Course Syllabus: MSDS 6371

Spring 2020

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| Live Session Instructors:  Office Hours:  Course Text:  Prerequisites:  Graders/TAs: | Dr. Bivin Sadler  Robert Hazell  Ramsey, F. L., and Schafer, D. W. (2013), *The Statistical Sleuth: A Course in Methods of Data Analysis* (3rd ed.), Boston, MA: Brooks/Cole, with associated website [www.statisticalsleuth.com](http://www.statisticalsleuth.com).  A previous introductory statistics course.  TBD |

**The text is available in electronic version from CengageBrain.com and is much less expensive this way!**

**All elements of the syllabus are subject to change by the instructor.**

**Before taking this class, you should know**

* Statistical methods from an introductory statistics course: appropriate use of the mean and median, interpretation of boxplots and histograms, use of simple linear regression, probability calculations using the Normal distribution, applications of the central limit theorem, interpretation and calculation of confidence intervals for a population mean, interpretation and calculation of a *p*-value for any hypothesis test.
* If you have serious deficiencies in the material mentioned above, you must address these yourself on your own outside of class as soon as possible.

**Learning Objectives: The student will**

* Gain a better understanding of basic statistical methods covered in introductory statistics courses and problems that arise when these analytic methods are applied to real-life research problems
* Demonstrate understanding of the advantages and disadvantages of a given experimental design, particularly with respect to the type of conclusions that can be made
* Appropriately apply the methods discussed in the course to numerical and categorical data
* Communicate the findings of a statistical analysis in a clear, concise, and scientific manner

**Course Expectations**

* As a Data Scientist in Training, you need to learn to search out answers to questions for yourself before asking your instructor. It’s amazing what five minutes on the internet can turn up! Please, train yourself to try to find an answer for yourself before asking someone else. Give yourself a time limit (e.g., I will search for one hour and if I can’t find anything, I will ask). It’s better for you in the long run!!
* Download SAS prior to the first live session meeting. Mac users must use the version at apps.smu.edu. If you have questions on obtaining SAS, please contact help.smu.edu. The live session instructors cannot help you with questions regarding downloading and installation of SAS.
* Play around with SAS. It is a very powerful software program. Asynchronous videos regarding the use of SAS are available in the LMS, but there is no way that they can cover every scenario! Please examine SAS help (available online or within the software itself) before asking your instructor a question about the use of SAS. You also have the Elliott and Woodward book at your disposal. And don’t forget Google!!!
* Watch all asynchronous material for the course. If you do not view required materials for a given week, the instructor has the right to refuse to answer any question over those materials until you have viewed them.

**Course Coverage**

The course will cover chapters 1–12 of the text. Much of the material may seem like a review to those of you who have had a previous course in statistics. That assessment is somewhat true; however, we will pay more attention to sample size calculation and experimental design than a first course typically does. Furthermore, we will concentrate on understanding WHY a particular technique is appropriate and HOW to interpret the results.

**Grading:** Midterm Exam (25%), Final Exam (25%), Homework (11%), Project (6%), Quizzes (13%), Participation (20%)

**Homework (11%):** Homework will be assigned most weeks and is due on Sunday at 11:59 p.m. after that week’s live session. Late homework will be accepted until Monday (the day after it was due) at 11:59 p.m. However, late homework will be penalized 10 points. Solutions will be posted likely on the following Tuesday. We hate taking off points for non-content reasons, so please turn it in on time.

Homework will be self-graded. Graders will randomly select homework submissions to grade to provide extra feedback and make sure everyone is well calibrated.

All data sets for cases studies and exercises are available (or will be when assigned) on the 2DS website. Datasets for problems assigned out of the book can also be found at the text book website: [www.statisticalsleuth.com](http://www.statisticalsleuth.com/). Your lowest homework will be dropped.

**Project (6%):** In lieu of typical homework for weeks 13 and 14, a group project will be assigned.

**Quizzes (13%):** Each week there will be a short, online, multiple choice quiz over the videos and readings. Quizzes are due at 11:59PM the night before Live Session. This allows time for the live session instructor to review quiz answers and tailor the class to address any difficulties with that week’s material. These are graded on a completed/not completed basis. If you complete all of the questions in a quiz, you receive all of the points. Your lowest quiz score will be dropped.

**Participation (20%):** This component has 3 parts: viewing of asynchronous material (including BLTs), participation during live sessions, and completing and submitting the For Live Session Assignment for each unit. The course is structured with both synchronous and asynchronous sessions. In order to participate fully in the synchronous sessions, you must complete ALL of the material for the asynchronous sessions each week.

BLTs (Bi-directional Learning Tool) are questions asked during the asynchronous videos that require an answer before going on to the next part of the video. Some of these BLTs will be graded and some will not; however, completion ***of all*** of the BLTs is required. Everyone can see each other’s answers… discussion will be very helpful here!

The For Live Session Assignment is a set of questions and activates that the student is to work on and provide a response to *before* live session.

