Instructor: Jacob Turner, Ph.D.
Department: Mathematics and Statistics
Email: turnerja2@sfasu.edu
Phone: 936-468-1692
Office: 342 NM
Office Hours:

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
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<tbody>
<tr>
<td>10:00am-12:00pm</td>
<td>10:00am-12:00pm</td>
<td>3:30pm-4:30pm</td>
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Class meeting time and place: Tuesday/Thursday 5pm-7:30pm  Mathematics Room 213

Course Description: Probability, statistical inference, rank tests, chi-square tests, linear regression and correlation, analysis of variance, multiple regression.

Text and Materials:

<table>
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<tbody>
<tr>
<td>R statistical software</td>
<td>Freely Available</td>
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Course Goals:

- Obtain the ability to define and explain the terminology used in the application of statistical methods
- Perform appropriate one sample, two sample, and many sample inferences on means. Additionally statistical inference on standard deviations, proportions, correlations
- Broaden the understanding of generalized models and their special cases.
- Interpret a wide variety of graphical displays, statistics, and result of confidence intervals and hypothesis tests
- Determine when normal-theory or nonparametric approaches should be preferred for a specific data set

Computer Access/Skills:

This course is all about application to real world problems, we live in an age where data sets are massive and statistical software is absolutely necessary. I will be providing R scripts and small R tutorial sessions during class. R and its friendly user interface RStudio is freely available to download. [https://www.r-project.org/](https://www.r-project.org/)  [https://www.rstudio.com/](https://www.rstudio.com/)

R is a programming language, but this is not a programming course. I will provide you with as many example code snippets and tools as I possibly can so you can focus on the content of the course. The online community however is great, and once you start to see the power of R, you are simply a google search away from figuring out how to do some amazing things. I encourage you to learn as much as you can if time allows.

If some students are familiar with other statistical software or tools I’m not opposed to you using them, just make sure that you are using them appropriately as the results and interpretation from the software is what matters most. A point and click version of SAS called JMP, is freely available via MySFA.
**Tentative Course Calendar:**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Statistical Thinking, Data Collection, &amp; The Impact on Inference</td>
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<tr>
<td>2</td>
<td>Descriptive Statistics, Reference Distributions, Probability Distributions, Sampling distributions</td>
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<tr>
<td>3</td>
<td>Assumption Checking, One Sample t-tools Confidence Intervals and Interpretation; Intro to hypothesis testing</td>
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<tr>
<td>4</td>
<td>One Sample t-tools, Error Rates, Inference for Variances, power and sample size</td>
</tr>
<tr>
<td>5</td>
<td>Two sample t-tools, Tests for equal variances, power and sample size</td>
</tr>
<tr>
<td>6</td>
<td>Real world logistics, transformations, permutation tests / Box-Cox Transformations</td>
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<tr>
<td>7</td>
<td>Nonparametric tests using ranks, In class conceptual midterm</td>
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<tr>
<td>8</td>
<td>One Way ANOVA analysis / Multiple Testing</td>
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<tr>
<td>9</td>
<td>Correlation - Simple Linear Regression / Special cases</td>
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<tr>
<td>10</td>
<td>Multiple Linear Regression / The building blocks</td>
</tr>
<tr>
<td>11</td>
<td>Multiple Linear Regression / Special Cases / Real world applications to observational studies</td>
</tr>
<tr>
<td>12</td>
<td>Categorical Data analysis (2x2 contingency tables)</td>
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<tr>
<td>13</td>
<td>Extensions to categorical data analysis (RxC and Mantel Haenzel Tests)</td>
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<tr>
<td>14</td>
<td>Logistic Regression</td>
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**Grading Policy:** Grades will be determined by the following:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
</tr>
<tr>
<td>Presentations/Projects</td>
<td>20%</td>
</tr>
<tr>
<td>Mid-Term</td>
<td>30%</td>
</tr>
<tr>
<td>Final</td>
<td>30%</td>
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**Homework**
I will assign conceptual and analysis problems form the text. These will be assigned during class and will be due the following week.

**Presentations/Projects**
It is important that we not only be able to “DO” statistics but also communicate what we did, why we did it, and interpret results appropriately. Throughout the course, we will have a mixture of the following tasks: in class group exercises, presenting the solutions to HW problems, present an analysis project, and/or research additional methods and present what you’ve learned. You are expected to participate and contribute to the group in whatever deliverable is necessary.

