

STAT 110—Fundamentals of Statistics

Course Syllabus – Fall 2017

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OFFICE HOURS: Office hours and location are listed on my website: <http://course1.winona.edu/thooks/>.

COURSE WEBSITE and D2L: All announcements, notes, homework assignments, and other important documents will be posted on the course website: http://course1.winona.edu/thooks/STAT_110.html.

Grades and quizzes will be posted on D2L Brightspace: <https://winona.ims.mnscu.edu/>.

TEXT: There is no text required for this course. Course materials will be posted on the website.

PREREQUISITES: Qualifying score on the mathematics placement exam or STAT 100.

BASIC SKILLS COURSE: This course can be used to satisfy Goal Area 4 under the General Education Program. Courses in Goal Area 4 are intended to increase your knowledge about mathematical and logical modes of thinking. This will enable you to appreciate the breadth of applications of mathematics, evaluate arguments, and detect fallacious reasoning. You will learn to apply mathematics, logic, and/or statistics to help you make decisions in your life and career. After successfully completing a course in Goal 4, you will be able to...

- Illustrate historical and contemporary applications of mathematical/logical systems.
- Clearly express mathematical/logical ideas in writing.
- Explain what constitutes a valid mathematical/logical argument (proof).
- Apply higher-order problem-solving and/or modeling strategies.

STAT 110 LEARNING OUTCOMES: Successful completion of this course will promote your abilities to...

- **use mathematical models to describe real-world phenomena and to solve real-world problems, as well as understand the limitations of models in making predictions and drawing conclusions;**
The majority of the problems we will encounter in STAT 110 are real-world based. A successful student will be able to correctly analyze data from such problems, write conclusions, and discuss limitations of an analysis.
- **organize data, communicate the essential features of the data, and interpret the data in a meaningful way;**
This is the heart of STAT 110. Students who successfully complete the course will be able to organize data, communicate essential features of the data both numerically and graphically, and provide interpretations/conclusions.
- **critically analyze scientific and other research;**
A student who successfully completes STAT 110 will be able to investigate a desired research question by carrying out an analysis and providing implications, interpretations, and conclusions that are correct. Successful students will also be able to recognize flaws in designs or analyses carried out by others.
- **use appropriate technology to describe and solve quantitative problems.**
In this section of STAT 110, we will primarily use a statistical software package called JMP. A successful student will be able to use this software package to perform the analyses we encounter in this course and will also be able to interpret the results from the given output.

METHOD OF INSTRUCTION: Class time will consist of some lecture, but you should also expect to participate in discussion and in-class tasks for active discovery. You should always check for new lecture notes on the course website before class begins.

LEARNING REQUIREMENTS: To both achieve and demonstrate the above learning outcomes, you will be asked to complete the following assessment tasks. Your grade earned in the course will be based on the level of mastery of the learning outcomes that you attain.

1. D2L Brightspace Quizzes (approximately 70-80 points).

These quizzes will be administered electronically through Desire2Learn (D2L) Brightspace and will be due at a designated time (which will be announced in class and clearly posted on the course website). No late quizzes in D2L will be accepted, and each student must submit their own work in D2L.

2. Written Homework Assignments (approximately 180-200 points)

Homework problems will be regularly assigned throughout the semester. These assignments will often involve the use of JMP for data analysis and will always require you to communicate your results in clearly written interpretations and conclusions. These assignments *can* be completed in groups of two or students, if desired.

WRITTEN HOMEWORK POLICIES:

- A **hard copy** of each assignment is due at the beginning of class on the assigned due date.
- Late written homework assignments will be assessed a 10% penalty for being late and **WILL NOT BE ACCEPTED** after graded assignments have been returned to other students or after solutions are posted.

3. Two Midterm Exams (100 points each)

These exams will require you to demonstrate your *understanding* of the material as opposed to your ability to memorize certain concepts.

EXAM POLICY: Exam dates will be announced at least one week in advance. Rescheduling of an exam will be permitted only if there is a family/medical emergency or if you have a note from your advisor stating explicit reasons why the exam must be missed. Also, **you must contact me before the exam is to be taken**. Arrangements will be made for the exam to be taken at an earlier time, if at all possible.

4. Final Exam (100 points)

Again, you will be asked to demonstrate your achievement of the learning outcomes. Your final exam has already been scheduled as follows. You are expected to arrange your personal and work schedule to allow you to take the exam at the scheduled time.