* The Fore Live Session Assignment is due 24 hours before live session.
* It is important to note that the goal of the activities is to become familiar with the methods, ideas and implementation involved in that activity so that we can efficiently iron out all the details in live session.
* Analogy: You are building the pieces of puzzle in the For Live Session Assignment and we are putting them together to see the big picture in live session.
* It is ***not*** expected that the student have all the correct answers. The expectation is that each student spend the allotted time (indicated next to the activity) on each activity so that we can discuss the details in live session.
* If you max out the indicated time without finishing the activity and you don’t have more time to finish, simply write up what you have learned by that time and record any questions you might have and we will address those in live session!
* We want to develop the questions before live session so that we can use the live session time to effectively answer any questions and master the material!

Discussion Boards: Students are not required to post in discussion boards, unless specified by the professor.

Note: Participation includes **attending every Live Session from start to finish** (the scheduled hour and a half.) This includes not using Video Pause excessively. For an ‘80s explanation of the dilemma this causes see the following [link](https://www.youtube.com/watch?v=CfL8N_bDo1E) from the ‘80s cinema hit *Real Genius*! For those of you who have seen the movie, you will enjoy the whole montage! Those who have never seen it, you are in for a treat … please pay close attention to 2:45, 3:10 and 4:35. <https://www.youtube.com/watch?v=CfL8N_bDo1E>

You may miss 1 Live Session without penalty.

**Midterm Exam (25%):** There will be a midterm exam at week 7 of the course. It will cover concept and hand-calculation questions, as well as a data analysis question. The exam will be held online on **Saturday, February 22, 2020 from 11am to 2pm Central Standard Time**. Please clear your schedule now! We will have a review for Live Session 7.

**Final Exam (25%):** A final exam will be given the last week of the course. It will be comprehensive, containing concept and hand-calculation questions, as well as a data analysis question. It is a cumulative exam and is similar in format to the midterm. We will have a review for Live Session 15. This test will be from **11am to 2pm Central Standard Time on Saturday, April 18, 2020**.

**Rescheduling Exams:** Life happens. Should you need to reschedule an exam, please give notice to your live session instructor at least 24 hours prior to the live session in which the exam review is discussed (Unit 7). The notice should be given via e-mail. You and your instructor will discuss the best course of action given your circumstances. Retakes of exams will not be allowed, and a missed exam cannot be made up if notification is received AFTER the exam has taken place.

**Honor Code**

**The Honor Code**

When you signed your letter of intent to enroll in the program, you initialed the following statement:

* “I have read and agree to abide by the SMU Honor Code available online at: <http://www.smu.edu/StudentAffairs/StudentLife/StudentHandbook/HonorCode>”

Please know that the Honor Code is taken very seriously.

Honor Code Violations Include: Academic Sabotage, Cheating, Fabrication, Facilitating academic dishonesty, Plagiarism among others.

**Collaborative Work**

* Data science is a collaborative subject
* Most professors encourage collaborative work except when explicitly prohibited (usually on quizzes & exams)
* Collaboration means helping one other, not copying answers from one another.
* Students who turn in exactly the same answers to the same homework will share the grade assigned (i.e. if two students have the same answers, and the grade on the assignment is a 90, then each student will receive a 45).
* Some instructors may impose stricter penalties

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| Okay | Not Okay |
| * Discussing problems (or even solutions) with other students. * Telling another student how you did something in SAS (which PROC and how to use it, etc.) or sending “snippets” of code (i.e. an example of how to use a PROC) to help them out. | * Sending your answers to a student or receiving them from another student. * Sharing anything, including ideas, when expressly forbidden, such as on exams. * Passing off anyone else’s work or explanations as your own. * **Using solutions from prior terms to inform your own work.** |

**Plagiarism**

Here is an example of plagiarism:

A regression is a statistical analysis assessing the association between two variables. It is used to find the relationship between two variables.

The following is NOT plagiarism:

“A regression is a statistical analysis assessing the association between two variables. It is used to find the relationship between two variables.” (<https://www.easycalculation.com/statistics/learn-regression.php>).

The difference is in the punctuation and the attribution.

Note that one can self-plagiarize. If you are using something that you wrote (e.g. a blog or a previously published article), please reference yourself.

**Consequences**

Plagiarism, sabotage, fabrication, and cheating carry high penalties.

Instructors may choose to fail the student on the assignment, give a 0 for the assignment, fail the student for the course, and/or bring the student before the Honor Council at which point expulsion is an option.

The worst penalty from breaking the honor code is the fact that either the person or their peers (or both) miss out on learning the material; they miss out on growth.

The obvious takeaway is:

Have a blast in this course learning the material. We learn through making mistakes and then talking through and correcting those mistakes.

