assign a final grade of “F” for the course. A student may appeal these decisions. The full text of the Academic Honesty Policy is available here: http://www.slu.edu/x16363.xml.


**Tentative Course Outline:**
Weekly coverage may change, as it depends on the progress of the class.

<table>
<thead>
<tr>
<th>Week</th>
<th>Content</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>• Introduction to Probability and R: Computing probabilities of events.</td>
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<tr>
<td>Week 2</td>
<td>• Introduction to Probability and R: Independence of events and conditional probability. Introduction to simulation using R.</td>
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<td>Week 3</td>
<td>• Discrete random variables: Binomial, geometric, Poisson, hypergeometric and expectations. Simulations using R.</td>
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<tr>
<td>Week 4</td>
<td>• Continuous random variables: Normal, exponential, uniform and expectations. Simulations using R.</td>
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<tr>
<td>Week 5</td>
<td>• Random variables: Independence and Central Limit Theorem. Simulation and computations using R. Project one due.</td>
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<tr>
<td>Week 6</td>
<td>• Introduction to Statistics: Exploratory data analysis using R.</td>
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<td>Week 7</td>
<td>• Midterm (tentative).</td>
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<tr>
<td>Week 8</td>
<td>• Introduction to Statistics: Confidence intervals for means and proportions. Simulations using R.</td>
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<td>• Midterm Exam</td>
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<td>Week 9</td>
<td>• Introduction to Statistics: Hypothesis testing of means and proportions. Simulations using R.</td>
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<tr>
<td>Week 10</td>
<td>• Introduction to statistics: Simple linear regression.</td>
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<tr>
<td>Week 11</td>
<td>• Introduction to statistics: Multiple linear regression using R. Residual analysis. Project 2 due.</td>
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<tr>
<td>Week 12</td>
<td>• Introduction to statistics: robustness of regression analysis and model building.</td>
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<tr>
<td>Week 13</td>
<td>• Introduction to statistics: ANOVA.</td>
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<tr>
<td>Week 14</td>
<td>• Final Project Due.</td>
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