



INSTRUCTIONAL PACKAGE

MAT 120

Probability and Statistics

Effective Term
2019—2020 Academic Year

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Part I: Course Information

Effective Term: 2019—2020 Academic Year

COURSE PREFIX: MAT 120

COURSE TITLE: Probability and
Statistics

CONTACT HOURS: 3.0

CREDIT HOURS: 3.0

RATIONALE FOR THE COURSE:

The course is designed to provide the student with the fundamental concepts of probability and statistics, which influences nearly all facets of our society. It should help the student by developing the ability to critically analyze statistical claims and to make decisions in government, education, business, sports, politics and many other fields.

COURSE DESCRIPTION:

This course includes the following topics: introductory probability and statistics, including organization of data, sample space concepts, random variables, counting problems, binomial and normal distributions, central limit theorem, confidence intervals, and test hypothesis for large and small samples; types I and II errors; linear regression; and correlation.

PREREQUISITES/CO-REQUISITES:

((ACCUPLACER Elementary Algebra 040 or New ACCUPLACER Adv Algebra 200 or New ACCUPLACER Arithmetic 260 or COMPANION Elementary Algebra 040 or SAT Mathematics 400 or New SAT Mathematics 420 or ACT Math 15 or Credit level [MAT 110](#) Minimum Grade of C or Credit level [MAT 110](#) Minimum Grade of TC or Credit level [MAT 155](#) Minimum Grade of C or Credit level [MAT 155](#) Minimum Grade of TC or Credit level [MAT 102](#) Minimum Grade of C or Credit level [MAT 102](#) Minimum Grade of TC or Credit level [MAT 101](#) Minimum Grade of C or Credit level [MAT 101](#) Minimum Grade of TC) or (Multiple Measures Math 1))

***Online/Hybrid** courses require students to complete the DLI Online Student Orientation prior to completing an online course. The DLI Online Student Orientation can be found in WaveNet, under the My Student tab.

REQUIRED MATERIALS:

1. Please visit the Bookstore online site for most current textbook information. Use the direct link below to find textbooks.

[BOOKSTORE](#).

Enter the semester, course prefix, number and section when prompted and you will be linked to the correct textbook.

2. Scientific calculator with statistics functions.

ENTRY LEVEL COMPETENCIES:

The student should enter MAT 120 with knowledge of algebraic variables, algebraic operations and formula manipulation, in addition to competence in arithmetic operations.

TECHNICAL REQUIREMENTS:

Access to Desire2Learn (D2L), HGTC's student portal for course materials.

WaveNet and D2L email access.

STUDENT IDENTIFICATION VERIFICATION

Students enrolled in online courses will be required to participate in a minimum of one (1) proctored assignment and/or one (1) virtual event to support student identification verification. Please refer to your Instructor Information Sheet for information regarding this requirement.

CLASSROOM ETIQUETTE:

As a matter of courtesy to other students and your professor, please turn off cell phones and other communication/entertainment devices before class begins. If you are monitoring for an emergency, please notify your professor prior to class and switch cell phone ringers to vibrate.

NETIQUETTE: is the term commonly used to refer to conventions adopted by Internet users on the web, mailing lists, public forums, and in live chat focused on online communications etiquette. For more information regarding Netiquette expectations for distance learning courses, please visit [Online Netiquette](#).

Part II: Student Learning Outcomes

COURSE LEARNING OUTCOMES and ASSESSMENTS*:

The student should be able to:

1. Distinguish between a population and sample; a parameter and statistic
2. Determine the best method of collecting data
3. Construct and interpret a frequency distribution and other graphs
4. Find measures of central tendency, variation and position
5. Determine the probability that an event will occur

6. Use Counting Principles to find probabilities
7. Create and interpret probability and binomial distributions
8. Recognize normal distributions and apply their properties in real-life applications
9. Use the Central Limit Theorem to find the probability of a sample mean
10. Calculate confidence intervals
11. Use Hypothesis Testing to test a claim about a population parameter by use of sample statistics
12. Find the correlation coefficient to measure the strength of a linear correlation
13. Find the equation of a regression line and use it to predict y values

UNIT I:

A. Introduction to Statistics

1.1 What is Statistics?

- Identify variables in a statistical study.
- Distinguish between quantitative and qualitative variables.
- Identify populations and samples.
- Distinguish between parameters and statistics.
- Determine the level of measurement.

