



MATH 3345 – Statistical Inference Course Syllabus

Course description: Covariance and correlation, sampling distributions, development and data analysis concerning: one/two/many sample location tests and confidence intervals. Analysis of variance and simple linear regression, chi-square tests for categorical data. Use of technology and/or statistical software throughout.

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: MATH 3315 (or concurrent enrollment) and MATH 3340

Course outline:	<u>Approximate time spent</u>
<ul style="list-style-type: none">• Covariance and Correlation	10%
<ul style="list-style-type: none"><ul style="list-style-type: none">○ Introduction to multiple random variables and independence○ Joint, marginal and conditional distributions○ Calculation and interpretation of correlation and covariance	
<ul style="list-style-type: none">• Sampling and Sampling Distributions	10%
<ul style="list-style-type: none"><ul style="list-style-type: none">○ Properties of Normal, t, chi-squared and F distributions○ Properties of the sample mean and variance	
<ul style="list-style-type: none">• The Need for Estimation and Testing: a review of scenarios in which popular discrete & continuous named distributions are used.	5%
<ul style="list-style-type: none"><ul style="list-style-type: none">○ Use of experimental conditions in order to identify a parametric family○ Use of descriptive statistics to identify a parametric family	
<ul style="list-style-type: none">• Elements of Testing Hypotheses	10%
<ul style="list-style-type: none"><ul style="list-style-type: none">○ terminology associated with testing○ likelihood ratio tests	
<ul style="list-style-type: none">• The Popular One Sample Location Tests and Confidence Intervals	15%
<ul style="list-style-type: none"><ul style="list-style-type: none">○ mathematical development of one sample t and z tests (and associated confidence intervals)○ analysis of data and computer application for one sample t and z procedures○ mathematical development of the sign and signed rank tests○ analysis of data and computer application for sign and signed rank procedures	

- paired data as a one-sample problem
- **The Popular Two Sample Location Tests and Confidence Intervals** **15%**
 - mathematical development of the two-sample independent t-test (and associated confidence interval)
 - analysis of data and computer application for two-sample independent t-test procedures
 - mathematical development of the rank sum test
 - analysis of data and computer application for the rank sum test procedure
- **Tests for Variances and Associated Confidence Intervals** **5%**
 - The chi-squared test (and associated confidence intervals) for a single population variance including data analysis and computing/software usage
 - The F test for the equality of two population variances (and associated confidence interval) including data analysis and computing/software usage.
- **One Way Analysis of Variance & Simple Linear Regression** **20%**
 - mathematical development & application
 - analysis of data and computer application for ANOVA and regression procedures
 - multiple comparisons in ANOVA, residual analysis in Regression including data analysis and computing/software usage
- **Categorical Data** **10%**
 - Chi-squared goodness-of-fit test
 - Tests for Independence/Row Homogeneity for Two Categorical Variables
 - Analysis of data and computer application for categorical data procedures

Student Learning Outcomes (SLO): At the end of MTH 420, a student who has studied and learned the material should be able to:

1. Discuss the similarities and differences between the branch of mathematics known as probability and the science of statistics. [PLO: 1,2,3]
2. Describe the key components of a hypothesis test. [PLO: 1,2,3]
3. Analyze one or two sample data, including the use of computing/software, in order to test a hypothesis or form a confidence interval about measures of center and spread. [PLO: 1,2,3]
4. Demonstrate an understanding of the theory, assumptions and procedures of analysis of variance and analyze data suitable for ANOVA including the use of computing/software. [PLO: 1, 2, 3]
5. Explain how confidence intervals and hypothesis tests in one, two and many sample problems are derived and interpreted, including knowing the proper assumptions for each procedures' application. [PLO: 1, 2, 3]
6. Choose and apply an appropriate statistical tool to analyze data from one, two or many samples. Specifically, students will be able to discriminate between the proper scenarios for applying parametric and nonparametric methods. [PLO: 1, 2, 3]
7. Analyze categorical data using chi-squared methods and discuss the assumptions and limitations of these procedures, including the use of computing/software. [PLO: 1,2,3]
8. Describe relationships which exist among bivariate data through the use of correlation measures and simple linear regression models, including the use of computing/software. [PLO: 1,2,3]

Program Learning Outcomes (PLO): Students graduating from SFA with a B.S. Degree and a major in mathematics 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.

This course meets educator preparation standards for one or more certification programs; a complete listing of all the educator preparation standards this course meets can be found at:

<https://sfasu.edu/docs/jacksteach/jacksteach-standards-alignment-chart.xlsx>.

Academic Integrity

[The Code of Student Conduct and Academic Integrity](#) outlines the prohibited conduct by any student enrolled in a course at SFA. It is the responsibility of all members of all faculty, staff, and students to adhere to and uphold this policy.

Articles IV, VI, and VII of the new Code of Student Conduct and Academic Integrity outline the violations and procedures concerning academic conduct, including cheating, plagiarism, collusion, and misrepresentation. Cheating includes, but is not limited to: (1) Copying from the test paper (or other assignment) of another student, (2) Possession and/or use during a test of materials that are not authorized by the person giving the test, (3) Using, obtaining, or attempting to obtain by any means the whole or any part of a non-administered test, test key, homework solution, or computer program, or using a test that has been administered in prior classes or semesters without permission of the Faculty member, (4) Substituting for another person, or permitting another person to substitute for one's self, to take a test, (5) Falsifying research data, laboratory reports, and/or other records or academic work offered for credit, (6) Using any sort of unauthorized resources or technology in completion of educational activities.

Plagiarism is the appropriation of material that is attributable in whole or in part to another source or the use of one's own previous work in another context without citing that it was used previously, without any indication of the original source, including words, ideas, illustrations, structure, computer code, and other expression or media, and presenting that material as one's own academic work being offered for credit or in conjunction with a program course or degree requirements.

Collusion is the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any provision of the rules on academic dishonesty, including disclosing and/or distributing the contents of an exam.

Misrepresentation is providing false grades or résumés; providing false or misleading information in an effort to receive a postponement or an extension on a test, quiz, or other assignment for the purpose of obtaining an academic or financial benefit for oneself or another individual or to injure another student academically or financially.

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. For additional information, go to <https://www.sfasu.edu/policies/course-grades-5.5.pdf>.

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>.

Student Wellness and Well-Being

SFA values students' overall well-being, mental health and the role it plays in academic and overall student success. Students may experience stressors that can impact both their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, emotional well-being, alcohol and other drugs, identities, finances, etc.

If you are experiencing concerns, seeking help, 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.

On-campus Resources:

The Dean of Students Office (Rusk Building, 3rd floor lobby)

www.sfasu.edu/deanofstudents

936.468.7249

dos@sfasu.edu

SFA Human Services Counseling Clinic Human Services, Room 202

www.sfasu.edu/humanservices/139.asp

936.468.1041

The Health and Wellness Hub "The Hub"

Location: corner of E. College and Raguette St.

To support the health and well-being of every Lumberjack, the Health and Wellness Hub offers comprehensive services that treat the whole person – mind, body and spirit. Services include:

- Health Services
- Counseling Services
- Student Outreach and Support
- Food Pantry
- Wellness Coaching
- Alcohol and Other Drug Education

www.sfasu.edu/thehub

936.468.4008

thehub@sfasu.edu

Crisis Resources:

- Burke 24-hour crisis line: 1.800.392.8343
- National Suicide Crisis Prevention: 9-8-8
- 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.

Date of document: 08/23/2023