Course Module
Stephen F. Austin State University
MATH 1342-004, Introduction to Statistics
Math (Bush) 208 12:00-1:40 PM MTWR
ZOOM: Mtg#: 957 2188 8930, PC: 921510

Instructor
Robert (Bob) Henderson
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BA in Math & History – Trinity University, San Antonio, TX (1978)
MS in Mathematical Statistics – Southern Methodist University, Dallas, TX (1980)
PhD in Mathematical Statistics – Southern Methodist University, Dallas, TX (1982)
MBA – University of Delaware, Newark, DE (1988)
Worked in industry for 27 years: ~6 years with DuPont as internal consultant for a variety of businesses and staff groups; then ~21 years in the semiconductor business, most with a supplier of a key enabling material for semiconductor production; and later with Samsung working primarily with engineers in process control efforts. The entire 27 years included many training delivery, as well as course development activities related to basic statistics, experimental design, and process control systems. Fall 2009 was first semester working at SFA.

Teaching Hours – 10:00AM to 11:40AM & 12:00PM – 1:40PM MTWR
Office Hours – 11:40AM-12:00PM MTW 2:00PM-4:00PM MTW, and by appointment.

Course Goals
Statistics is a subject that has a tendency to evoke emotions for students. These emotions can run from fear and loathing to apathy, and there are the occasional students who are excited about the subject. However, the latter is generally not the norm. One of the goals of the course will be to change any primary negative emotion associated with statistics to one of at least respect for the subject, if not excitement, and, of course to nurture even greater enthusiasm for anyone already interested in the subject.

There is substantial evidence that statistics can be challenging for many students. Traditionally, a significant barrier to having students embrace learning about statistics has been the relatively large number of formulas involved. These are not going to go away, and there are many of them in the course material; however, it is NOT going to be a goal of this course for the student to memorize formulas. Students will have access to formulas for all work and exams, just as you would in any future employment.

My experience is that much of the challenge for many people with the subject of statistics is that the subject often requires us to think about things differently than we have before encountering this subject. Statistics is a subject that requires admission of ignorance, and this takes a certain level of humility, security, and self-esteem to do. Fortunately, it does not require an admission of complete and total ignorance, and certainly no one enrolled here at SFA would ever be so described. However, it does require admission of ignorance about a specific question or set of questions, which are sufficiently important that effort to reduce our ignorance related to this question (or these questions) is deemed to be of some value.
In order to reduce the level of ignorance, often an experiment is run, an observational study is conducted, or a survey of some sort is initiated, all of which generate data related to the question(s) of interest. With the presence of data, there is always that lurking discipline of statistics, which is simply the art of extracting meaningful information from data.

Unfortunately, what you will find out in this course is that there are many ways to do this, and that rarely, if ever, will one approach provide the exact answer(s) to the original question(s). This can make the study and use of statistics frustrating for some. However, if the process of collecting, analyzing, and interpreting the relevant data is done well, then knowledge will be improved and the level of ignorance will be reduced. If done poorly, then the level of ignorance may actually be increased. Consequently, a second goal of this course is to provide the student with the knowledge necessary to understand when a statistical endeavor has been done well, and how such studies, even the well executed ones, may be lacking.

This course is titled “Introduction to Statistics”, and this is what it is – an introduction. You will not leave this course as a world-class statistician. I have a PhD in statistics and over 27 years working with data and statistics in industry and do not consider myself a world-class statistician. However, the desire is for each of you to leave this class with respect for the discipline of statistics (and perhaps some with a level of excitement about the subject), as well as an understanding of its limitations. In addition, you will acquire the background to be able to work with professional statisticians as a subject matter expert, including being able to more easily converse with a professional statistician, and ask pertinent questions about the approaches and assumptions being made in their efforts to help you address your question(s) of interest. Another take-away from this course would ideally be a healthy perspective on what can and cannot be learned from a specific set of data and or a statistical report attempting to summarize that data.

Text
None. The course reference materials will consist primarily of the Case Study Manual, as well as the Course Notes, both of which will be posted on D2L as discussed through the semester.

Computer Access/Skills
It will be necessary to have access to a Microsoft Office tools: PowerPoint, Word, and Excel. The Class Notes are all PowerPoint files, the Case Study Manual and most of the assignments will be Word files, and the Utilities to do calculations, the Data Sets, and some of the assignments and Class Exercises will utilize Excel files. Almost every workplace will work with these Microsoft programs, and generally expect employees to have competency in working with them when hired. Hence, gaining some experience in using it will likely be helpful beyond this course. In addition, it may be helpful to download the university version of the JMP software (available on MySFA) for work later in the semester; however, while the Case Study Manual will reference it a few times, this is certainly not necessary for this course.

