This course supports the objective assessment for Probability and Statistics II. It covers 4 competencies.

Introduction

Overview

Probability and Statistics II covers the knowledge and skills necessary to apply random variables, sampling distributions, estimation, and hypothesis testing, and to use appropriate technology to model and solve real-life problems. It provides tools for the science of analyzing and interpreting data. Topics include:

- discrete and continuous random variables;
- expected values;
- the Central Limit Theorem;
- the identification of unusual samples;
- population parameters and point estimates;
- confidence intervals;
- influences on accuracy and precision; and
- hypothesis testing and statistical tests (z mean, z proportion, one sample t, paired t, independent t, ANOVA, chi-squared, and significance of correlation).

Probability and Statistics I is a prerequisite for this course.

Getting Started

Welcome to Probability and Statistics II! Carefully working through the Checkpoints and “Did I Get This?” activities in the modules within the online textbook prepares you for the pre-assessment and objective exam. Take each Checkpoint a few times as new items will be revealed with each use, and the exam questions are adapted directly from them. The last module called "Extra Practice" is a great source of extra problems for when you have thoroughly mastered the Checkpoints. Reviewing the items to carefully consider the wrong answer choices is also great preparation for the pre-assessment and objective assessment, as similar distractors will be on the exam items.

Competencies

The following competencies are covered in this course:

- **Competency 215.1.1: Random Variables**  
  The graduate analyzes probability distributions of discrete and continuous random variables to determine probabilities and solve expected value problems.

- **Competency 215.1.2: Sampling Distributions**  
  The graduate uses sampling distributions and the Central Limit Theorem to identify unusual samples and solve problems.
• Competency 215.1.3: Estimation
The graduate estimates population parameters using point estimates, confidence intervals, and an understanding of the factors that influence the accuracy and precision of estimates.

• Competency 215.1.4: Hypothesis Testing
The graduate applies the logic and process of hypothesis testing to evaluate claims about populations.

Objectives

The following objectives are covered in this course:

Explain the logic behind and the process of hypotheses testing. In particular, explain what the p-value is and how it is used to draw conclusions.

In a given context, specify the null and alternative hypotheses for the population proportion and mean.

Carry out hypothesis testing for the population proportion and mean (when appropriate), and draw conclusions in context.

Apply the concepts of: sample size, statistical significance vs. practical importance, and the relationship between hypothesis testing and confidence intervals.

Identify and distinguish among cases where use of calculations specific to independent samples, matched pairs, and ANOVA are appropriate.

In a given context, carry out the inferential method for comparing groups and draw the appropriate conclusions.

Specify the null and alternative hypotheses for comparing groups.
Choose the appropriate inferential method for examining the relationship between two variables and justify the choice.

In a given context, carry out the appropriate inferential method for comparing relationships and draw the appropriate conclusions.

Calculate probabilities of events involving continuous variables using integration.

Calculate expected values of continuous variables using integration.

Distinguish between discrete and continuous random variables

Find the probability distribution of discrete random variables, and use it to find the probability of events of interest.

Use the normal distribution as an approximation of the binomial distribution, when appropriate.

Apply the rules of means and variances to find the mean and variance of a linear transformation of a random variable and the sum of two independent random variables. Fit the binomial model when appropriate, and use it to perform simple calculations.

Explain how a density function is used to find probabilities involving continuous random variables.

Find probabilities associated with the normal distribution.
Use the normal distribution as an approximation of the binomial distribution, when appropriate.

Identify and distinguish between a parameter and a statistic.

Explain the concepts of sampling variability and sampling distribution.

Apply the sampling distribution of the sample proportion (when appropriate). In particular, be able to identify unusual samples from a given population.

Apply the sampling distribution of the sample mean as summarized by the Central Limit Theorem (when appropriate). In particular, be able to identify unusual samples from a given population.

Determine point estimates in simple cases, and relate the sampling distribution of a statistic to its properties as a point estimator.

Explain what a confidence interval represents and determine how changes in sample size and confidence level affect the precision of the confidence interval.

Find confidence intervals for the population mean and the population proportion (when certain conditions are met), and perform sample size calculations.

Teaching Dispositions Statement
Please review the Statement of Teaching Dispositions.

Preparation for Success

The information in this section is provided to detail the resources available for you to use as you complete this course.

**Study Plan**

**Using the Interactive Textbook**

Acrobatiq is an innovative provider focused on developing learning resources that produce a measurable improvement to learning.

**Launch Course**

When you have launched the textbook, use the icons in the upper-right corner for an informational tour and quick navigation to the starting page. Complete Unit 1 to learn how to use the interactive course. To learn the material needed to pass the course, complete all the activities in Units 2-4, with special emphasis on scoring well on the Checkpoints. The Checkpoints were used to generate and inspire the test and pre-assessment items, so the surest route to success is to master the Checkpoints.

You also have access to [Acrobatiq's Probability and Statistics I](#) in case you need to review earlier content.

**Graphing Calculator**

Buy an appropriate calculator and familiarize yourself with how to use it. Refer to the [WGU Calculator and Scratch Paper/Whiteboard Guidelines](#) for calculators permitted on WGU exams.