1.2 Random Samples

- Explain the importance of random samples.
- Describe stratified sampling, cluster sampling, systematic sampling, multistage sampling, and convenience sampling.

1.3 Introduction to Experimental Design

- Discuss what it means to take a census.
- Describe simulations, observational studies, and experiments.
- Identify control groups, placebo effects, completely randomized experiments, and randomized block experiments.
- Discuss potential pitfalls that might make your data unreliable.

Text Reference: Chapter One 3 hours

B. Organizing Data

2.1 Frequency Distributions, Histograms, and Related Topics

- Organize raw data using a frequency table.
- Construct histograms, relative-frequency histograms, and ogives.
- Recognize basic distribution shapes: uniform, symmetric, skewed, and bimodal.
- Interpret graphs in the context of the data setting.

2.2 Bar Graphs, Circle Graphs, and Time-Series Graphs

- Determine types of graphs appropriate for specific data.
- Construct bar graphs, Pareto charts, circle graphs, and time-series graphs.
- Interpret information displayed in graphs.

2.3 Stem-and-Leaf Displays

- Construct a stem-and-leaf display from raw data.
- Use a stem-and-leaf display to visualize data distribution.
- Compare a stem-and-leaf display to a histogram.

Text Reference: Chapter Two 3 hours

C. Averages and Variation

3.1 Measures of Central Tendency: Mode, Median, and Mean

- Compute mean, median, and mode from raw data.
- Interpret what mean, median, and mode tell you.
- Explain how mean, median, and mode can be affected by extreme data values.
- Compute a weighted average.

3.2 Measures of Variation

- Find the range, variance, and standard deviation.
- Apply Chebyshev's theorem to raw data. What does Chebyshev interval tell us?

3.3 Percentiles and Box-and-Whisker Plots

- Interpret the meaning of percentile scores.
- Compute the median, quartiles, and five-number summary from raw data
- Make a box-and-whisker plot. Interpret the results.
- Describe how a box-and-whisker plot indicates spread of data about the median.

Text Reference: Chapter Three 3 hours

UNIT II:

A. Correlation and Regression

4.1 Scatter Diagrams and Linear Correlation

- Make a scatter diagram.
- Use sample data to compute the sample correlation coefficient r .
- Investigate the meaning of the correlation coefficient r .

4.2 Linear Regression and the Coefficient of Determination

- State the least-squares criterion.
- Use sample data to find the equation of the least-squares line. Graph the least-squares line.
- Use the least-squares line to predict a value of the response variable y for a specified value of the explanatory variable x .
- Use r^2 to determine *explained* and *unexplained* variation of the response variable y .

Text Reference: Chapter Four 3 hours

B. Elementary Probability Theory

5.1 What is Probability?

- Assign probabilities to events.
- Explain how the law of large numbers relates to relative frequencies.
- Apply basic rules of probability in everyday life.

5.2 Some Probability Rules – Compound Events

- Compute probabilities of general compound events.
- Compute probabilities involving independent events or mutually exclusive events.
- Use survey results to compute conditional probabilities.

5.3 Trees and Counting Techniques

- Organize outcomes in a sample space using tree diagrams.
- Compute number of ordered arrangements of outcomes using permutations.
- Compute the number of (nonordered) groupings of outcomes using combinations.
- Explain how counting techniques relate to probability in everyday life.

Text Reference: Chapter Five 6 hours

C. The Binomial Probability Distribution and Related Topics

6.1 Introduction to Random Variables and Probability Distributions

- Distinguish between discrete and continuous random variables.
- Graph discrete probability distributions.
- Compute μ and σ for a discrete probability distribution.

6.2 Binomial Probabilities

- List the defining features of a binomial experiment.
- Compute binomial probabilities using the binomial formula.
- Use the binomial probability distribution to solve real-world applications.

