Math 311 Winter 2017

Statistical Concepts and Method

M-Th 9-9:50 Bouillon 106, Friday Bouillon 103 Computer Lab

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Office Hours: M-F 10:00-10:50, and by appointment.

Course Description

This course will facilitate your learning and applying the basic ideas and methods of the science and art of statistics. Statistics is a large and important field, and the people who apply it well have become rich, saved lives, and quite literally changed the world. This course aims especially to make you a more intelligent citizen/consumer and evaluator of statistics. The course outcomes are designed to help you *understand and apply* (not just memorize) statistical principles and concepts, and to help you think in an analytical and critical way about statistics through practical community-based-inquires case studies. Topics include, but are not limited to: descriptive statistics, regression, probability theories, inference, and analysis of two-way tables.

Goals and Objectives

Our primary objective is to **grow your proficiency and practical use** of the following:

1) The concepts and methods for understanding data and population they represent (Knowledge)
2) The analysis and interpretation of data (ANALYSIS)
3) The choice and application of appropriate methods (INFERENCE)
4) The communication of the results to others (EVALUATION)
5) **5-STEP How Novice Learn-- Engaging, Exploring, Explaining, Extending, Evaluating to achieve concept invention and innovative applications**

Required Text

1. Discovering Statistics, by James S. Hawkes and Williman H. Marsh,
[Bundled new copy with online learning ***ACCESS CODE***] or [used textbook and an access code purchased from online http://www.hawkeslearning.com/Support/GetYourAccessCode/OnlinePurchase_SelectProduct.aspx]
Reading in advance of the text material is essential to good performance in this course.
2. Course pack (Lecture notes, Labs, Sample Test Questions) by Chueh, available at CWU Wildcat shop (bookstore).

Calculator

You will need a TI83 or TI84 calculator both in class and during exams that performs basic statistical calculations to allow your work done efficiently and validated. TI83 or 84 and statistical software MINITAB will be explored and used extensively in class and in Lab.

Teaching Philosophy and Course Expectations

New learning occurs most effectively when it is based on what students *already know*, when students actually '*do*' real science, and when they become aware of *how* they learn, not just *what* they learn Donovan, 2005). Learning is a deliberate and conscious decision, one that involves breaking established neural patterns and creating new ones. To best facilitate growth, my expectations are for you to:

- ***Think critically***. This course will require critical thinking. People that analyze, infer, evaluate, and make reasoned judgments do better in college, make better daily decisions, and have greater professional success. Developing critical thinking should be a key goal of every student.
- ***Apply yourself.*** This course will take a lot of time and energy. If you have high learning expectations, that is what you will achieve. Success in this course will require significant effort (several hours of study time for each hour of class). Depending on your mathematical background, you may need to spend more or less study time. Attend class regularly, be on time, and budget your time to accommodate the workload.
- ***Ask questions***. Statistics is fascinating, but it can be confusing, too. Ask questions. If you aren't clear on something, there are likely others who are equally unclear on the topic.
- ***Be informed***. People sometimes use information to manipulate others' behaviors and decision-making in ways not always to your benefit. If you don't understand the mathematical basis of a claim about data, you can't make an informed decision about it. Be curious; try and found out all you can about a topic before you make a decision that may profoundly affect your life.
- ***Be respectful***. We will discuss some sensitive and controversial issues in this course. Everyone will respect others' right to express their opinions even if you disagree. Respectful discourse is a minimal expectation of every student.
- ***Communicate clearly***. Effective written and oral communication indicates an intelligent mind. Clarity, proper format, spelling, and grammar are expected of every student.
- ***Use common sense***. Cheating on assignments or tests, plagiarizing others' work, and turning in late assignments is unacceptable. Any infractions may result in a zero for the assignment, a failing course grade, and the possibility of disciplinary action by the university. I won't accept *anything* late unless you have written documentation from an appropriate source or have made prior arrangements with me. If you have a problem that prohibits you from turning something in on time, let me know ahead of time. In all instances, communicate with me so we can prevent problems.