**Calculator Skills**

Every technology-training portion of the textbook has a drop-down menu where you can choose what technology to learn about: you should always study the calculator version because you will have access to your calculator on the objective exam and no other computation technology. It is recommended, but not required, that you also learn how to use software to do the technology work (for example, Microsoft Excel, Minitab, the open source R software, or StatCrunch).

You need to know how to get your calculator to compute a paired t-test for a small sample that you type in by hand. Other useful calculator skills include finding probabilities for given z-scores, doing z-tests for the proportion and mean, computing independent t-tests, and conducting chi-squared tests.

**Formula Sheet**
The following formula sheet will be available to you when you take the Probability and Statistics II objective assessment. Note that the learning resource rounds the confidence multiplier for a 95% confidence interval to 2. However, the exam uses the more accurate value of 1.96 as the confidence multiplier for a 95% confidence interval. Become familiar with what is available to you and use it to take your Checkpoints and pre-assessment:

- **Probability and Statistics II Formula Sheet**

**Finding Supplemental Materials**

Access the Course Community in the right margin and use the search engine on the word "supplemental" to find additional materials. These are useful, but not essential. We have found that most students master the course using only the materials in the study plan, but we want to make available the best alternative materials we know about.

**Course Instructor Assistance**

Your course instructor is an important resource for you to take advantage of as you progress through your study of probability and statistics. Your course instructor will be able to help guide your learning, answer questions, and provide valuable information. Be sure to consult your course instructor frequently.

**Pacing Guide**

Follow this plan carefully to complete the course in the suggested time frame.

Week 1

- Get Oriented, Self-Assessment, Module 4 (3 Checkpoints)

Week 2

- Module 4 and Calculus in Statistics (1 Checkpoint and 32 exercises)

Week 3

- Modules 5, 6, 7, 8, and 9 (2 Checkpoints)

Week 4

- Module 10 (5 Checkpoints)

Week 5

- Modules 11, 12, and 13 (6 Checkpoints)
Week 6

- Review, Pre-assessment, Objective Exam

Week 1: Get Oriented

Take a half hour to go through Unit 1, which includes three brief modules to explain what the interactive course offers and the big picture for this course.

Week 1: Self-Assessment

If you have prior experience in statistics, consider taking the pre-assessment immediately. If you score near or above the passing mark, consider skipping to Week 6. Then fill in the gaps to prepare for the objective assessment instead of going through the course linearly.

Week 1: Discrete Random Variables (6 exam items)

Do Module 4 through page 28, including Random Variables Checkpoints 1, 2, and 3.

Week 2: Continuous Random Variables (prerequisite to exam items)

Do Module 4 through page 45, including Random Variables Checkpoint 4.

Week 3: Calculus in Statistics (2 exam items)

Use the online PDF Supplementary Chapter to Accompany Applied Calculus by Stefan Waner & Steven R. Costenoble.


Read Section P.2: “Probability Density Functions: Uniform, Exponential, Normal, and Beta,” pages 13–24 (skip “Beta Density Functions”). Set up the integrals for exercises 29, 30, 33, and 34 and use the calculator you will bring to the test to compute the answer. For exercises 35, 36, 37, 38, and 39, just set up the integrals.

Read Section P.3: “Mean, Median, Variance, and Standard Deviation,” pages 30–33, 37–40 (skip “Variance and Standard Deviation”). For exercises 5, 6, 8, 13, 14, 21, 22, 23, and 24, find $E(X)$. For exercises 27, 29, 31, and 33, find $E(X)$ and the median.

Worked solutions to most of these exercises are available online.

Week 3: Sampling Distributions (6 exam items)

Do Module 5 through page 54, including Sampling Distributions Checkpoints 1 and 2. Read page 55 in Module 6.

Week 3: Point Estimation (2 exam items) and Interval Estimation (4 exam items)

Do Modules 7, 8, and 9 through page 77, including Estimation Checkpoint 1.

Week 4: Hypothesis Testing (9 exam items)

Do Module 10 through page 109, including all five Checkpoints: Overview; Hypothesis Testing
for a Population Proportion; Hypothesis Testing for a Population Mean; Hypothesis Testing; and Type 1 & Type II.

**Week 5: Case C -> Q (3 exam items)**

Do Module 11 through page 140, including all four Checkpoints: Two Independent Samples, Matched Pairs, ANOVA, and Case C -> Q.

**Week 5: Case C -> C and Q -> Q (3 exam items)**

Do Module 12 through page 150, including Case C -> C & Q -> Q Checkpoint and Inference for Relationships Checkpoint. Read page 151 in Module 13.

**Week 6: Exam Preparation**

- Review Checkpoints: Work until you have scored above 80% on each.
- Review Formulas Sheet: This is listed before the Study Plan.
- Take the Pre-assessment: The Coaching Report will show you where you ought to re-examine the Study Plan. Each line of the report is an exact match for one of the activities above.
- Take the objective assessment. If you do not pass, meet with a course instructor.