Department of Mathematics and Statistics

General Statistics

MATH 17-114, 48 contact hours, 3 credit hours

5-Week Summer Session

Instructor:	**TBA**
Email:	**TBA**
Office Hours:	**TBA**

Prerequisites

ACT math score of at least 22, HS GPA of 3.00, successful completion of Math Skills, or concurrent enrollment in 17014 Strategies for General Statistics. Students wishing to receive credit for 17-114 by passing an examination may attempt to do so. The procedure is given in the catalog and must be carried out during the first week of classes.

Textbooks and Supplementary Materials

Textbook

INTRO STATS (4th ed.), by Richard D. DeVeaux, Paul F. Velleman, and David E. Brock (selected sections from chapters 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, and 22).

Other Resources

The STATCATO software program (free download).

Course Description

Basic concepts of decision making, central values, variability, probability, and statistical inference, elementary concepts of correlation, parametric tests of significance and regression analysis.

Course Rationale

The scope of statistics and the need to study statistics have grown enormously in recent years. One reason is the increasingly quantitative approach employed in many disciplines – not just the sciences – that affect our lives. Another reason is that the amount of data that is collected, processed, and disseminated to the public has increased dramatically. More and more, persons with some knowledge of statistics are needed to take an active part in the collection, analysis and preliminary planning of statistical studies. An educated citizen is expected to use and understand this information.

Student Learning Outcomes

After successfully completing this course, a student will be able to:

Course Content Outcomes	Assessment Methods
1. Identify, describe (using both graphs and numerical tools), and draw conclusions using: • characteristics of distributions of data • characteristics of sampling distributions, including applying the Central Limit Theorem • relationships between two categorical variables via two-way tables and Chi-square • relationships between two quantitative variables via simple linear regression	*Class Discussions*; *Exams*
2. Identify common sampling techniques and explain possible sources of bias or ambiguity, understanding the value of good sampling and questioning processes	*Class Discussions*; *Exams*
3. Estimate parameters of various distributions a. by means of a point estimate b. by means of an interval estimate and identify appropriate interpretations of the intervals	*Class Discussions*; *Exams*
4. Perform hypothesis tests for some basic situations and correctly interpret the results, understanding the value of inference from a sample and questioning conclusions drawn in media	*Class Discussions*; *Exams*
For more detail, see the Statistical Reasoning Mathematics Pathway Strategic Learning Objectives at the end of this document.	

Northwest Core (overarching) Outcomes	**Assessment Methods**
2C. Critical Thinking Choose appropriate processes and interpret results. (Be critical consumers of statistical information by reading, understanding, and questioning charts, graphs, sources and stated summaries and conclusions.)	*Class Discussions* **Exams**
3C. Managing Information Perform the mechanics (including using technology, reading outputs) and/or processes of creating graphs, determining numeric summaries, creating confidence intervals, and performing hypothesis tests.	*Class Discussions* **Exams**
1C. Communication Explain data, limitations, and conclusions to general and more statistically advanced audiences, using density curves, graphs, charts, numerical summaries, written narrative, and speech.	*Class Discussions* **Exams**
4C. Valuing Identify and be critical of misleading information, determining sources of bias and ambiguity in both data collection and analysis, and indicate when resulting conclusions should be trusted, used with caution, or ignored.	*Class Discussions* **Exams**

Course Outline and Expectations

Graded course requirements:

14 Online Tests and 3 Discussion Participations

Instructional Methods and Techniques

Students are expected to read the pertinent sections of the text, view the embedded lecture videos, and complete the discussion assignments and tests. You are allowed two attempts for each test. If you have questions after your first attempt, contact the instructor for help before taking the second attempt.

Participation/Attendance

This is an online course. Students are expected to abide by the deadlines in the course syllabus of the course. Attending class in an online course means logging on to the course site, engaging with the material regularly, and meeting due dates and/or course pacing guides set by the instructor. Keep these points in mind as you read the policy link below. It is the responsibility of the student to promptly notify his or her instructor when unable

to participate. Please refer to the university policy on attendance at http://nwmissouri.smartcatalogiq.com/en/2016-2017/Undergraduate-Catalog/Policies-and-Regulations/Academic-Policies/Attendance

Technology Requirements

Northwest Online (Canvas)

Access to Northwest Online is at: https://www.nwmissouri.edu/online

Grading and Evaluation

Final Grade Calculation

Assessments	Percentages
Chapter Tests	90%
Discussions	10%
Total Percentage For Course	100%

See Section XIV Course Topics for Due Dates.

