# QUANTITATIVE ANALYSIS FOR PLANNERS
## PP&D 214

## Course Description

This class introduces a mindset and tools to think and learn through quantitative data. In your career as a planner, you will invariably encounter quantitative data and analysis. They will appear in numerous forms, including demographic projections, public opinion surveys, cost-benefit analyses, and published research reports. By learning how to understand and interpret those numbers and their associated statistics, you will be better equipped to evaluate policy decisions and think through their potential consequences. You will additionally be able to judge the quality of statistics presented in reports and the media and what lessons you can or should infer from them.

This class will teach you how to formulate clear questions and answer those questions effectively using quantitative approaches. Specifically, we will cover descriptive statistics (using data to describe the state of the world), probability and sampling theory (understanding the variability and limitations inherent in social data), and inferential statistics (drawing broader conclusions about a population a limited dataset). Additionally, because many statistical tools are best tackled using computational approaches, we will spend ample time in class practicing using computer programs to run statistical analyses.

## Expected Learning Outcomes

1. You will be able to use exploratory data analysis and visualizations (e.g., box plots, histrograms) to describe the structure of variables and datasets.
2. You will be able to describe why probability and randomness matter in planning and policy and apply basic approaches to quantify that probability.
3. You will be able to select, apply, and interpret the results of basic inferential tests, including a t-test, chi-squared test, univariate regression, and ANOVA.
4. You will be able to use Microsoft Excel to perform basic statistical tests.

## Textbooks and Other Learning Resources

I have always found it useful to have multiple avenues for learning about statistical analysis. Because some of the concepts we will cover in class may not be immediately intuitive, having a range of different explanations and media to explore and practice the concept will help you find one that makes each concept clear for you as a learner.

This primary, **required** textbook for this class is *Statistics for People Who (Think They) Hate Statistics, Microsoft Excel 2016 Edition* by Neil J. Salkind (ISBN 978-1483374086). This is a clear, engaging, and sometimes humorous take on the statistical approaches we'll discuss in class. The text is on reserve at Langson Library or can be purchased in paperback or as an eTextbook on Amazon. You are welcome to purchase another edition of the text (esp. the 5th or 6th edition), but be warned that they do not have the sections on using Excel, which will be our primary computational tool.

For the sections on Probability and Sampling, we will use the online text provided by Carnegie Mellon's Open Learning Initiative (https://oli.cmu.edu).

For more visual learners, a recommended resource to supplement the textbook and in-class activities is the *Cartoon Guide to Statistics* by Woollcott Smith (ISBN 0062731025). This text is on reserve in Langson Library or can be purchased on line.

Additionally, I highly recommend Khan Academy (www.khanacademy.org). They provide free, high quality videos on many of the topics we'll be covering in class, and are a great way to review concepts we discuss.

### Required Statistical Software

You will need access to Microsoft Excel with the Data Analysis toolpak. This is available on all recent PC versions of Microsoft Excel and on Excel for Mac 2016. If you have Excel for Mac 2011, you can use StatPlus, which has many of the same capabilities (download at https://www.analystsoft.com/en/products/statplusmacle/).

### Course Requirements and Assignments

Unless noted otherwise, all assignments are due by the start of class on the due date.

### *1. Problem Sets*

You will complete 5 problem sets to practice using statistical concepts introduced in the lectures and readings. You may discuss the problem sets with other students, but you must each turn in your own assignment. Of the five problem sets, your four highest scores will comprise your final grade.

### *2. Quizzes*

Every week, there will be a <u>short</u> online quiz to test your comfort with topics covered the prior week. Except week 1 (when the quiz will be due on Thursday), the quizzes are due by Tuesday at noon. The quizzes are graded credit/no credit, designed for you to practice the concepts in a low stakes setting.

### *3. Mid-Term Exam*

On ▮▮ there will be an in-class midterm exam covering material from weeks 1-5. The exam is open book and open note.

### *4. Final Exam*

On ▮▮, there will be a final exam covering material from all weeks of the course. The exam is open book and open note.

### *5. In class participation*

Up to 10 points for in-class participation will be derived from a self assessment of your engagement in the class sessions. The assessment is due by 4pm on ▮▮.

### Grading Breakdown (ABCD/F or P/NP)

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|---|---|
| Problem Sets (10 points each x 4) | 40 points |
| Quizzes (1 point each x 10) | 10 points |
| Mid-Term Exam | 20 points |
| Final Exam | 20 points |
| In class participation | 10 points |

## Course Outline

| Week | Date | Topic | Readings | Assignment |
|------|------|-------|----------|------------|
| ***Descriptive Statistics & Probability*** | | | | |
| 1 | ■ | Why numbers matter for planning, asking questions with data | Ch. 1 | |
| | ■ | Types of variables, measuring center | Ch. 2 | |
| 2 | ■ | Measures of center and spread | Ch. 3 | PS 1 available |
| | ■ | Using Excel, data visualization 1 | Ch. 4 | |
| 3 | ■ | Data visualization 2, intro to probability | CMU Module 8 | PS 1 due |
| | ■ | Probability 1 | CMU Module 9 | PS 2 available |
| 4 | ■ | Probability 2 | CMU Module 10 | |
| | ■ | Populations and samples | CMU Module 6 | PS 2 due |
| 5 | ■ | Questions and hypotheses, review | Ch. 7 | |
| | ■ | MIDTERM EXAM | | |
| ***Inferential Statistics*** | | | | |
| 6 | ■ | Normal curve, z-scores, confidence intervals | Ch. 8 | PS 3 available |
| | ■ | Hypothesis testing for 1 variable, 1 sample | Ch. 9 | |
| 7 | ■ | Hypothesis testing for 1 variable, 1 sample | Ch. 10 | PS 3 due |
| | ■ | Hypothesis testing for 1 variable, 2 samples | Ch. 11 | PS 4 available |
| 8 | ■ | Hypothesis testing for 1 variable, 2 samples | Ch. 12 | |
| | ■ | Bivariate & multivariate data 1: ANOVA | Ch. 13 | PS 4 due |
| 9 | ■ | Bivariate & multivariate data 2: Correlation | Ch. 5,15 | PS 5 available |
| | ■ | Bivariate & multivariate data 3: Regression | Ch. 16 | |
| 10 | ■ | Bivariate & multivariate data 4: Chi-square | Ch. 17 | PS 5 due |
| | ■ | Course wrap-up & review | | |
| 11 | ■ | FINAL EXAM (4-6pm) | | Participation assessment due |

## Course Policies

DROPS must be submitted by 5PM of week 2 using WebReg system.
ADDS must be submitted by 5PM of week 3 using WebReg system.
CHANGE must be submitted by 5PM of week 2 using WebReg system. From week 3 through 6, you must use the Student Access system to submit a request for a grade option change. No exceptions will be considered after week 6.

## Students with Disabilities

If you anticipate needing any type of an academic accommodation in this course or have questions about physical access, please discuss this with me during the first week of class AND please register with the Disability Services Center (http://www.disability.uci.edu/). In order for you to receive any type of academic accommodation, I will need formal notification from the Disability Services Center during the first two weeks of the quarter of the type of academic accommodations to which your disability entitles you.