**Weekly Breakdown of Course**

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| *Unit* | *Chapter* | *Topic* |
| *1* | *1* | *Drawing Statistical Conclusions* |
| *2* | *2* | *Inference Using* t*-Distributions* |
| *3* | *3* | *Data Screening, Assumptions, and Transformations* |
| *4* | *4* | *Alternatives to the* t*-Tools for One, Two, and Multiple Samples* |
| *5* | *5* | *Comparisons Among Several Samples* |
| *6* | *6* | *Linear Combinations and Multiple Comparison Problem* |
| *7* | *1 - 6* | *Midterm Exam Week* |
| *8* | *Notes* | *Correlation and Scatterplots* |
| *9* | *7* | *Simple Linear Regression: Introduction* |
| *10* | *7* | *Simple Linear Regression: Prediction* |
| *11* | *8* | *Regression Diagnostics and Model Refinement* |
| *12* | *9* | *Multiple Linear Regression* |
| *13* | *10* | *Inference for Multiple Linear Regression* |
| *14* | *11-12* | *Model Selection and Validation* |
| *15* | *1 - 12* | *Review and Final Exam* |

**Best Practices for Success in MSDS 6371 (and other courses also)**

**Attendance**. Take responsibility for your commitment. Attendance means not only being there for synchronous sessions but also participating in asynchronous work.

**Citizenship.** You need to be actively engaged to succeed in this class. Talking on cell phones, texting, “facebooking,” tweeting, or leisure web browsing are prohibited in class. These are considered to be disruptive (not to mention rude).

**Integrity.** A lot of the graded work occurs outside of class, so honesty and integrity are expected in your submissions. Evidence of academic dishonesty will minimally result in zeroes for all involved parties, and perhaps University-level disciplinary action. Don’t risk your academic career.

**Humility.** Don’t get lost! Ask questions in class. If something isn't clear to you, it probably isn't clear to others either. Questions may arise because your professor hasn’t made a connection clear or has inadvertently left out an important point. Your question gives the professor a chance to explain more clearly. Don't be proud or shy.

**Organization.** Don’t procrastinate! This is a technology-driven course. Count on your computer failing or your wireless connection breaking the night before a due date. Start early and give yourself a chance to succeed.

**Deadlines.** You will generally have a week to complete an assignment. Due dates and times will be clearly indicated. Late submissions will be penalized, but it is much better to turn in work late than not at all (or to turn in incomplete/sloppy work). Work turned in after solutions have been posted to the course website will receive no credit.

**Getting help.** If questions arise while doing assignments/exams, do your best to resolve these questions before the assignment is due, first by taking time to seek answers yourself, next by asking questions on the wall, and finally via e-mail to your instructor or other students. **I encourage you and expect you to seek help.** For questions during exams, please e-mail the live session instructor directly.

**Collaboration.** The formation of study groups and collaboration with your fellow students in tackling the assignments is encouraged. Working together in groups on homework is permitted, even encouraged. **However, every student should write up and complete his or her homework independently. Students who chose to turn in exactly the same work will share the grade assigned.** Talking about problems with other people does help in learning, but just copying the solutions from one another doesn't help!

**Looks do matter!** All assignments must be NEATLY executed and organized. You risk a zero on any assignment submitted in a sloppy manner. See submission guidelines for more detail.

**Submission guidelines for assignments**

* Your name must be at the top of the first page and on each successive page.
* Submit solutions in problem order.
* Use an easy-to-read variable-width font (try Ariel, Helvetica, and Geneva fonts—this document is in Helvetica 11 point) with a minimum of 11 point font.
* Relevant SAS/R code and output from the SAS/R console must be included in-line at the appropriate point using Courier New (or other fixed width) font, in 10 point size. **Inclusion of irrelevant code or output will be penalized (aka SAS DUMP). Do not include a printout of the data as well. (example, data / datalines statements in SAS.)**
* Any graphics from SAS/R must be electronically cut and pasted in-line at the appropriate point of the write-up. You can use Word to resize the graphics appropriately.
* Any mathematical notation must be provided with appropriate use of subscripts, superscripts, and symbols. Use MS Equation or another equation editor if you submit your work in Word.

University Policies

**Incompletes** will be given only in the case of extraordinary circumstances that prevent you from finishing the semester. You must have completed at least 50% of the course with a passing grade to be eligible for an incomplete.

**Religious Observance:** Religiously observant students wishing to be absent on holidays that require missing class should notify the live session instructor via e-mail, and should discuss with the instructor, in advance, acceptable ways of making up any work missed because of the absence. (See University Policy No. 1.9.)

**Excused Absences for University Extracurricular Activities:** Students participating in an officially sanctioned, scheduled University extracurricular activity will be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work (University Undergraduate Catalogue).

**Students with disabilities**: The university has procedures in place to handle accommodations for disabilities. Please go to <http://www.smu.edu/Provost/ALEC/DASS/DisabilityAccommodations> for more information.

**CALENDAR**

[**http://www.smu.edu/EnrollmentServices/Registrar/AcademicCalendarsCourseCatalogs/AcademicCalendars**](http://www.smu.edu/EnrollmentServices/Registrar/AcademicCalendarsCourseCatalogs/AcademicCalendars)