Name: Kent Riggs, Ph.D.  Office: 350 in Bush Mathematical Sciences Building
Email: riggske@sfasu.edu  Office Hours: 9-11:30 on MW, or by appointment
Phone: (936) 468-6263  Class meeting time and place: 3:30-4:45 TR in 213 Bush Mathematical Sciences Building

Course Description
Random variables, discrete and continuous distributions, multiple random variables, distributions of functions of random variables, estimation, and hypothesis testing.

Text and Materials
Introduction to Mathematical Statistics by Hogg, McKean, and Craig, 7th edition

R Commands in Sage by Dr. Tom Judson: http://utmost-sage-cell.org/r-commands
This is a web-based platform that allows one to easily compute basic probabilities, descriptive statistics, and inferential statistical analysis.

Course Requirements
Homework, Exams, and Final Exam

Homework
Homework problems will not be taken up to be graded in a traditional sense. However, we shall have periodic “homework quizzes” in an effort to motivate/reward correctly completed homework.

Exams
Exams may be in-class, take-home, or a mixture of both formats.

Final Exam
The Final Exam shall be comprehensive. As such, it's grade will replace the lowest of the previous three exams, provided that it is higher.

Grading Policy
The final average will be computed using the following weights:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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</thead>
<tbody>
<tr>
<td>Homework</td>
<td>15%</td>
</tr>
<tr>
<td>Exams (20% each)</td>
<td>60%</td>
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<tr>
<td>Final Exam</td>
<td>25%</td>
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</table>

Attendance Policy
Attendance/participation is expected.

Classroom Behavior
In addition to what is specified on the document under “Other,” please note that your behavior in the classroom must reflect a proper respect for others and self. Also, note that your dress attire must be modest and not distracting to others. Any violations of classroom behavior may result in dismissal from the class.

Other
Please see http://www2.sfasu.edu/math/docs/syllabi/MATH5350Syllabus.pdf for elements common to all sections.
<table>
<thead>
<tr>
<th>Section</th>
<th>Problems</th>
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<tr>
<td>1.2</td>
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<td>4.2</td>
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<td>4.6</td>
<td>4, 5</td>
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MATH 5350 – Mathematical Statistics I  
Course Syllabus

Course description: Random variables, discrete and continuous distributions, multiple random variables, distributions of functions of random variables, convergence concepts.

Credit hours: 3

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.

Course Prerequisites and Corequisites: MTH 439 or equivalent

Course outline: Approximate time spent

- Probability Functions and Spaces 5%
  - Review of Set Theory
  - Probability Functions & the Axioms
  - The Probability Space
  - Elementary Probability Rules Based on the Axioms

- Results of Conditioning & Independence 10%
  - Conditional Probability
  - Theorem of Total Probabilities
  - Bayes’ Rule
  - Independent Events

- Language of Random Variables 10%
  - Discrete vs. Continuous Random Variables
  - Cumulative Distribution Function
  - Mass and Density Functions

- Summary of Random Variables 10%
  - Expected Value (Discrete and Continuous)
  - Variance and Standard Deviation of Random Variables
  - Moment Generating Functions (and other Generating Functions)

- Discrete Distribution Theory 20%
  - Uniform Distributions
  - Bernoulli Trials
• Binomial Models
• Geometric Models
• Negative Binomial Models
  o Hypergeometric Models
  o Poisson Models and the Poisson Process
  o Relationships Between Discrete Probability Models
• **Continuous Distribution Theory** 25%
  o Uniform Distributions
  o Exponential and Gamma Models
  o The Normal Distribution
  o The Beta and Other Continuous Models
  o Relationships Between Models
    ▪ Exponential and Poisson
    ▪ Gamma and Poisson
    ▪ Uniform and Exponential
  o Truncation and Mixtures of Random Variables
• **Multivariate Probability Models** 15%
  o Joint Cumulative Distribution Functions
  o Joint Mass Functions
    ▪ The Multinomial Distribution
  o Joint Density Functions
    ▪ The Multivariate Normal Distribution
  o Multivariate Expectation
  o Conditional Distributions
    ▪ Independent Random Variables
    ▪ Conditional Expectation and Variance
    ▪ Double Expectation Theorem
  o Covariance and Correlation
• **Transformations of Random Variables** 5%
  o The Cumulative Distribution Function Method
  o The Moment Generating Function Method
  o Transformation Theorems

**Student Learning Outcomes (SLO):** At the end of MATH 5350, a student who has studied and learned the material should be able to:

1. Apply the axioms of probability and basic probability laws in order to compute likelihood of events in various scenarios. [PLO 1,2,3]
2. Recognize when conditional probabilities are relevant and be able to calculate a variety of conditional probabilities using several techniques. [PLO 1,2,3]
3. Explain the need for summarizing random variables and successfully compute the expected value and standard deviation of random variables useful in practice. [PLO 1,2,3]
4. Explain the role and meaning of random variable. [PLO 1,2,3]
5. Model random natural phenomena using discrete and continuous probability distributions. [PLO 1,2,3]
6. Explain the relationships which exist between the major probability distributions. [PLO 1,2,3]
7. List the main features of the popular discrete and continuous probability models. [PLO 1,2,3]
8. Calculate probabilities in higher dimensions and model multivariate random variables. [PLO 1,2,3]
9. Explain the need for functions of random variables and determine the appropriate density function for the function of a continuous random variable. [PLO 1,2,3]
10. Delineate between the major methods useful for finding the distribution of a function of random variables. [PLO 1,2,3]
11. Calculate and explain the relevance of correlation and its interpretation. [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.

Academic Integrity
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 (SFA policy 4.1):
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 one’s 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 the Internet or another source;
- incorporating the words or ideas of an author into one's paper or presentation without giving the author credit.

Withheld Grades Semester Grades (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.

www.sfasu.edu
On-campus Resources:
SFASU Counseling Services
www.sfasu.edu/counselingservices
3rd Floor Rusk Building
936-468-2401

SFASU Human Services Counseling Clinic
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

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). 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.

Date of document: 08/17/2021