Learning Performance Evaluation

People learn differently; some people excel at taking lecture exams while others do better with written projects or group work. To accommodate different learning styles, your performance in this course will be evaluated using: 1) individual exam scores, 2) laboratory performance, 3) group quizzes, 4) case studies, 5) a written project, and 6) peer evaluation, as follows:

Assessment Method	**Value**
Online Homework (Hawkes Learning System)	30%
Friday Labs	15%
Two Best Tests	20%
Case Studies	15%
Professionalism and attendance	10%
Final Exam	10%
Total	100%

Final grades will be assigned according to the following scale:

	A 100-93%	**A-** 92.9-90%
B+ 89.9-87%	**B** 86.9-83%	**B-** 82.9-80%
C+ 79.9-77%	**C** 76.9-73%	**C-** 72.9-70%
D+ 69.9-67%	**D** 66.9-63%	**D-** 62.9-60%

F 59.9% and below

Explanation of Assignments and Activities

Pre-Test and rate yourself: To help you and the instructor know where you stand for the needed background knowledge and preliminary skills required to succeed in this course, we will conduct a pretest based on the material

that should be learned in Math 130, designed as pre-requisite course for math 311. If you use Calculus course to meet pre-requisite requirement or rate yourself "working toward standard", you should value this opportunity to identify your self-learning/reading priority. The prerequisite material can be fulfilled by online Hawkes Learning and Assignments through Hawkes Learning System and will be assigned and due in the first few weeks.

In Class Work: There will be in-class work and activities related to lectures and Case Studies. You will be graded according to your in-class engagement and group-participation on a regular basis.

Computer Labs: Labs are opportunities to learn and practice the mechanics of performing statistics on a computer. Labs are ways to validate/connect the concepts and theorems discussed in class. The lab each Friday (Bouillon 103) will include Minitab codes and procedures and relevant statistical analyses. Your answers to these questions (which should include both statistical output and written English sentences) should be handed during next Wednesday's class. **NO credit will be given for late work.** Electronic submissions will not be accepted. Your solutions should be typed, written in complete sentences, and follow the general guidelines for written work given above.

Tests: Tests will consist of a combination of concepts, computations, interpretations, and problem solving/application questions. Any changes to the tentative exam dates will be announced ahead of time in class. Make-up exams must be arranged ahead of time unless you can document an unexpected circumstance beyond your control that prevented you from taking the exam. For instance, in the case of illness, a doctor's note will be required. All make-up exams must be requested as early as possible. Exams requested more than 24 hours after the scheduled exam will be given only in extreme extenuating circumstances (e.g. hospitalization, jail, etc.)

The final exam is cumulative, and must be taken at the designated time.

Case Studies: You will work with your group on a significant, open-ended case study in which you will be guided to come up with statistical questions, formulate your solving approach, and perform careful analysis, inference, and evaluation of the results. Each case study will culminate in an oral presentation with your peer audience giving evaluation and feedback and then written report afterwards.

Peer Evaluation: Collaborative groups are where some of the best science is done. Most of you have probably been in situations where someone takes more credit than they deserve while others get less credit for their contributions. Ultimately the most qualified people to evaluate group contributions are others within the group. Each student will peer evaluate group member contributions as well as yourself at the end of the course, which will be calculated into each student's final course grade. Failure to complete a peer evaluation will result in a zero score for that individual. Individual accountability/responsibility is enforced through frequent communications and peer evaluation.

Homework: Online Homework will be assigned at the early weeks through Hawkes Learning System. It is expected that you will do the homework problems on a daily basis. To aid the battle against procrastination, questions about the previous day's homework, and only the previous day's homework, will be taken at the beginning of class each day. Of course, I will happily take any and all homework questions during office hours. Keeping up with the homework is one of the best things you can do to help yourself succeed in this course!

General Course Policies

Daily attendance is expected and considered necessary for success. If you need to miss class for some reason, you should try to contact your professor in advance. It is your responsibility to find out what was covered on days you were absent, either from a classmate or from your professor. You are responsible for any announcements made in class regarding homework, exams, and quizzes, whether or not you are present. Please bring your calculator to each class meeting.

Please note that Fridays are "lab days", on which class will meet in the computer lab. You will have activities to do on these days using statistical software and write-ups based on these to hand in; see below.

All work handed in for the course must be written neatly, legibly, clearly, using correct mathematical notation, and with sufficient explanation. A good rule of thumb is to write your solution so that a classmate who knows roughly what's going on in the course but doesn't know how to do this particular problem can understand your solution. As

a side benefit, this makes it much more likely that you will be able to understand your solution when you go back to study for exams or the final! The bottom line: for any written work handed in for the course, including lab write-ups, exams, and quizzes, **you must show the critical thinking (evaluating, inference, analytical) elements of your work**.