Prerequisites
Students will be expected to have some basic math skills (enough to obtain an acceptable score on the Math element in the SAT or ACT), and some facility with college-level algebra will be helpful. Any familiarity with calculus would be an additional plus, but it certainly is not required.
Course Rationale
Data surrounds us from all media: radio, TV, internet, etc. Data can be collected, summarized, and interpreted as statistics. Decisions are often based on data and statistical summarizations of data. To help us better understand and live in our world, it is helpful to know something about statistics.

Across the domains of human knowledge, information is becoming more quantitative. A basic understanding of statistics is necessary to make some sense out of all the data. The use of statistics has increased in the workplace. Market research, analysis of business trends, manufacturing, and quality assurance all make use of statistical analysis. Statistics are also used both correctly and incorrectly in matters of political and public debate to achieve desired results without deliberately falsifying the data.

The course is designed to introduce the statistical methodology that might be encountered in any of the above situations or others. It is hoped that with this knowledge, the student will have some appreciation for how to critically evaluate the actual information conveyed by some of the more standard types of statistical analyses.

Course Overview
Week 1-2: Introduction & Case 1A – Small Sample Proportion (Binomial Distribution)
Weeks 2-3: Case 1B – Large Sample Proportion (Normal Distribution, Confidence Intervals)
Week 3: Case 2A – Small Sample Population Mean (Descriptive Statistics, t Distribution)
Weeks 3-4: Case 2B – Large Sample Population Mean (Central Limit Theorem)
Week 4: Case 3A – Two Sample Means
Week 5: Case 4A – Correlation & Regression
Week 6: Case 5A – Two Sample Proportions
The above is a general plan, how the term actually proceeds depends on many factors, but is most influenced by students asking questions in class about the assignments.

Course Student Learning Objectives
The ideas it would be expected a MATH 1342 student to successfully address at the time of course completion include:

1) Data from real-world processes exhibits variation. The strongest form of model for this variation is a distribution. As such, distributions, including those of frequent application are of importance in statistics.

2) Because the exact distribution of a population of values is rarely known, statistical science relies on sampling in order to investigate the distribution and its features.

3) We estimate the distribution of a population, or more often, specific features of populations (parameters) with appropriate and corresponding features from a sample (statistics).

4) Knowledge gained from a sample is imperfect. It is not possible to make definitive claims about populations from taking samples. It is, however, possible to provide (non-definitive) claims about populations with margins of error attached.

5) Non-definitive claims about populations can be sufficient for decision making.
6) Claims about populations must be made in recognition that the collected sample is one of many that were possible. As such, statistics vary from sample to sample and therefore have distributions themselves. The most important statistic whose distribution deserves study is the average or proportion (which is merely an average in disguise) of a sample.

7) Investigating the distribution of a statistic leads to the ability to create a margin of error to be provided along with any statistical estimate (confidence interval). This margin of error is intimately tied to two things: the amount of variation present and the size of sample taken.

8) Investigating the distribution of a statistic under an assumption about a parameter leads to a null distribution. The null distribution has information in it that allows an experimenter to assess how common it would be to observe the value of the statistic seen in the sample (p-value). The p-value facilitates a decision regarding the validity of the assumption.

9) Samples should be taken in a way that is representative of the population. Data from the sample should be summarized, described, graphed – generally - communicated in efficient, reliable ways.

10) Data can be of different types. As such, the way we describe and utilize data depends on this type. Descriptive statistic techniques and inferential statistics procedures are intimately tied to data types (students will be exposed to continuous and categorical data, to univariate and bivariate data and to statistical methods for each type).

Departmental Course Syllabus Link:
http://www2.sfasu.edu/math/docs/syllabi/MTH220Syllabus.pdf

**SFASU Policy:** The federal definition of a credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates:
1. Not less than one hour of classroom or direct faculty instruction and a minimum of two hours out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or 10 to 12 weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time, or;
2. At least an equivalent amount of work as outlined in item 1 above for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours.

To this end, all students in courses offered by the Department of Mathematics and Statistics that wish to be successful should plan to spend at least two hours outside of class for every credit hour associated with this course. Expected activities to be completed in the time outside of class include reviewing notes from previous class meetings, reading assigned course resources, completing all assigned exercises and projects, and performing periodic assessment preparation.