- If you are in the 11:00 am section, your final exam is scheduled for 8-10 am on Thursday, December 7.
- If you are in the 1:00 pm section, your final is scheduled for 1-3 pm on Monday, December 4.
- If you are in the 2:00 pm section, your final is scheduled for 10:30 am-12:30 pm on Wednesday, Dec. 6.

GRADING POLICY: At the end of the semester, I will add up all of the points you have earned on assessment tasks and divide by the total number of points possible to calculate your final grade. My "target" number of points for each assessment task is given above; however, I reserve the right to change these numbers if needed. I will use the following guidelines for grading:

- 92% and above guarantees at least an A
- 82% and above guarantees at least a B
- 72% and above guarantees at least a C
- 62% and above guarantees at least a D
- Below 62% will likely result in failure of the course

ATTENDANCE POLICY: If you choose to take this course, then you are expected to attend every class period. However, in the event that you have to miss a class, you are responsible for the material covered and any homework assigned during that period.

LAPTOP POLICY: You should bring your laptop to class every day, as laptops will often be used during class.

SOFTWARE: We will be using JMP almost exclusively for data analysis this semester. We will also use Tinkerplots®, which you will be required to purchase (approximately \$7). You can install these software programs using instructions that will be posted on the course website.

ACADEMIC INTEGRITY POLICY: All students must abide by Winona State University's Academic Integrity Policy: <http://www.winona.edu/sld/academicintegrity.asp>.

EXPECTATIONS: The following excerpt was taken from Rob Jenkins' article "Defining the Relationship" which was published in *The Chronicle of Higher Education* (August 8, 2016). This accurately summarizes what I expect of you in my classroom (and also what you should expect of me).

"I'd like to be your partner. More than anything, I'd like for us to form a mutually beneficial alliance in this endeavor we call education.

I pledge to do my part. I will:

- *Stay abreast of the latest ideas in my field.*
- *Teach you what I believe you need to know, with all the enthusiasm I possess.*
- *Invite your comments and questions and respond constructively.*
- *Make myself available to you outside of class (within reason).*
- *Evaluate your work carefully and return it promptly with feedback.*
- *Be as fair, respectful, and understanding as I can humanly be.*
- *If you need help beyond the scope of this course, I will do my best to provide it or see that you get it.*

In return, I expect you to:

- *Show up for class each day or let me know (preferably in advance) if you have some good reason to be absent.*
- *Do your reading and other assignments outside of class and be prepared for each class meeting.*
- *Focus during class on the work we're doing and not on extraneous matters (like whoever or whatever is on your phone at the moment).*
- *Participate in class discussions.*
- *Be respectful of your fellow students and their points of view.*
- ***In short, I expect you to devote as much effort to learning as I devote to teaching.***

What you get out of this relationship is that you'll be better equipped to succeed in this and other college courses, work-related assignments, and life in general. What I get is a great deal of professional and personal satisfaction. Because I do really like you guys and want the best for you."

COMMITMENT TO INCLUSIVE EXCELLENCE:

WSU recognizes that our individual differences can deepen our understanding of one another and the world around us, rather than divide us. In this class, people of all ethnicities, genders and gender identities, religions, ages, sexual orientations, disabilities, socioeconomic backgrounds, regions, and nationalities are strongly encouraged to share their rich array of perspectives and experiences. If you feel your differences may in some way isolate you from WSU's community or if you have a need for any specific accommodations, please speak with the instructor early in the semester about your concerns and what we can do together to help you become an active and engaged member of our class and community.

If you or a friend has been a victim of sexual assault, dating violence, domestic violence, or stalking, you can talk to a trained, confidential advocate by calling 507-457-5610. See the [Sexual Violence](#) page for more information about your rights and resources.

Campus Resources

- [Inclusion and Diversity Office](#), Kryzsko Commons Room 236, 457.5595
- [KEAP Diversity Resource Center](#), Kryzsko Commons Room 162, 457.2286
- [Access Services](#) (Services for Students with Disabilities), Maxwell 314, 457.5878
- KEAP Diversity Resource Center Faculty Liaison, Professor Chuck Ripley, Minné Hall 307, 457.5445, wripley@winona.edu
- [Affirmative Action/Title IX Office](#), Lori Mikl, Somsen 202, 457.2766, lmikl@winona.edu
- [Warrior Success Center](#), Maxwell 314, 457.5878
- [Advising Services](#), Maxwell 314, 457.5878
- [Winona] [Tutoring Services](#), Krueger Library 220, 457.5680
- [Winona] [Writing Center](#), Minné Hall 348, 457.5505
- [Winona] [Student Support Services](#), Krueger Library 219, 457.5465
- [Winona] [Counseling and Wellness Services](#), Integrated Wellness Complex 222, 457.5330
- [Rochester] UCR Learning Center, UCR Room AT 306, 285.7182
- [Rochester] [Student & Campus Services](#), UCR Room SS 128, 285.7100, rochss@winona.edu