Part of this class involves the writing of weekly lab reports on your computer-based statistics work. These must always represent your own work. The taking of work from other sources, including your classmates, is plagiarism, and is strictly prohibited by the university's conduct code. If you commit plagiarism on a lab assignment once, you will receive a "0" for that assignment, and a note will be sent to the department chair. If you commit plagiarism a second time, you will automatically fail the course.

Students with disabilities who wish to set up academic adjustments in this class should give me a copy of their "Confirmation of Eligibility for Academic Adjustments" from the Center for Disability Services as soon as possible so we can discuss how the approved adjustments will be implemented in class. Students without this form should contact the Center for Disability Services, Bouillon 205 or dssrecept@cwu.edu or 963-2171.

Exam Policy

Because of the timely nature of the exams, no make-ups will be given. For mid-term test, a grade of zero will be assigned unless you contact me before the scheduled time and provide an acceptable excuse. A weighted average of your scores on the remaining tests will be used for the missing score. Final examination policy is as established by the Dean of Students.

Incompletes:

An "I" is appropriate only if you have finished almost all of the course requirements, and have a good chance of completing the course without re-enrolling. (Example: missing the final exam due to illness.) The course must be completed within a year; otherwise, the "I" reverts to an "F."

Class Attendance (5%)

All students are responsible for actively participating in all classroom sessions in a positive, sensitive, and contributory manner. Please note passivity in discussion/response will be equally as noticeable as active response and discussion in class for the grading reference. In each class meeting session **(worth of 2.5 points)** observed passivity in joining whole class discussion will result in a "Zero" point on this category.

See Attendance Policy: Extra credit points will be awarded to those students who do not miss class or are absent once. Absences will NOT BE EXCUSED without a published obituary or medical note from health care provider. Documentation will not be accepted until it is officially confirmed by the professor. **Repeated late arrivals / early departures will result a drop of the letter grade.**

If you are an athlete and have games or practices scheduled during class, you must present appropriate documentation that will excuse you from class. Please consider taking the class at another time if you cannot be here on a timely and consistent basis.

Please be on time for class. If you are late, have the courtesy not to disrupt the learning environment.

Professionalism (5%)

- Punctual attendance is required as part of the **Professionalism** requirement. You need to be in class to earn credit.

- Informal assessment on participation: We will treat each other with courtesy, cordial civil manner and sensitivity, flexibility. This "Professionalism" category refers to one's chosen actions, attitude, and choice of words in the public, during class discussion, in writings, through course assignments, in forms of communications on your grades or sharing personal opinions. This category is evaluated according to the instructor's discretion.

- When class in session, electronic device of all sorts are required to ***turn off and put away out of sight***. Any of the following disruptive behaviors will result in **5%** taken off in the final grade ***each time of incident***: Playing computer games, repeated early departure and late arrival, cell phone disruptions, ***electronic texting***, ***surfing internet***, reading the newspaper, grading papers or projects, studying for exams, working on other class assignments, engaging in ***incessant talking of a social nature***, and / or (but not limited to) behaviors that disturb the learning environment for other students. Points will be taken off by the instructor's discretion (No warnings given). Inappropriate and unprofessional academic behaviors will be reported to CARR (Committee for Academic Recruitment and Retention) for advisement and improvement plan.

To earn all 5% professionalism and attendance points you must exhibit to a HIGH DEGREE the following:

- Collegial Support (1%)

- Positive Attitude (1%)

- Perfect Attendance (1%)

- Active Participation (1%)

- All materials complete & on time (1%)

ACADEMIC POLICIES & PROFESSIONAL PROTOCOL

The following policies and protocols have been established based on university policies and state and federal laws. They are equally binding for all students enrolled in each of my classes.

A. Equal Educational Opportunity:

Central Washington University seeks to provide reasonable accommodations for all qualified individuals with disabilities. Accommodations are intended to minimize the functional limitations of a disability and provide the student equal access to the educational process. Please inform me how I might support you in this regard.

B. Discrimination, Intimidation, & Harassment:

Hate speak and racist or sexist dialogue and behaviors will not be tolerated. The right of all students to equal access of the course content in an environment free of prejudice, discrimination, and harassment will be respected and upheld. All illegal behavior will be reported to the proper municipal and university authorities.

