

# ORF 245 FUNDAMENTALS OF STATISTICS

Spring 2019, Second Half

---

<b>Instructor:</b>	Alexander Giessing	<b>Time:</b>	M W 3:00 pm – 4:20 pm
<b>Email:</b>	<a href="mailto:giessing@princeton.edu">giessing@princeton.edu</a>	<b>Location:</b>	Friend Cen 101

---

**Course Pages:** <http://blackboard.princeton.edu/>

**Instructor's Office Hours:** Thursday, 11:00 am – 12:00 pm, Sherrerd Hall 216

I welcome questions about course material, concepts in class, course logistics, etc. However, questions about homework should be addressed during precepts and the AI's office hours.

## AI's Office Hours:

- Wednesday, 10:30 am – 12:00 pm, Yifeng Zhou ([yifengz@princeton.edu](mailto:yifengz@princeton.edu)), Sherrerd Hall 005
- Thursday, 10:30 am – 12:00 pm, Zhuoran Yang ([zy6@princeton.edu](mailto:zy6@princeton.edu)), Sherrerd Hall 005
- Thursday, 2:00 pm – 3:30 pm, Carson Eisenach ([eisenach@princeton.edu](mailto:eisenach@princeton.edu)), Sherrerd Hall 005
- Friday, 10:30 am – 12:00 pm, Yaqi Duan ([yaqid@princeton.edu](mailto:yaqid@princeton.edu)), Sherrerd Hall 006

## Precepts:

- Monday, 07:30 pm – 08:20 pm, Sherrerd Hall 101
- Tuesday, 03:30 pm - 04:20 pm, Friend Center 004
- Tuesday, 07:30 pm - 08:20 pm, Sherrerd Hall 101

## Main Reference:

- Jay Devore, *Probability and Statistics for Engineering and the Sciences*, 9th Edition, Cengage Learning, 2015.

**Course Goals:** The second half of ORF 245 will develop the background to understand and produce statistical analysis including estimation, confidence intervals, hypothesis testing, regression, logistic regression and machine learning. Applicability and limitations of these methods will be illustrated using a variety of modern real world data sets and manipulation of the statistical software R.

**Prerequisites:** Successful completion of the first half of ORF 245.

**Computation:** The software package for this class is R. The class will not teach programming in R and you are expected to pick it up yourself. I encourage you to start with the following resources:

- [Quick Start of R installation and learning](#)
- [U-Tube video: An introduction to R](#)

- **Quick Labs 1-5: Basic skills.** These labs cover basic skills for R. Do the first three labs for now and the remaining when we get to Multiple Regression.

### Tentative Course Outline:

1. **Joint Distributions and Random Samples:** Discrete joint distribution, Joint densities, Covariance and correlation, Multivariate random variables, Square root law, Central limit theorem.
2. **Concepts and Methods of Estimation:** Point estimation, Methods of estimation, Standard error, Bootstrap.
3. **Confidence intervals:** Basic concept, Precision and Sample size, Bootstrap, Intervals based on normal population, One-sided confidence bounds.
4. **Hypothesis Testing:** Basic concept, Test for population mean, t-test, Test for population proportion.
5. **Comparisons of two treatments:** Inference based on two samples, Two-sample z-test, Two-sample t-test, Difference between two proportions, Analysis of paired data,  $\chi^2$ -square tests and contingency tables.
6. **Simple linear regression:** Models and Summary statistics, Estimation of model parameters, Regression effect and goodness of fit, Inference of model parameters, Prediction, Inference of correlation.
7. **Multiple and Nonlinear Regression:** Parameter estimation, Variable selection, Statistical inference and ANOVA, Model diagnostics, Training and testing, Cross-validation and Prediction errors, Polynomial and nonlinear regression, Model building using dummies.

**Grading Policy:** Final Grade = Grade 1st Half (50%) + Homework 2nd Half (25%) + Final (25%).

**Homework:** Weekly homework will be posted Monday evening and is due the following Monday at 11:59pm. Late homework submissions will not be accepted, except under extreme circumstances. I encourage you to discuss homework problems, but solutions must be written up individually.

**Exams:** There will be a final exam. This exam will cover material from the first and second half of the course. The exam will be open-book and open-notes. Laptops with wireless off and calculators may be used during the exams. The exam is required and there will not be any make-up exams; missing it will result in a grade of zero.

**Attendance:** Regular attendance of the class is required. The class covers many conceptual issues and statistical thinking that are not covered in the text book. They will appear in the midterm and final exam.

### Important Dates:

Mid Term ..... March 13, 2019.  
Final Exam ..... To be announced.

**Academic Honesty:** Lack of knowledge of the academic honesty policy is not a reasonable explanation for its violation.