**MAT111**

**Spring 2015**

**Elementary Probability and Statistics**

**Instructor Information**

* Dr. Homer S. White, 115 ASC, extension 8307, email hwhite0.
* Office Hours: 1-1:50 PM MWF, 2:25-3:25 PM TR, and at other times by appointment.

**Course Description**

This course is an introduction to statistics, including graphical and numerical descriptive techniques, design of observational studies and experiments, basic probability in connection with the distribution of sampling statistics, and inferential procedures. Applications are taken from the social and life sciences and sports. Statistical techniques are studied in an open-source computational environment that thoroughly integrates statistical analysis with the emerging paradigms of literate programming and reproducible research. In layman’s terms, this means that you learn to use totally free software to produce compelling data-analysis reports easily and with a minimum of fuss, in a way that facilitates collaboration with team members and permits colleagues to verify every step of your analysis.

**Text and Materials**

* **Required Materials:** No external textbook is required. All necessary resources, including the Course Notes, are available from the course website: [http://statistics.georgetowncollege.edu](http://statistics.georgetowncollege.edu/). The course Moodle page also has important materials, such as an electronic copy of this syllabus and the Online Quizzes (see below).
* **Campus Network Access.** You must be able to log on to the Georgetown College Campus network with your user name and password, so you can gain access to the RStudio Server. We will do most of our course work on the Server. You may access the Server and the course website from anywhere in the world, as long as you have an internet connection.
* **Strongly Recommended:**
  + Your own computer. You will have a desktop computer during class, but if you want to bring your own laptop, that’s fine. Everything except in-class quizzes has to be done by computer, so you will find it a great convenience to have your own machine for out-of-class work. If you do not have your own machine, then you can use any computer that is connected to the Internet.
  + A small notebook for note-taking in class.

**Course Objectives**

In this class, successful students will:

* demonstrate basic content knowledge of descriptive and inferential statistical procedures on online quizzes, daily assignments, data analysis reports and exams;
* employ analytical reasoning skills by reading problem scenarios and selecting an appropriate technique for the problem described on data analysis reports and exams;
* apply problem-solving skills to arrive at correct solutions on data analysis reports and exams;
* apply critical thinking and written communication skills to interpret their answers in the context of scenarios described on data analysis reports and exams.

**Course Requirements**

Your grade will be determined by your performance on quizzes, homework, tests, a final exam, a project, and an engagement component.

***Daily Assignments (DAs)****.* On each class day you will turn in a small assignment on the R Studio Server. Near the end of the semester I will check them. Most are graded as either turned in or incomplete/missing, but a few are selected for closer scrutiny to make sure you are putting in the proper effort. **DAs are worth 5% of your course grade.**

***Online Quzzes (OQs).*** These are posted on Moodle. There are very strict deadlines, so if you have to be away from the course due to travel or some other reason, make sure to work on the quiz well ahead of time. You are allowed three attempts on each quiz, with your highest score counting toward your grade. **OQs count for 15% of your course grade.**

***Data Analysis Reports (DARs)***. After you have attained a certain level of proficiency in R and in basic descriptive statistics, you will begin to write small data analysis reports. Each DAR addresses one or more specific Research Questions pertaining to a particular dataset. You turn in your DAR as an R Markdown document by leaving a saved copy in the Submit directory in your Home folder on the R Studio server, and you turn in a printed hard-copy of a “knitted” pdf version in class.

You may consult with me, with fellow students and with Help Session Leaders about the DAR assignments, but everyone must write up his/her own DAR without copying from others. Strong evidence of copying from others results in a zero grade for all parties involved.

I plan to assign several DARs during the course of the semester. **DARs are worth 20% of your course grade.**

***Tests (T1 and T2)***. There will be two semester tests, **each worth 20% of your course grade**. If you must miss a test,then you must let me know in advance, if it is humanly possible for you to do so. If I judge that your excuse is acceptable, then we will try to arrange a time for you to take the test separately, although usually this is not possible. In the event that you are unable to make up the test in this way, then your final will count an additional 20%.

***Final (FE)*.** The final exam is worth **20% of your course grade**. It is cumulative, but is slanted somewhat toward material covered since T2.

