Course Description
STAT 302 is an introductory statistics course covering the basic concepts of data summary, sampling, and statistical inference. We will cover the following topics: descriptive statistics, sampling, sampling distributions, confidence intervals, z tests, t tests (one sample, independent samples and paired), analysis of variance, chi-squared tests, and simple linear regression.

This course focuses on understanding statistical concepts and applying them to real world problems. My goal is to teach you enough about statistics and statistical reasoning so that at the end of the semester you can understand and apply critical thinking to the statistical results presented in newspapers and journal articles in various medical fields.

Prerequisites
Math 141 or Math 166 or the equivalent high school algebra are required before this course.

We use a little high school algebra along with logical reasoning to come to conclusions about data. Be ready to think!

Learning Objectives
My goal is to teach four main topics:

1. How to collect data for a statistical study. I hope you’ll be able to describe different randomization mechanisms, discuss the consequences of failing to use blinding or control groups, and decide which groups study results apply to.
2. How to describe data. We’ll learn how to recognize which charts, graphs, and statistics are appropriate for a given data set. We’ll also interpret these results.
3. How to make appropriate inferences about the population based on data. We’ll devise a non-subjective way to make inferences about a population based on data, and make those inferences on real data sets. We’ll learn how to take random chance into account when interpreting these results.
4. How statistics work. We’ll learn how different results affect different computations.

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YOUR PROFESSOR:
DR. ELIZABETH KOLODZIEJ

Office: 415G Blocker
Email: eykolo@stat.tamu.edu
Office Hours: TR 8:30-9:15, 12:00-12:30, and most Fridays
Course Requirements

Attendance and Daily Work (10%) I expect attendance in each class. You should be on time and ready to take notes, use your calculator, and vote using your clicker. There’s no such thing as an “excused absence” – you’re either in class, or you’re not. Work may include clicker questions, 5 minute papers, or occasionally more involved group work. These cannot be made up, since they depend on being present in class.

Homework (20%) The homework is designed to give you practice working problems and to check on your progress towards understanding how statistics behave and how random chance affects our interpretation of results. It is weighted as heavily as one exam to encourage you to work hard on completing it. Statistics is learned much more by doing than by sitting passively in class. Working with a study group collaboratively is highly encouraged; however, you must do your own work. The lowest two homework grades are dropped; there is no makeup homework.

Exams (20% each midterm; 30% final) We will have two midterm exams and a final exam, all multiple choice. Exams are designed to check that you are the one who has learned the material rather than a friend. If you miss exam 1 or exam 2, you must contact me within 2 working days of a university excused absence.

Grading Scale

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance and Daily Work</td>
<td>10%</td>
<td>Daily work cannot be made up. Due in class.</td>
</tr>
<tr>
<td>Homework</td>
<td>20%</td>
<td>Due approximately weekly on WebAssign.</td>
</tr>
<tr>
<td>Midterm Exams</td>
<td>20% + 20% = 40%</td>
<td>Exam dates: Bring #2 pencils, a grey scantron, and a photo ID.</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
<td>Exam dates: 502: 12/12 at 10:30; 507: 12/13 at 3:30; 510: 12/13 at 8:00</td>
</tr>
</tbody>
</table>

ELECTION 2016

As of August 17, NBC was reporting 43% of voters planned to vote for Hillary Clinton, while 37% planned to vote for Donald Trump. But not every voter was asked who they would vote for in that poll; how sure can we be that these statistics reflect how Americans actually felt? And what does the margin of error of 1.2% mean? Is that why Trump won?

WEBSITE: eCampus.tamu.edu
CLASS: NOTES AVAILABLE IN eCampus OR AT TEXTBOOK SOLUTIONS; iCLICKER
HOMEWORK: www.webassign.net AND ACCESS TO JMP SOFTWARE ON A COMPUTER
TEXTBOOK: The Practice of Statistics in the Life Sciences, Brigitte Baldi and David Moore
EXAMS: 3 GREY SCANTRONS, 8.5 X 11”, AND #2 PENCILS TO BUBBLE THEM
Learning Strategies

What is Statistics?
Learning statistics is like cooking a grilled cheese sandwich. First, people tend to see the bread, the calculations, without realizing what else is there. But bread alone isn’t a sandwich at all; there’s more to statistics than you might first assume. Next comes the cheese, the underlying concepts that make our sandwich-class a statistics class and not a geometry or physics class.

