

MTH 265: Statistics for Scientists and Engineers

Winter 2020 CRN: 30586
 12:00 – 12:50 P.M., MTWR; WOH-112

Instructor: Stanley Leung
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Office hours: Monday, Thursday: 1:00 – 2:00 P.M. (Appointments are welcome)

Course Description:

Covers probability and inferential statistics applied to scientific and engineering problems. Includes random variables, expectation, sampling, estimation, hypothesis testing, regression, correlation and analysis of variance. This course satisfies the OSU requirement of ST 314 for engineering programs.

Prerequisite: MTH 252 Integral Calculus with a grade of C or better.

Student Learning Outcomes – MTH 265

Upon successful completion of this course, students will be able to:

- Calculate probabilities and interpret their meaning.
- Calculate expected values of discrete random variables, including means and variances and interpret their meaning.
- Calculate expected values of continuous random variables, including means and variances and interpret their meaning.
- Calculate marginal and conditional probabilities continuous random variable and interpret their meanings.
- Calculate means and variances of sample of random variables, both discrete and continuous and interpret their meaning.
- Calculate the appropriate confidence intervals for single sample and multiple samples point estimators.
- Be able to identify and perform the appropriate hypothesis test for single sample and multiple sample point estimators.

Required course materials:

- **Textbook:** *Probability and Statistics for Engineering and the Sciences*, 9th edition, Jay L. Devore
 Course Key: linnbenton 5299 5237 for WebAssign
- Bring your laptop, calculator (TI-83, or TI-84) to every class meeting.
- Software: MS Excel, R (For graphs and computations)

Class format:

The course consists of lectures, discussion/problem solving,

Grading Criteria:

Points Allocated	Grade Assignment
The final course grade will be computed as follows:	A: 90 – 100 points
• Homework assignments 35 points	B: 80 – 89.99 points
• Two tests 20 points	C: 70 – 79.99 points
• Five quizzes 10 points	D: 60 – 69.99 points
• In-class assignments 15 points	F: 0 – 59.99 points
• Final examination 20 points	

Grades of Y and WP are not given in this course. *Note:* Your scores for this course are not stored on Moodle.

- **Absences and excuses do not improve grades.**
- **Understanding comes after studying.**

“The capacity to learn is a gift; the ability to learn is a skill; the willingness to learn is a choice.”

Brian Herbert (American author)

You are expected to observe the following cell-phone policy:

Cell-phone policy: Zero tolerance for cell-phone use in class.

You will be asked to leave the classroom if you use cell phone in class.

All **electronic devices** (except approved medical devices) **are banned** from our classroom or instructor's office.

This policy gives you a higher chance of success in Math 265.

How to do well in this course?

To do well in this course, **your responsibilities** include: **Attend all classes and do all required course work.** Take quizzes, tests, and the final examination. Submit homework assignments and in-class assignments on time. Study class notes and the textbook daily. Understand the connections between concepts. Pay close attention to definitions, technical details. **Know and understand each formula and its required conditions.**

Notice:

- **You are responsible for the material covered, course-related information, and announcements made during the class(es) that you miss.** Even if you are sick, even if your car breaks down, even if your cats have to go to the vet; you are still responsible for all the material you missed in your absence.

Tips for success

- To succeed in Math 265, attendance is essential. Two or more absences can affect your grade, due to missed work, and explanation of concepts.
- Keep up! You need to be comfortable with the topics from the first 4 weeks of the course to be successful in the end.
- Study your lecture notes and read the textbook. (You are expected to review lecture notes daily.)
- Help will be much more effective and productive if *you know what it is that you don't understand* and if *you bring specific questions from lecture or the book!*
- To ensure you comprehend the material, plan on studying at least 2 hours a day outside of class. **You are expected to spend 5 to 10 hours** per week outside of class studying and working on the content of Math 265.
- Use Learning Center (WH-226) and instructor's office hours. Ask questions in class. Do not wait. You are encouraged to form teams of two.

In-class assignments

Besides lectures, the instructor provides guided discussion/problem solving to illustrate and reinforce statistics concepts. Students are encouraged to work in teams of two. Students studying in teams can improve understanding statistics concepts, acquire learning skills including Excel and R skills; and make new friends.

Notice:

- **To receive credit for in-class assignments, you must be present in class.** No excuses.
- In-class assignments must be turned at the end of that class meeting, unless instructed otherwise.

Homework assignments

Do homework assignments **completely** on your own team (= 1 student or 2 students). You must work on the homework assignments on your own team, independent of other teams in class. **Credit for an assignment is equally divided among those teams for work that has been copied.** This includes computer output when used in the homework assignments. The instructor retains copied homework assignments. Random grading of certain problems in a homework assignment may be used.

You must hand in your homework assignment at the start of class.

Homework deadline: **5 minutes after the start of class** on the due date.

Notice: The instructor does not accept electronic versions of homework assignments.