Grading

In determining the final course grade, the following scale is used:

87.5% – 100% A
77.5% – 87.4% B
67.5% – 77.4% C
57.5% – 67.4% D
Below 57.5% F

Late Work Policy

This is a self-paced course. The due dates are intended to keep you on schedule to complete the coursework on time; there is no penalty for late submission.

Course Evaluation

At the end of this course, students are encouraged to complete a course evaluation that will be distributed to them via email and through a course link.

Course Topics

Module/Week	Due Date	Chapters Covered	Tests
Module 1		**1, 2, 3**	**Chap. 1-2 test, Discussion 1**
Module 2		**4, 5, 6, 7,**	**Chap. 3 test, Chap. 4 test, Chap. 5 test Chap. 6-7 test, Discussion 2**
Module 3		**9, 10, 11, 12, 15**	**Chap. 9-10 test, Chap. 11 test, Chap. 15 test, Discussion 3**
Module 4		**16, 17, 18, 19**	**Chap. 16 test, Chap. 17 test Chap. 18 test, Chap. 19 test**
Module 5		**20, 21, 22**	**Chap. 20 test, Chap. 21 test, Chap. 22 test**

Additional Course Information

Disclaimer: Course schedule is subject to change with instructor notification and students will be responsible for abiding by these changes.

While information and assurances are provided in this course syllabus, it should be understood that content may change in keeping with new research and literature and that events beyond the control of the instructor could occur. Students will be informed of any substantive occurrences that will produce syllabus changes.

Statistical Reasoning Mathematics Pathway

Statistical Reasoning is a first course in statistics for students whose college and career paths require knowledge of the fundamentals of the collection, analysis and interpretation of data.

Topics include the presentation of interpretation of univariate and bivariate data using graphical and numerical methods, probability, discrete and continuous probability distributions, linear regression, an understanding of good practice in study design, statistical inference, confidence intervals and hypothesis testing. Emphasis is placed on the development of statistical thinking, simulation and the use of technology.

Students should develop an appreciation of the need for data to make good decisions and an understanding of the dangers inherent in basing decisions on anecdotal evidence rather than data. To that end, students will use appropriate data-collection methods and statistical techniques to support reasonable conclusion through the following student learning outcomes.

I. **Data Exploration**

Students will analyze data using graphical and numerical methods to study patterns and departures from patterns, using appropriate technology as needed. Specifically, students will be able to:

- **Construct and interpret graphical displays of distributions of univariate data.**
  - Create and interpret dotplots, boxplots, stem and leaf plots and histograms.
  - Analyze center, shape and spread, as well as clusters, gaps, outliers and other unusual features.
- **Summarize distributions of univariate data and compare multiple distributions.**
  - Compute measures of center (median, mean), measures of spread (range, interquartile range, standard deviation) and measures of position (quartiles, other percentiles and standardized scores).
  - Compare groups using back-to-back stem and leaf plots, parallel boxplots and dotplots.
- **Explore bivariate data.**
  - Analyze scatterplots for patterns, linearity, and outliers.
  - Calculate and interpret the correlation coefficient.
- **Explore categorical data.**
  - Create and interpret frequency tables and bar charts.
  - Compare distributions of categorical data.

II. Statistical Design

Students will critically evaluate a data-collection plan to answer a given research question. Specifically, students will be able to:

- **Identify characteristics of good study designs. Understand what conclusions are appropriate for a given design and whether conclusions can be generalized to a larger population.**
  - Identify the population of interest.
  - Determine whether an observational or experimental study is appropriate and feasible.
  - Explain the difference between and importance of random selection and random assignment in study design.
- **Know the elements of planning and conducting an observational study.**
  - Verify basic elements of statistically valid sample survey.
  - Determine when a census or a sample survey is appropriate.
  - Identify potential sources of bias in sampling and surveys.
- **Know the elements of planning and conducting an experimental study.**
  - Verify basic elements of statistically valid experimental design.
  - Explain the purpose of including a control group and blinding in an experiment.
  - Identify potential sources of confounding in an experiment.

III. Probability and Simulation

Students will use probability concepts and simulation. Specifically, students will be able to:

- **Determine and interpret probabilities.**
  - Interpret a probability as a long-run relative frequency of occurrence.

- Calculate the probability of a specified event in a chance experiment with equally likely outcomes.