But now we have a cheese sandwich, rather than a grilled cheese sandwich. Ideas need time to melt together in your head: we want to connect the computations to their underlying concepts, and create formulas based on them. This in turn affects our interpretations of results: if data is collected differently, the computations mean something different. Melting together the cheese and the underlying concepts to give appropriate results is the real heart of our class.

Fixed vs. Growth Mindsets
Americans tend to believe in a “fixed mindset,” that is, that ability comes more from talent that individuals are born with than from practice and hard work. But this is much more true in sports, where you need flipper feet to swim or tremendous height to play basketball, than it is in school, and it is more important in the Olympics, where champions are separated by tenths of a second, than it is for everyday work, where reasonable proficiency can be achieved by everyone willing to work hard.

One way in which this is important is illustrated in a study where participants were asked trivia questions while having an EEG. Those with growth mindsets were interested in finding out whether they got the questions right and what the right answers were, while those with fixed mindsets shut down once they knew their performance results.

Unsurprisingly, those with growth mindsets did better on a subsequent trivia quiz. Similarly, students with growth mindsets perform better in classes than students with fixed mindsets.

Another issue has to do with taking risks. In one study, children were given problem-solving tasks that were too difficult for them. One poster child for the growth mindset pulled up his chair, rubbed his hands together, smacked his lips, and announced, “I love a challenge.” However, students with fixed mindsets tend to view setbacks as personal threats, and tend to choose only experiences in which they shine. Seeing failure as a chance to learn enables growth mindset students to choose challenging experiences that are necessary to grow and flourish.

Strategy: Big Picture
Sometimes learning a new subject is simply about putting in time. A pianist has to put in some time each day practicing scales. But there is also some strategy to learning a new skill that will help you learn statistics better in less time. One such strategy is this: while memorization might help a bit here and there, seek to understand the system. For example, if you’ve had a second semester calculus class, do you think of this:

\[
f(x) = \int_{a}^{b} f(x) dx
\]

Or this:

\[
s = \int_{a}^{b} f(x) dx
\]

Similarly, when we study the Central Limit Theorem, I don’t want you to think “\(\frac{\sqrt{n}(x-\mu)}{\sigma}\) converges in distribution to a normal distribution with mean \(\mu\) and standard deviation \(\frac{1}{\sqrt{n}}\)” but rather, I hope you picture what’s going on:

This underlying understanding of the big picture, the statistical concepts, makes learning the computations ten times faster. Memorizing thousands of individual facts takes far too long – understand the system, and there’s far less to worry about.

Help and Resources
If you are feeling lost or overwhelmed:

1. Make an appointment with me. I will be in my office during office hours. (If I’m not there, I probably slipped away to the bathroom briefly and will be right back.) If you’re not available during my office hours, email me for another time.

2. Ask lots of questions on the discussion board on eCampus. Answering other students’ questions is, perhaps surprisingly, a great way to “overlearn” something for your own benefit: when you teach something to a friend, you keep it in long term memory much longer.

3. The Statistics Department has employed graduate students including our TA to help you with homework problems. Open lab times are TBA. The lab is in Blocker 162, down the hall from the coffee shop.

4. Visit the Academic Success Center website (successcenter.tamu.edu). They have lots of helpful information on math study skills, note taking skills, textbook reading skills, time management, and how to handle anxiety.
The Fine Print

Statement on Disabilities:
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation for their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

Statement on Sexual Harassment:
Sexual harassment is a form of sex discrimination. Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitute sexual harassment when this conduct explicitly or implicitly affects an individual's employment, unreasonably interferes with an individual's work or educational performance, or creates an intimidating, hostile, or offensive work environment.

Statement on Plagiarism:
The handouts used in this course are copyrighted. By “handouts”, I mean all materials generated for this class, which include but are not limited to syllabi, quizzes, exams, lab problems, in-class materials, review sheets, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts, unless I expressly grant permission. As commonly defined, plagiarism consists of passing off as one’s own ideas, words, writings, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. If you have any questions regarding plagiarism, consult the latest issue of the Texas A&M University Students Rules, under the section “Scholastic Dishonesty”.

Academic Integrity Statement:
Plagiarism is just one example of academic misconduct. The Aggie Honor System Office provides the following definitions of academic misconduct and acts that are characterized as scholastically dishonest:

Cheating: Intentionally using or attempting to use unauthorized materials, information, notes, study aids or other devices or materials in any academic exercise.