Policy on late homework assignments

- [1] You are allowed to turn in one late homework assignment (up to **72 hours late**) without penalty. Use it for an emergency only. This 72-hour policy may change when it is close to a test or final exam.
- [2] If you turn in your homework assignment later than **12:05 P.M.**, you will **lose one point** from the score of the assignment for every minute past the due time. If your assignment is more than 10 minutes late, then option [3] applies.
- [3] 1 day late: 90% credit; 12:06 P.M.(due day) to within 24 hours
2 days late: 70% credit; 12:06 P.M. (due day) to within 48 hours
3 days late: 50% credit; 12:06 P.M. (due day) to within 72 hours (After 72 hours, late HW assignments will go to recycle bins.)

Homework Policy

- To get credit, all parts of your response to a problem (or part of a problem) must be **correct, specific, and explicit**.
 - You **must use standard procedure of solving statistics problems**, with standard mathematical symbols and notation. Your instructor, as well as your textbook, shows you the standard procedure for solving statistics problems. *Clear written communications are expected.*
 - Homework must be written neatly and in an **organized manner**. Homework that is submitted for grading must be in **finished form** and not in draft form. **Do not put your sketch work on homework sheets.**
 - Use 3 or 4 decimal places for numerical answers if necessary. Units of measurement must be included.
 - For **full credit**, show all your **WORK** (problem setup, formulas and steps of calculation, standard procedure, standard notation, units of measurement, ...)
 - **Correct numerical answers with no WORK receive no credit.**
- This policy applies to in-class assignments, homework assignments, tests, and the final examination.*

Solutions to homework assignments will be posted on Moodle.

Tests

All tests consist of two parts: in-class tests and take-home tests. In-class tests consist of true-or-false questions, multiple-choice questions, computational problems, short-answer conceptual questions, and data-analysis skills. All in-class tests are closed-book and closed-notes. In-class tests start at 12:00 P.M. Take-home tests may include Excel commands. Save the Excel, and R commands from homework assignments. If you have questions regarding your graded test, you must talk to the instructor within **3 school days** after it is returned to you.

Test 1: Thursday, Week 4; **Test 2:** Thursday, Week 8

Policy on tests:

- Make-up tests will not be given under any circumstances.
- If you missed a test and have a **documented reason** or **verifiable emergency**, the credit for the test will be transferred to the final exam. That is, the credit for your final exam is 30 (= 20 + 10) points.
- You must not use cell phones or cell-phone calculators during tests, or the final examination.

Quizzes

You will have 5 quizzes. The topics for a quiz will be announced on Moodle. Quiz time: 12:40 – 12:50 P.M., **Wednesday**. Quiz dates: Weeks 2, 3, 5, 6, 7. No make-up quizzes.

Final Examination

The final examination is comprehensive and covers all lectures through the end of the semester. This is an open-book and open-notes exam. The final exam consists of true-or-false questions, multiple-choice questions, conceptual questions, computational problems, and data-analysis skills. **No make-up final examination.**

Incomplete Policy

- If you are **passing the course** (C or above) **and** have a **documented reason** or **verifiable emergency** for not being able to complete the course, I may be able to grant you an incomplete. You must obtain my written agreement if you wish to have a grade of incomplete recorded.
- If you miss the final exam, are passing Math 265 and have a **documented reason** or **verifiable emergency**, you will be given an Incomplete. If you miss the final exam and your absence is unexcused, you will receive whatever grade you have earned by your total points (maximum 80) prior to the final exam.

Special Circumstances:

Students who have any emergency medical information the instructor should know of, who need special arrangements in the event of evacuation, or students with documented disabilities who may need accommodations, should **make an appointment with the instructor as early as possible, no later than the first week of the term.**

Request for Special Needs or Accommodations

You should meet with your instructor during the first week of class if:

1. You have a documented disability and need accommodations.
2. Your instructor needs to know medical information about you.
3. You need special arrangements in the event of an emergency.

If you have documented your disability, remember that you must make your request for accommodations through the Center for Accessibility Resources (CFAR) Online Services webpage every term in order to receive accommodations. If you believe you may need accommodations but are not yet registered with CFAR, please visit the CFAR Website for steps on how to apply for services or call 541-917-4789.

Center for Accessibility Resources

Main Office, Red Cedar Hall 105 (RCH-105)

Monday-Friday 9:00 a.m. - 3:00 p.m.

Phone: [\(541\) 917-4789](tel:5419174789) Email: cfar@linnbenton.edu

Support Lab, Red Cedar Hall 114 (RCH-114)

Monday-Friday 8:00 a.m. - 3:00 p.m.

Phone: [\(541\) 917-4343](tel:5419174343) Email: cfarlab@linnbenton.edu

The LBCC Center for Accessibility Resources and YOU!

The Center for Accessibility Resources provides assistance to students who have documented disabilities by:

- Reviewing documentation, provided by the student, that provides evidence of disability
- Planning reasonable accommodations
- Coordinating services in the classroom
- Providing support (i.e. assistive technology, testing accommodations, and classroom accommodations)
- Success coaching and advocating

If you have a disability and feel that you will need accommodations as a student at Linn-Benton Community College, we are here to support you.