Student Support Resources

- Two good places to help you find resources of all kinds on campus are *Student Support/Campus Services* and the *Inclusion and Diversity Office*. Both offices are dedicated to helping students of all racial, ethnic, economic, national, sexual, and gender identities. They can facilitate tutoring and point you to a wide range of resources.
- If you have a mental, physical, or learning disability, the *Access Services* office can document it for your professors and facilitate accommodations. If you have a documented disability that requires accommodation, please contact Access Services as soon as possible.
- College can be very stressful. *Counseling* offices on both campuses are here to help you with a wide range of difficulties, ranging from sexual assault, depression, and grief after the loss of a loved one to stress management, anxiety, general adjustment to college, and many others.
- The KEAP Diversity Resource Center offers an inclusive space for diverse people and organizations and is open to the campus from Monday-Thursday 8 a.m.-9 p.m. and Friday from 8 a.m.-4:30 p.m.
- If you or a friend experience gender-based violence (sexual assault, rape, dating/domestic violence, stalking, sexual harassment, harassment based on gender expression or nonconformity, stalking, cyber-stalking, etc.), the following people and organizations offer support and are not required to report to university officials. They will work with you to help you understand all your rights and options.
 - WSU'S Confidential 24/7 GBV Helpline: 507.457.5610
 - WRC of Winona: 507.452.4453
 - WSU Health, Counseling, and Wellness Services: 507.457.5160

Academic Support Resources

- To find out about web registration, placement tests, program requirements, and support tools to help students succeed, visit the *Advising Services* office and website for answers to all your questions!
- On the Rochester campus, the *UCR Learning Center* provides help with both the development and the writing of papers.
- On the Winona campus, for help with understanding the concepts of a particular class or understanding the requirements of an assignment, *Tutoring Services* offers three types of tutoring: drop-in appointments, 1-on-1 tutoring, and group sessions. You can visit them in Krueger Library 220 or go on-line and use TutorTrac to schedule a session.
- Located in Minne 348, the Writing Center offers free, individualized instruction in all forms and disciplines during any stage of writing, reading or research (<https://www.winona.edu/english/writingcenter.asp>).

TENTATIVE COURSE OUTLINE (note that topics may not be covered in this order):

I. The Research Process

- a. The research question/hypothesis and the predictor, response, and population of interest
- b. The role of random samples; population vs. sample
- c. Types of studies
 - i. Experiments and the role of randomization
 - ii. Observational studies and effects of confounding
 - iii. Surveys and possible biases

II. Data Displays and Summary Statistics

- a. For categorical variables
 - i. Bar charts
 - ii. Frequency distributions
- b. For numeric variables
 - i. Measure of central tendency: mean/average, median
 - ii. Measures of variation: variance, standard deviation, interquartile range
 - iii. Robustness
 - iv. Histograms and boxplots
- c. Contingency tables
 - i. Row and column percentages
 - ii. Relative risk, difference between proportions, and odds ratios
 - iii. Relationships in $r \times c$ tables
- d. Scatterplots
 - i. Measures of correlation
 - ii. Simple linear regression

III. Introduction to Sampling Distributions

- a. Statistics vs. parameters
- b. Sampling errors
- c. The importance of random samples

IV. Confidence Interval Estimation

- a. One-sample confidence intervals
 - i. Inference about a single proportion
 - ii. Inference about a single mean
- b. Two-sample confidence intervals
 - i. Inference about a difference between two proportions
 - ii. Inference about relative risks
 - iii. Inference about a difference between means
- c. Paired-sample confidence interval, involving inference about a mean difference

V. Hypothesis Testing

- a. The logic of hypothesis tests
 - i. Translating a research question into null and alternative hypotheses
 - ii. p-values; Type I and Type II errors
- b. Interpretation of statistical results
 - i. Association vs. causal connection
 - ii. Description of a sample vs. inference about a population
 - iii. Statistical significance vs. practical significance
- c. Comparative analysis for independent samples
 - i. For a difference between proportions
 - ii. For a difference between means
 - iii. Mann-Whitney-Wilcoxon Test
- d. Comparative analysis for paired-samples
 - i. Paired-sample t-test
 - ii. Wilcoxon signed-rank test
- e. Tests for contingency tables
 - i. Fisher's Exact Test for 2x2 tables
 - ii. Chi-square test