**About Assignments**
Given the current pandemic, completed assignments will need to be e-mailed to me at hendersork@sfasu.edu. There will generally be homework and/or quiz problems assigned every day. However, usually, only a subset of the problems assigned will actually be evaluated/graded.
No credit will be given for the correct answer when no work is shown, and/or no information is supplied related to how answers were obtained. Since the grading will primarily be focused on the steps and/or approaches used to reach a final solution, neatness will count. If the steps cannot be followed, or it is unclear how a specific step is reached in a given problem solution, then points will be lost.

Of the problems assigned for homework, it is highly likely only 1 or 2 (or parts thereof) will be chosen at random to be evaluated for each homework result. There generally will be approximately 15-20 homework assignments during the term, and your best ~70-90% of scores will be used in the calculation of the homework grade.

There will be 7 quizzes assigned throughout the course, and again, there will often be multiple problems assigned for each quiz, but only 1 or 2 problems (or parts thereof) chosen at random may be graded for each specific quiz result. The best 5 of the quiz scores will be used in the calculation of the quiz grade.

There will be a project of some nature assigned later in the session. It will be a group project and details will be provided at a later date.

**Grading**

Final grade will be determined based on the following proportions:

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<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework (including Reading HW Review Quizzes)</td>
<td>30%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>30%</td>
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<tr>
<td>Project</td>
<td>10%</td>
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<tr>
<td>Exams</td>
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<tr>
<td>Mid-Term</td>
<td>10%</td>
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<tr>
<td>Final</td>
<td>20%</td>
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Homework and quizzes will be expected to be e-mailed to me by 1PM of the day they are due. Homework will be graded and returned as quickly as possible.

The mid-term will cover up through Case 2A, and the final will be comprehensive. Details on how these exams will be administered will be relayed closer to the actual event.

**Attendance**

Since homework/quizzes account for 60% of the grade, and will be assigned frequently (and the policy is to not accept late homework), it will serve the student to do all the assigned problems by their indicated due times. This is nothing more than is going to be expected of you at any place of employment where they expect you to show up and do the work every day.

**Student Support**

SFASU values students’ mental health and the role it plays in academic and overall student success. SFA provides a variety of resources to support student mental health and wellness. Many of these resources are free, and all of them are confidential.

**Academic Integrity**

It is the responsibility of the student to abstain from cheating. Dishonesty of any kind with respect to examinations, written assignments [completed] in or out of class, alteration of records, or illegal possession of current examinations or keys to examinations shall be considered cheating. Courtesy
and honesty require that any ideas or materials borrowed from another must be fully acknowledged. Offering the work of another as one’s own is plagiarism. The subject matter of ideas thus taken from another may range from a few sentences or paragraphs to entire articles copied from books, periodicals, or the writing of other students. The offering of materials assembled or collected by others in the form of projects or collections without acknowledgment is also considered plagiarism. Any student who fails to give credit for ideas or materials taken from another is guilty of plagiarism.

**Definition of Academic Dishonesty**

Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one’s own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit. (from SFA on-line Student Handbook)

A full description of university procedures and penalties in response to cheating and plagiarism can be found in the on-line Student Handbook in the Academic Integrity section at [http://www.sfasu.edu/policies/academic_integrity.asp](http://www.sfasu.edu/policies/academic_integrity.asp).

All of the above is the official policy of the school; however, the ultimate defender of academic integrity is each individual student. In this class, it often will be helpful to work in small groups on the problems. Sharing ideas and helping each other with approaches to understand and solve the problems is not considered cheating or plagiarism. Copying someone else’s results verbatim (or nearly so) is considered to be cheating (be warned that these situations are generally easy to identify, and both parties will be subject to the respective penalties). You are encouraged to discuss the problems with others outside the classroom, but you are all considered adults, and until you provide evidence to the contrary, will be relied upon to set appropriate boundaries in how you work with others through the duration of this class.

**Withheld Grades**

Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms, the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

**Students with Disabilities**

In accordance with University policy, students with disabilities who need accommodations are expected to initiate a meeting with the professor immediately upon registering with Disability Services to discuss how accommodations included on the Special Accommodation Request form will be provided. Students with disabilities who may have special needs and have not requested support services should seek assistance through Disability Services. The Office of Disability Services (ODS) is located in the Human Services Building, room 325, and can be contacted by
Acceptable Student Behavior
Classroom behavior should not interfere with the instructor’s ability to conduct the class or the ability of other students to learn from the instructional program (see the Student Conduct Code, policy). Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic or other penalties. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom. Students who do not attend class regularly or who perform poorly on class projects/exams may be referred to the Early Alert Program. This program provides students with recommendations for resources or other assistance that is available to help SFA students succeed.