# UP116 | Urban Informatics 1 | Spring 2019

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| **Lectures:** | Monday and Wednesday, 3:00 – 3:50pm,<br>Room 225 Temple Buell Hall |
| **Labs:** | Friday, 3:00– 3:50pm, Room 70B Wohlers Hall |
| **Instructor**: | Cong Cong, ccong2@illinois.edu<br>Office hours: 2:00-3:00pm on Friday and by appointment |
| **Teaching Assistant:** | Sushma Pramod, spramod2@illinois.edu<br>Office hours: 12:00-1:00pm on Monday at TBH227 |

## 1. OVERVIEW

This class aims to accomplish two major goals.

Goal #1: Students will build familiarity with a set of fundamental mathematical and statistical techniques. Specifically, you will learn quantitative research techniques frequently used in Planning, the Social Sciences, and related fields/professions. Among the topics covered are:

- Descriptive vs. inferential statistics
- Types of variables
- Measures of central tendency and dispersion
- Sampling and estimation
- Hypothesis testing
- Analysis of variance (ANOVA)
- Introduction to regression analysis

Goal #2: Students will cultivate research skills, particularly with survey methods. Although homework will be assigned to directly practice the statistical analysis techniques discussed in class, the bulk of the course will entail completing a project that can be used as a writing sample when seeking an internship or first job. Throughout the semester you will develop, conduct, and write your own self-guided research project using your own survey data. Tasks that will be completed include a literature review, a survey design, survey implementation, survey analysis, and writing/presenting your research findings.

## 2. OBJECTIVES

By the end of the semester, each student will:

1. Understand the value of statistics in their daily life and career, while also keeping a healthy dose of scepticism;
2. Understand the basic foundational statistical concepts of data, variation, and inference;
3. Understand and critically examine statistics used in urban planning and policy research;
4. Be able to formulate a research question, collect data, and use statistical software and methods to analyse the data;

5. Have the ability to navigate the RStudio interface and understand how to load data into R;
6. Become familiar with the most commonly used statistical procedures and explore simple programming in R; and,
7. Know how to better communicate and make an argument with numbers.

## 3. COURSE MATERIALS

Two books are required:

1. Healey, J. F. 2013. *Statistics: A tool for social research, 10th Edition*. Belmont, CA: Thomas Wadsworth.
2. Verzani, J. 2014. Using R for Introductory Statistics, Second Edition. New York, NY: Chapman & Hall/CRC. E-book available at UIUC Library https://ebookcentral.proquest.com/lib/uiuc/detail.action?docID=1619952

## 4. COURSE FORMAT

Monday and Wednesday classes are in a lecture/discussion format. Students will learn and discuss fundamental concepts, theories, and tools of urban informatics. The Lab sessions on Fridays will alternate between (1) workshops that introduce you to software you will be using on your final project and homework assignments and (2) feedback, questions and self-directed work on your final project.

## 5. REQUIREMENTS AND GRADING

### *Project*

You have several 'mini' Project Assignments (PAs) throughout the semester. Each PA represents a major section of your final project (e.g., sources, literature review, survey, survey design, statistical analysis), the sum of which accrete into your final project. When you turn in each PA, you will receive critical feedback that you will take into account in your final assignment. You will sign up for a day at the end of the semester to present your findings to the rest of the class. **Your final project grade (40% of your class grade) will be the average of the (1) individual PA grades, and (2) the completed final project grade.**

### *Homework Assignments*

There will be six homework assignments that practice the class material. Each assignment may contain short answer questions, calculation, and lab exercises. Solutions should be submitted on compass on the due date at the beginning of class. **Late assignments will be graded down by 10 percent each day.** Students are encouraged to help each other with the homework assignments, but each student is responsible for his or her own individual work and receives individual grade. Copying your study group's work is plagiarism.

### *Concept Quizzes*

Throughout the semester we will have four in-class or in-lab quizzes. These quizzes assess your knowledge of certain statistical, research method, or survey method concepts. Knowledge of these concepts will be crucial to you completing an excellent final research project, so regular assessments will assure that you're "staying on track."