*Course Grade Calculation*. Your course percentage is computed as follows:

**Course = 0.05\*DA + 0.15\*OQ + 0.20\*DAR + 0.20\*T1 + 0.20\*T2 + 0.20\*FE**

The grading scale is as follows:

A 92.5% and above

A/B 87.5% to 92.5%

B 82.5% to 87.5%

B/C 77.5% to 82.5%

C 70% to 77.5%

D 60% to 70%

F below 60%

**Final Exam Date:** TBA. It will occur in the classroom.

**Course Outline (number of DARs still tentative)**

The following list indicates the course content and the approximate placement of tests and DARs within that content:

* Chapter One: Introduction to R, R studio, and the Basic Ideas of Statistics
* Chapter Two: Basic Descriptive Statistics (numerical and graphical) for:
  + one factor variable
  + relationship between two factor variables
  + one numerical variable
  + relationship between one factor and one numerical variable
* The **first DAR** deals with a topic from Chapter 2.
* Chapter Three: More on Two Factor Variables
  + Further Concepts for Descriptive Statistics
  + Introduction to Inference, with the Chi-Square Test
* The **second DAR** deals with a topic from Chapter 3.
* Chapter Four: Relationship Between Two Numerical Variables
  + Scatterplots
  + Linear Models (descriptive approach only)
* **T1 (covers chapters 1-4)**
* The **third DAR** deals with a topic from Chapter 4.
* Chapter Five: Sampling to Gather Data
* Chapter Six: Design of Studies (Experiments and Observational Studies)
* Chapter Seven: Probability for Statistics
  + Basic Ideas of Probability
  + Random Variables
  + Expected Value and Standard Deviation
  + Two Important types of Random Variables: the Binomial and Normal Families
* Chapter Eight: Random Variables in Sampling
  + Five Basic Parameters:
    - one mean
    - difference of two means
    - mean of differences
    - one proportion
    - difference of two proportions
  + Estimators for these parameters, and their probability distributions
* Chapter Nine: Confidence Intervals for the Basic Five Parameters
* **T2 (covers Chapters 5 through 9)**
* The **fourth DAR** deals with material from Chapter 9.
* Chapter Ten: Tests of Significance for the Basic Five Parameters
* The **fifth DAR** deals with material from Chapter 10.
* Chapter Eleven: Inference for One Factor Variable
  + The Chi-Square test for Goodness of Fit
* **Final Exam:** Tuesday May 5, 12-2 PM, in this classroom.

**Miscellaneous Course Policies**

* **Getting Help.**
  + **Office Hours** (see under "Instructor Information") are very important to college professors. During my posted office hours I am in my office for no other purpose than to help you. Therefore you never need to make an appointment to see me during office hours: just stop by. If you cannot make my office hours, consider stopping by anyway. Quite often I will be too busy to see you, but sometimes I can put off my other tasks. Remember: to the faculty, you are much more interesting than any paperwork they have to do. You can also contact me to set an appointment if you need to be sure of seeing me outside of office hours. To summarize: don't be shy, and if you start to have troubles, come to me for help right away—not weeks later when it will probably be too late.
  + **Peer Instructors** will run Help Sessions several times per week, time and location TBD. Details will be posted on Moodle.
* **Attendance and Timeliness**. Attendance will be taken daily. Late arrivals are as serious as absences and are reported as such on Early Warning Reports. DAs and tests missed due to unexcused absences or lateness cannot be made up, and DARs turned in late are either penalized, or – at the discretion of the instructor – not accepted at all.
* **Classroom Demeanor.** Signs of poor participation (use of cell-phones or other devices for non-class purposes, etc.) are noted and counted as an absence, and are reported as such on Early Warning Reports. Although it is unlikely to be a problem in a college classroom, disruptive behavior—should it occur—results in a request to leave class, is counted as an absence, and is reported to the Administration.
* **Academic Honesty**. On in class-assessments (in-class quizzes and tests) you may use only materials that are explicitly permitted. For out-of-class assessments (Online Quizzes and DARs) you consult with me, with fellow students and with Help Session Leaders, but everyone must write his/her own assignment without copying from others. Strong evidence of copying results on a DAR in a zero grade for all parties involved.
* **Check your College email daily for course announcements.** Updates on quizzes and homework, as well as other announcements, are announced via email.

**Disclaimer**

I hope that the foregoing has given you a good idea of what the course will be like. It should not, however, be construed as a contract or legal document of any sort. In particular, the course content and policies mentioned herein are subject to reasonable modification in response to changing circumstances and events. I will, however, endeavor to notify you well in advance of any needed changes.