C. Professional Participation:

The nature of the course requires that each student be treated with respect, dignity, and sensitivity. While we can agree to disagree in a professional manner, all students are responsible for actively participating in all classroom activities in a positive, sensitive, and contributory manner. **Each class members' professionalism will be evaluated based on the instructor's discretion.**

Students will also be graded on their active, professional participation**. Please turn off your electronic devices completely during class session.** Be advised you will be marked down **without warning** for playing computer games, checking or looking at mobile phones, watching DVDs, talking on the phone, reading the newspaper, grading papers or projects, studying for exams, working on other class assignments, engaging in incessant talking of a social nature, and / or (but not limited to) behaviors that disturb the learning environment for other students.

D. Attendance Policy:

Punctual attendance is required. You need to be in class to get credit. Extra credit points will be awarded to those students who do not miss class or are absent once. Absences will NOT BE EXCUSED without a published obituary or medical note from health care provider. Documentation will not be accepted until it is officially confirmed by the professor.

When you are absent, please email me by 8:00 a.m. on the date of your absence. The following are the specific attendance policy of this course.

One informed absence – 1 point deduction
One uninformed absence – 1.5 points deduction
One late arrival within 5 minutes– 0.5 point deduction
One early departure within 5 minutes – 0.5 point deduction
One late arrival more than 5 minutes– 1 point deduction
One early departure more than 5 minutes – 1 point deduction
Accumulation of 2 absences and 1 early departure/late arrival – 0 professionalism points of the final grade

If you are an athlete and have games or practices scheduled during class, you must present appropriate documentation that will excuse you from class before the events take place. A coach or faculty member must officially confirm the documentation.

Please consider taking the class at another time if you cannot be here on a timely and consistent basis.

E. Late Assignments:

Late assignment will not be accepted. No exceptions will be made once deadlines are established. Email submission will not be accepted unless specified in the syllabus or changes made by the instructor. Please refer to the specific instruction for submission in the "Course Requirement" section. Even if you are absent, this policy follows true. I may allow you to submit your work by email if you provide me with a published obituary or an official medical note.

F. Academic Integrity:

All cheating, plagiarism and forgery will be referred for disciplinary action and automatically result in an "F" for the course.

You are obligated to cite all electronic or bibliographic references for works that are not authored or created by you. Please use the format outlined by the American Psychological Association. If for some reason you do not have a complete reference for a document, do the best you can by providing an author, a date, a workshop site, etc. If a document has been translated, please give credit to the person whose talents made it readable to you or others.

All violations of the student code will be reported to the Department of Mathematics, College of the Sciences, Vice President for Student Affairs & other CWU departments for disciplinary action.

Schedule of Topics and Assignments

A tentative list of timing of topic coverage and exams is presented below. Due to the intensive nature of the course, and variability in student backgrounds and interest, we may deviate from this schedule. Please stay tuned with the announcements in class and in Canvas system.

Week	**Chapters**	**Topic**
1 Jan4-6	1, 2	**(Statistics & problem Solving)** • Statistics as a four-stage process **(Data Type)** • Types of variables • Roles of variables
2 Jan 9-13	3, 4	**(Displaying and summarize data)** • Single categorical variable • Single quantitative variable • Center and spread
3 Jan 16-20	5	**(Linear Regression)** • Bivariate data • Linear relationships between two Q's • Model fitting • Regression and Correlation
4 Jan 23-27		***TEST 1!*** January 26
5 Jan 30-Feb 3	6, 7	**(Random variables and their probability distributions)** • Discrete Distributions • Binomial distributions • Continuous distributions and normal distributions

6 Feb 6-10	8, 9	**(Sampling distributions)** • Sample proportion as a random variable • Sample mean as a random variable • Central limit theorem (CLT)
7 Feb 13-17	10	***TEST 2!*** **(Constructing Confidence Intervals)** • Interval estimation • Required sample size
8 Feb 20-24	11	**(Inference for a single Q variable)** • Normal population with standard deviation known • Large sample applying CLT • Small normal population with unknown std dev
9 Feb 27-Mar 3	12	**(Inference between two variables)** • Pair design t • Two-sample design t • Two-sample design Z
10 Mar 6-10		Review ***TEST 3!***
11 Mar 13-17		**Final exam week (all the chapters covered in class)**

Final Exam date will be according to the university schedule.