***Attendance***

Attendance accounts for 10% of your grade. Class attendance will be based on both random attendance checks and in-class quizzes. If you need to miss a session, try to notify the instructor in advance. **More than three unexcused absences will result in a lower attendance grade**. You are responsible for acquiring class materials when you do not attend and submitting tasks still due on the date posted.

Your grade will be based on the following:

| Component | Percentage |
|---|---|
| Concept Quizzes | 20% |
| Homework Assignments | 20% |
| Attendance | 10% |
| Final Project | 40% |
| Presentation | 10% |
| **Total** | **100%** |

I will assess final grades with the following schedule:

A+: 97.0 or higher
A: 94.0-96.99
A-: 90-93.99
B+: 87-89.99
B: 84-86.99
B-: 80-83.99
C+: 77-79.99
C: 74-76.99
C-: 70-73.99
D+: 67-69.99
D: 64-66.99
D-: 60-63.99
F: 59.99 or less

## 6. COURSE WEBSITE

I will post detailed guides for projects/assignments, lecture slides, required readings and other learning resource on Illinois Compass: compass.illinois.edu

Assignments deliverables and final projects are to be submitted electronically through Compass.

## 7. COURSE POLICIES

**Disability Services**: This course will accommodate students with documented disabilities. Please refer to the Disability Resource Guide at (http://www.disability.uiuc.edu/resourceguide) for more information. Please inform the instructor of any requests as soon as possible, preferably before the first week of class is over.

**Respectful environment:** The Department of Urban and Regional Planning (DURP) is committed to maintaining a learning environment that is rooted in the goals and responsibilities of professional planners. By enrolling in a class offered by the Department of Urban and Regional Planning, students agree to be responsible for maintaining an atmosphere of mutual respect in all

DURP activities, including lectures, discussions, labs, projects, and extracurricular programs. See Student Code Article 1-Student Rights and Responsibilities, Part 1. Student Rights: §1-102.

**Academic Integrity & Plagiarism**: The UIUC Student Code (http://www.admin.uiuc.edu/policy/code) requires all students to support academic integrity and abide by its provisions, which prohibit cheating, fabrication, plagiarism, and facilitation of these and related infractions.

**Emergency Information:** The Department of Homeland Security and the University of Illinois at Urbana-Champaign Office of Campus Emergency Planning recommend the following three responses to any emergency on campus: RUN > HIDE > FIGHT. For more information, visit http://police.illinois.edu/emergencyplanning/general/

**Counseling Center:** The Counseling Center is committed to providing a range of services intended to help students develop improved coping skills in order to address emotional, interpersonal, and academic concerns. The Counseling Center provides individual, couples, and group counseling. All these services are paid for through the health services fee. The Counseling Center offers primarily short-term counseling, but they do also provide referrals to the community when students could benefit from longer term services. https://counselingcenter.illinois.edu/

## 8. CLASS SCHEDULE

| Date | Topic | Reading to be Completed | Assignments |
|---|---|---|---|
| **Week 1 – Introduction and Math Review** | | | |
| Monday, January 14th | Introduction to course | | |
| Wednesday, January 16th | Intro to statistics and research questions | Chapter 1 | Assign HW1<br>Assign PA1: Research Questions and Literature Review |
| Friday, January 18th | Lab: Literature review guide | | |
| **Week 2 – Basic Descriptive Statistics** | | | |
| Monday, January 21st | **No Class – MLK Jr. Day** | | |
| Wednesday, January 23rd | Basics of descriptive statistics | Chapter 2 | |
| Friday, January 25th | Lab: R Intro – installation and workspaces | | HW1 due, Assign HW2 |
| **Week 3 – Measures of Central Tendency and Dispersion** | | | |
| Monday, January 28th | Measures of Central Tendency | Chapter 3 | |
| Wednesday, January 30th | Measures of Dispersion | Chapter 4 | |
| Friday, February 1st | Lab: R workshop – input and output, documentation, basic stats | | |
| **Week 4 – Probability and the Normal Curve** | | | |
| Monday, February 4th | Normal Curve | Portion of Chapter 5 (pg. 122-133) | HW2 due, Assign HW3 |
| Wednesday, February 6th | Normal Curve and Probability | Portion of Chapter 5 (pg. 133-142) | |
| Friday, February 8th | Lab: R workshop – find probability | | PA1 due |
| **Week 5 – Sampling and Estimation** | | | |
| Monday, February 11st | Survey methods | Chapter 6 | Assign PA2: Draft Survey Questionnaire |
| Wednesday, February 13rd | Estimation | Chapter 7 | |
| Friday, February 15th | Lab: Survey w/ Google Forms Workshop | | |