LBCC Comprehensive Statement of Nondiscrimination

LBCC prohibits unlawful discrimination based on race, color, religion, ethnicity, use of native language, national origin, sex, sexual orientation, gender, gender identity, marital status, disability, veteran status, age, or any other status protected under applicable federal, state, or local laws. For further information see Board Policy P1015 in our [Board Policies and Administrative Rules](#). Title II, IX, & Section 504: Scott Rolen, CC-108, 541-917-4425; Lynne Cox, T-107B, 541-917-4806, LBCC, Albany, Oregon. To report: linnbenton-advocate.symplicity.com/public-report

Your instructor is a fair dictator! ☺

- To be fair to all students in Math 265, the instructor strictly enforces the course policies. For individual situations not covered in the course policies, the instructor will act at his discretion. Additional information relating to the course material or assignments will be handed out or announced in class. **You are responsible for the material covered, course-related information, and announcements made during the class(es) that you miss.**
- The instructor does not use class time to return graded assignments, and tests.

The amount of time you spend on homework problems as well as in-class problems will directly affect how much you learn, your exam scores and, therefore, your grade in the course.

Tentative schedule of topics:

Week	Topics	Chapter
1	OVERVIEW AND DESCRIPTIVE STATISTICS	1
2	OVERVIEW AND DESCRIPTIVE STATISTICS PROBABILITY	1 2
3	PROBABILITY	2
4	DISCRETE RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS Review (Review material in Moodle) Test 1: Take-home (Wednesday), In-class (Thursday)	3
5	DISCRETE RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS CONTINUOUS RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS	3 4
6	CONTINUOUS RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS JOINT PROBABILITY DISTRIBUTIONS AND RANDOM SAMPLES	4 5
7	JOINT PROBABILITY DISTRIBUTIONS AND RANDOM SAMPLES STATISTICAL INTERVALS BASED ON A SINGLE SAMPLE.	5 7
8	STATISTICAL INTERVALS BASED ON A SINGLE SAMPLE. TESTS OF HYPOTHESIS BASED ON A SINGLE SAMPLE. Review (Review material) Test 2: Take-home ((Wednesday), In-class (Thursday)	7 8
9	INFERENCES BASED ON TWO SAMPLES	9
10	THE ANALYSIS OF VARIANCE	10
11	Final Exam (Comprehensive) 1:00 - 2:50 p.m., Wednesday	

Note: This outline gives you a rough sense of our course of study. We go faster on some simple topics, and slower on some important concepts. We will cover and learn as much as we can.

Important:

- Class notes, homework assignments, solutions, announcements, and review materials are stored on Moodle.
- Make sure that you check Moodle for class-related materials at least 3 times a week.

☺ I hope you will enjoy your *guided tour* through the wonderland of Statistics. ☺

Understanding comes after studying.

TABLE OF CONTENTS

1. OVERVIEW AND DESCRIPTIVE STATISTICS.

Populations, Samples, and Processes.
Pictorial and Tabular Methods in Descriptive Statistics.
Measures of Location.
Measures of Variability.

2. PROBABILITY.

Sample Spaces and Events.
Axioms, Interpretations, and Properties of Probability.
Counting Techniques.
Conditional Probability.
Independence.

3. DISCRETE RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS.

Random Variables.
Probability Distributions for Discrete Random Variables.
Expected Values.
The Binomial Probability Distribution.
Hypergeometric and Negative Binomial Distributions.
The Poisson Probability Distribution.

4. CONTINUOUS RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS.

Probability Density Functions.
Cumulative Distribution Functions and Expected Values.
The Normal Distribution.
The Exponential and Gamma Distributions.
Other Continuous Distributions.
Probability Plots.

5. JOINT PROBABILITY DISTRIBUTIONS AND RANDOM SAMPLES.

Jointly Distributed Random Variables.
Expected Values, Covariance, and Correlation.
Statistics and Their Distributions.
The Distribution of the Sample Mean.
The Distribution of a Linear Combination.

6. POINT ESTIMATION.

Some General Concepts of Point Estimation.
Methods of Point Estimation.

7. STATISTICAL INTERVALS BASED ON A SINGLE SAMPLE.

Basic Properties of Confidence Intervals.
Large-Sample Confidence Intervals for a Population Mean and Proportion.
Intervals Based on a Normal Population Distribution.
Confidence Intervals for the Variance and Standard Deviation of a Normal Population.

8. TESTS OF HYPOTHESIS BASED ON A SINGLE SAMPLE.

Hypotheses and Test Procedures.
z Tests for Hypotheses About a Population Mean.
The One-Sample t Test.
Tests Concerning a Population Proportion.
Further Aspects of Hypothesis Testing.

9. INFERENCES BASED ON TWO SAMPLES.

z Tests and Confidence Intervals for a Difference between Two Population Means.
The Two-Sample t Test and Confidence Interval.
Analysis of Paired Data.
Inferences Concerning a Difference between Population Proportions.
Inferences Concerning Two Population Variances.

10. THE ANALYSIS OF VARIANCE.

Single-Factor ANOVA.
Multiple Comparisons in ANOVA.
More on Single-Factor ANOVA.