Fabrication: Making up data or results, and recording or reporting them; submitting fabricated documents.

Falsification: Manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record.

Multiple Submissions: Submitting substantial portions of the same work (including oral reports) for credit more than once without authorization from the instructor of the class for which the student submits the work.

Plagiarism: The appropriation of another person’s ideas, processes, results, or words without giving appropriate credit.

Complicity: Intentionally or knowingly helping, or attempting to help, another to commit an act of academic dishonesty.

Abuse and Misuse of Computer Access: Students may not misuse computer access or gain unauthorized access to information in any academic exercise.

“An Aggie does not lie, cheat, or steal or tolerate those who do”.

FAMOUS STATISTICIANS

William Sealy Gosset
Gosset used his statistical knowledge to brew better beer for Guinness. Guinness wouldn’t allow him to publish work under his own name, which is why we have Student’s t-distribution rather than Gosset’s distribution.

Florence Nightingale
Nightingale used circular histograms to illustrate the necessity of sanitary reform in India. After a decade of reform, the mortality rate in the British Army in India declined from 69 to 18 per 1,000.
## Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Chapters to Read</th>
<th>Tuesday</th>
<th>Thursday</th>
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</thead>
<tbody>
<tr>
<td>1/17 and 1/19</td>
<td>1, 2</td>
<td>Syllabus Day, Sample vs. population, descriptive vs. inferential (Chap 1)</td>
<td>Graphs, Mean, median (Chap 2)</td>
</tr>
<tr>
<td>1/24 and 1/26</td>
<td>3, 4</td>
<td>Spread: standard deviation, IQR, box plots (Chap. 2)</td>
<td>Scatterplots, Correlation, Association vs. causation (Chap. 3, 4)</td>
</tr>
<tr>
<td>1/31 and 2/2</td>
<td>5, 9, 10</td>
<td>Two-way tables (Chap. 5)</td>
<td>Probability: intersections and unions (Chap. 9-10)</td>
</tr>
<tr>
<td>2/7 and 2/9</td>
<td>11</td>
<td>Probability: distributions (Chap. 11)</td>
<td>Probability: Bayes’s Rule</td>
</tr>
<tr>
<td>2/14 and 2/16</td>
<td>13</td>
<td>Sampling distributions: proportions, CLT (Chap. 13)</td>
<td>Sampling distributions: means (13)</td>
</tr>
<tr>
<td>2/21 and 2/23</td>
<td></td>
<td>Review</td>
<td>Exam 1</td>
</tr>
<tr>
<td>2/28 and 3/2</td>
<td>14, 15, 17, 19: Ignored hypothesis testing</td>
<td>Confidence Intervals (CI): proportions (19)</td>
<td>Cl: means (14, 15, 17)</td>
</tr>
<tr>
<td>3/13-3/17</td>
<td></td>
<td>Spring Break</td>
<td></td>
</tr>
<tr>
<td>3/21 and 3/23</td>
<td>7, 8</td>
<td>Finish HT</td>
<td>Collecting data: sampling (7)</td>
</tr>
<tr>
<td>3/28 and 3/30</td>
<td>20</td>
<td>Collecting data: experiments (8)</td>
<td>2-sample CI and HT for proportions and relative risk (20)</td>
</tr>
<tr>
<td>4/4 and 4/6</td>
<td>18</td>
<td>2-sample CI and HT for means (18)</td>
<td>Review</td>
</tr>
<tr>
<td>4/11 and 4/13</td>
<td>4, 23</td>
<td>Exam 2</td>
<td>Regression: Inference (4, 23)</td>
</tr>
<tr>
<td>4/18 and 4/20</td>
<td></td>
<td>Regression: residuals (23)</td>
<td>ANOVA (24)</td>
</tr>
<tr>
<td>4/25 and 4/27</td>
<td>24, 22</td>
<td>Chi-square (22)</td>
<td>Review</td>
</tr>
<tr>
<td>5/1 – 5/5</td>
<td></td>
<td>Attend Friday class!</td>
<td>Some Finals (Not ours)</td>
</tr>
<tr>
<td>5/9</td>
<td></td>
<td>Final: 8am 503 and 1pm 504</td>
<td></td>
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