**Exams**
The midterm and final will compose of two parts, an in-class portion of conceptual questions and a take home part involving more rigorous data analysis and interpretation.
Grading Scale:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>% Scale</th>
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<tbody>
<tr>
<td>A</td>
<td>90-100</td>
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<tr>
<td>B</td>
<td>80-89</td>
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<tr>
<td>C</td>
<td>70-79</td>
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<tr>
<td>D</td>
<td>60-69</td>
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<tr>
<td>F</td>
<td>below</td>
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Attendance Policy

Attendance is expected and will be reflected in everything you submit. It will be increasingly difficult to get a good grade or even pass if you miss class regularly. When a student misses class, s/he is expected to proactively and promptly acquire the missed information before the next calendar class day and meet all requirements administered by the instructor and the student must: Submit an official, dated note from attending doctor, parent, or supervisor, depending on the nature of the absence. Documentation must be submitted promptly.

The following is an excerpt from SFA Policy 5.4:

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 a minimum of 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.

Academic Integrity (SFA Policy 4.1)

Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

The penalty for a student found cheating on any part of an assignment, quiz, or exam in this class will range from a grade of zero on the work to a grade of F in the course, and may result in additional, more severe disciplinary measures. A student who allows another to copy his work and the student copying the work are both guilty of cheating. Do your own work. Do not show your completed work to others. Do not allow others to copy your work.
Definition of Academic Dishonesty
Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to

- using or attempting to use unauthorized materials on any class assignment or exam
- falsifying or inventing of any information, including citations, on an assignment
- helping or attempting to help other student(s) 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 include, but are not limited to

- submitting an assignment as one’s own work when it is at least partly the work of another person
- submitting a work that has been purchased or otherwise obtained from an Internet source or another source
- incorporating the words or ideas of an author into one's paper without giving the author due credit.

Withheld Grades Semester Grades Policy (SFA policy 5.5)
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. The circumstances precipitating the request must have occurred after the last day in which a student could withdraw from a course. Students requesting a WH must be passing the course with a minimum projected grade of C.

Students with Disabilities
To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices.

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

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 10.4), https://www.sfasu.edu/policies/student-code-of-conduct-10.4.pdf). 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.
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Credit hours: 3

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Course Prerequisites and Corequisites: MATH 1342 or equivalent

Course outline:

- **Descriptive Statistics**
  - Graphical Methods
  - Measures of Central Tendency
  - Measures of Variability
  Approximate time spent: 5%

- **Probability**
  - Probability Laws
  - Conditional Probability and Independence
  - Probability Distributions for Random Variables:
    - Discrete
    - Continuous
  - Random Sampling
  - Sampling Distributions
  Approximate time spent: 15%

- **Statistical Inference (Estimation and Hypothesis Tests)**
  - Inferences about a single population parameter
  - Inference comparing parameters of two populations
  Approximate time spent: 15%

- **Statistical Inference Comparing Parameters for More Than Two Populations**
  - Analysis of Variance (ANOVA)
  - Kruskal-Wallis Test
  Approximate time spent: 25%

- **Multiple Comparisons**
  - Fisher's Least Significant Difference Test
  - Tukey's Test
  Approximate time spent: 10%
Student-Newman-Keuls Test
- Duncan's Test
- Dunnett's Test
- Scheffe's Test

**Chi-Square Tests** 10%
- Goodness-of-Fit Test
- Tests for Independence and Homogeneity

**Regression** 20%
- Correlation and Simple Linear Regression
- Multiple Regression

**Student Learning Outcomes (SLO):** At the end of STAT 5340, a student who has studied and learned the material should be able to:
1. Solve problems encountered in research projects and make decisions based on data and life experiences beyond the classroom and university setting. [PLO: 1,2,3]
2. Investigate the nature of independence and/or dependence among several variables. [PLO: 1,2,3]
3. Formulate statistical hypotheses in terms of the parameters of populations. [PLO: 1,2,3]
4. Test hypotheses using appropriate test statistics. [PLO: 1,2,3]

**Program Learning Outcomes (PLO):** Students graduating from SFA with a M.S. Mathematical Sciences Degree will:
1. Written Communication - SFA Mathematics majors communicate mathematical ideas effectively in written form, integrating mathematical notation correctly and consistently.
2. Verbal Communication - SFA Mathematics majors communicate mathematics effectively to diverse audiences.
3. Mathematical Maturation - SFA Mathematics majors grow from a computational understanding of mathematics to an integrated approach which includes critical thinking proficiency, computational facility, conceptual understanding, and problem-solving persistence.

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**On-campus Resources:**
SFASU Counseling Services  
[www.sfasu.edu/counselingservices](http://www.sfasu.edu/counselingservices)  
3rd Floor Rusk Building  
936-468-2401

SFASU Human Services Counseling Clinic  
[www.sfasu.edu/humanservices/139.asp](http://www.sfasu.edu/humanservices/139.asp)  
Human Services Room 202  
936-468-1041

**Crisis Resources:**
Burke 24-hour crisis line 1(800) 392-8343  
Suicide Prevention Lifeline 1(800) 273-TALK (8255)  
Crisis Text Line: Text HELLO to 741-741

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*Date of document: 08/17/2021*