- **Use probability distributions to describe the behavior of discrete and continuous random variables.**
  - Distinguish between discrete random variables and continuous random variables.
  - Compute and interpret the mean and standard deviation of the probability distribution of a discrete random variable.
  - uniform, normal Demonstrate an understanding of the mean, standard deviation and shape of continuous probability distributions (and skewed).
- **Understand distributions.**
  - Distinguish between the distribution of a sample and a sampling distribution.
  - Describe the sampling distributions of a sample mean and sample proportion in terms of center, shape and spread.
  - Explain how these relate to sample size.
  - Identify when the use of the normal distribution is appropriate.

IV. Statistical Inference

Students will use statistical models to draw conclusions from data. Specifically, students will be able to:

- **Estimate population parameters including confidence intervals when appropriate.**
  - Verify that the appropriate conditions have been met.
  - Construct one-sample confidence intervals for means and for proportions.
  - Construct two-sample confidence intervals for means
  - Interpret confidence intervals in context and explain the meaning of the confidence level associated with a confidence interval estimate.
- **Conduct tests of significance when appropriate.**
  - Verify that the appropriate conditions have been met.
  - Carry out one-sample hypothesis tests for means and proportions.
  - Carry out two-sample hypothesis tests for means
  - Interpret the meaning of rejection of the null hypothesis and of failure to reject the null hypothesis, in context.
  - Demonstrate an understanding of the use of a p-value to reach a conclusion and of the difference between practical significance and statistical significance.

V. Regression Modeling

  - Determine the equation of the least-squares regression line and interpret its slope and intercept in context.

Administrative drop: An instructor may request the Office of the Registrar delete a student from a course roster if the student has not met the prerequisite for the course as stated in the catalog, or as a result of non- attendance in the course. In other words, if you miss many sessions, you may well be dropped from the class.

Code of Academic Integrity

The students, faculty, and staff at Northwest endeavor to sustain an environment that values honesty in academic work, that acknowledges the authorized aid provided by and intellectual contributions of others, and that enables equitable student evaluation. Please refer to Northwest Missouri State University's Academic Integrity Policy at http://www.nwmissouri.edu/policies/academics/Academic-Integrity.pdf

Family Educational Rights and Privacy Act (FERPA)

Family Educational Rights and Privacy Act of 1974, as amended (commonly known as the Buckley Amendment), is a federal law which provides that colleges and universities will maintain the confidentiality of student education records. Please refer to the Family Educational Rights and Privacy Act (FERPA) Policy at http://www.nwmissouri.edu/policies/academics/Family-Educational-Rights-and-Privacy-Act.pdf

Accessibility and Accommodations

Northwest Missouri State University complies with Section 504 of the Rehabilitation Act of 1973 and the American with Disabilities Act of 1990.

If a student has a documented disability that qualifies under ADA and requires accommodations, he/she/they should contact the Accessibility and Accommodations Office for information and assistance. Disabilities accommodated under ADA may include living, learning, psychological, physical disabilities, or chronic health disorders.

Information about supporting documentation requirements and the accommodations application can be found at the University Title IX and Equity, Accessibility & Accommodations website https://www.nwmissouri.edu/titleixequity/accessibility/index.htm

Students with questions about learning accommodations should contact the Accessibility Coordinator in the Title IX and Equity, Accessibility and Accommodations Office at ADA@nwmissouri.edu.

If you have been approved for a learning accommodation and received an accommodations approval letter, or if you have emergency medical information you choose to share with me, or if you need special arrangements in case the building must be evacuated, please inform me immediately.

Non-Discrimination Statement

Northwest Missouri State University (the "University") is committed to maintaining an environment for all faculty, staff, students, and third parties that is free of illegal discrimination and harassment. In keeping with that policy, the University prohibits discrimination and harassment by or against any faculty, staff member, student, applicant for admissions or employment, customer, third-party supplier or any other person (collectively the "University Community") because of their race, color, religion, national origin, sex, sexual orientation, gender identity, pregnancy, ancestry, age, disability, genetic information, veteran status, or any other legally-protected class (collectively "protected statuses"). http://www.nwmissouri.edu/diversity/titlevi.htm

CourseCommunicationPolicy

Students are expected to monitor their Northwest email account daily. Contact your instructor via email (vlieger@nwmissouri.edu)

Course Communication Guidelines (Netiquette)

Be as specific as possible when stating questions or concerns. The instructor will reply as necessary as soon as possible.