| Date | Topic | Reading to be Completed | Assignments |
|---|---|---|---|
| **Week 6 – Asking Questions with Data** | | | |
| Monday, February 18th | Hypothesis Testing – One Sample Case | Chapter 8 | HW3 due, Assign HW4 |
| Wednesday, February 20th | Hypothesis Testing – One Sample Case | | |
| Friday, February 22nd | Lab: R workshop – manage your datasets | | |
| **Week 7 – Asking Questions with Data** | | | |
| Monday, February 25th | Hypothesis Testing – Review | Chapter 9 | |
| Wednesday, February 27th | Hypothesis Testing – Two Samples | | |
| Friday, March 1st | Lab: R workshop – statistical tests (1) | | PA2 due<br>Assign PA3: Methods selection |
| **Week 8 – The Analysis of Variance** | | | |
| Monday, March 4th | ANOVA (1) | Portion of Chapter 10 (pg. 242-248) | HW4 Due, Assign HW 5 |
| Wednesday, March 6th | ANOVA (2) | Portion of Chapter 10 (pg. 249-263) | |
| Friday, March 8th | Lab: R workshop – statistical tests (2) | | |
| **Week 9 – Bivariate Tables and Chi Square** | | | |
| Monday, March 11st | Chi Square (1) | Chapter 11 | |
| Wednesday, March 13rd | Chi Square (2); methods review | | |
| Friday, March 15th | Lab: workday | | PA3 due |
| **Week 10 – SPRING BREAK** | | | |
| **Week 11 – Measures of Association** | | | |
| Monday, March 25th | Association between variables measured at the nominal level | Chapter 12 | HW5 Due, Assign HW6 |
| Wednesday, March 27th | Association between variables measured at the ordinal Level | Chapter 13 | |
| Friday, March 29th | Lab: Survey analysis guide | | All surveys completed<br>Assign PA4: Initial survey analysis |

| Date | Topic | Reading to be Completed | Assignments |
|---|---|---|---|
| **Week 12 – Measures of Association** | | | |
| Monday, April 1st | Association between variables measured at the Interval-Ratio Level | Chapter 14 | Send out final presentation sign-up link |
| Wednesday, April 3rd | Visualizing data | Stowell, Chapter 8 | |
| Friday, April 5th | Lab: R workshop – graphics | | |
| **Week 13 – Regression** | | | |
| Monday, April 8th | Regression (1) – model building | Portion of Chapter 16 (pg. 433-449) | HW6 due |
| Wednesday, April 10th | Regression (2) - assumptions | | |
| Friday, April 12th | Lab: R workshop – regression | | PA4 due<br>Assign PA5: Analysis section |
| **Week 14 - Regression** | | | |
| Monday, April 15th | Regression (3) – interpreting results | Portion of Chapter 16 (pg. 449-457) | |
| Wednesday, April 17th | Final guidelines | | |
| Friday, April 19th | Lab: Workday | | PA5 due |
| **Week 15 - Presentations** | | | |
| Monday, April 22nd | Final Presentations | | Slides due by noon |
| Wednesday, April 24th | TBD | | |
| Friday, April 26th | Lab: Workday (TA) | | |
| **Week 16 - Presentations** | | | |
| Monday, April 29th | Final Presentations | | Slides due by noon |
| Wednesday, May 1st | Final Presentations | | Slides due by noon |
| **Final paper due by May 7th, 11:59pm** | | | |

Although I will make every effort to follow the above schedule, some variations may be inevitable.