6.3 Additional Properties of the Binomial Distribution

- Make histograms for binomial distributions.
- Compute μ and σ for a binomial distribution.

Text Reference: Chapter Six 3 hours

UNIT III:

A. Normal Curves and Sampling Distributions

A.1 Normal Distributions

7.1 Graphs of Normal Probability Distributions

- Graph a normal curve and summarize its important properties.
- Apply the empirical rule to solve real-world problems.

7.2 Standard Units and Areas Under the Standard Normal Distribution

- Given μ and σ , convert raw data to z scores.

- Given μ and σ , convert z scores to raw data.
- Graph the standard normal distribution, and find areas under the standard normal curve.

7.3 Areas Under Any Normal Curve

- Compute the probability of “standardized events”.
- Find a z score from a given normal probability (inverse normal).
- Use the inverse normal to solve guarantee problems.

A.2 Sampling Distributions

7.4 Sampling Distributions

- Review such commonly used terms as *random sample*, *relative frequency*, *parameter*, *statistic*, and *sampling distribution*.

7.5 The Central Limit Theorem

- For a normal distribution, use μ and σ to construct the theoretical sampling distribution for the sample mean.
- For large samples, use sample estimates to construct a good approximate sampling distribution for the sample mean.

Text Reference: Chapter Seven 6 hours

B. Estimation

8.1 Estimating μ When σ is Known

- Explain the meanings of confidence level, error of estimate, and critical value.
- Find the critical value corresponding to a given confidence level.
- Compute confidence intervals for μ when σ is known. Interpret the results.
- Compute the sample size to be used for estimating a mean μ .

8.2 Estimating μ When σ is Unknown

- Learn about degrees of freedom and Student’s t distribution.
- Find critical values using degrees of freedom and confidence levels.
- Compute confidence intervals for μ when σ is unknown. What does this information tell you?

8.3 Estimating p in the Binomial Distribution

- Compute the maximal margin of error for proportions using a given level of significance.
- Compute confidence intervals for p and interpret the results.
- Interpret poll results.
- Compute the sample size to be used for estimating a proportion p when we have an estimate for p .
- Compute the sample size to be used for estimating a proportion p when we have no estimate for p .

Text Reference: Chapter Eight 3 hours

C. Hypothesis Testing

9.1 Introduction to Statistical Tests

- Understand the rationale for statistical tests.
- Identify the null and alternative hypotheses in a statistical test.
- Identify right-tailed, left-tailed, and two-tailed tests.
- Use a test statistic to compute a P -value.
- Recognize types of errors, level of significance, and power of a test.
- Understand the meaning and risks of rejecting or not rejecting the null hypothesis.

9.2 Testing the Mean μ

- Review the general procedure for testing using P -values.
- Test μ when σ is known using the normal distribution.
- Test μ when σ is unknown using a Student's t distribution.
- Understand the "traditional" method of testing that uses critical regions and critical values instead of P -values.

9.3 Testing a Proportion p

- Identify the components needed for testing a proportion.
- Compute the sample test statistic
- Find the P -value and conclude the test.

Text Reference: Chapter Nine 6 hours

****Students – please refer to the Instructor's Course Information sheet for specific information on assessments and due dates.***

General Education Outcomes

This course fulfills the following General Education Outcomes through a standardized departmental assignment. Upon completion of this course, students will be able to:

- Communicate effectively;
- Think critically;
- Self and professional development.

Part III: Grading and Assessment

EVALUATION OF REQUIRED COURSE MEASURES/ARTIFACTS*

****Students, for the specific number and type of evaluations, please refer to the Instructor's Course Information Sheet.***

GRADING SYSTEM:

A 90-100%

- B 80-89%
- C 70-79%
- D 60-69%
- F Below 60%

Grades earned in courses impact academic progression and financial aid status. Before withdrawing from a course, be sure to talk with your instructor and financial aid counselor about the implications of that course of action. Ds, Fs, Ws, WFs and Is also negatively impact academic progression and financial aid status.

The Add/Drop Period is the first 5 days of the semester for **full term** classes. Add/Drop periods are shorter for accelerated format courses. Please refer to the academic calendar for deadlines for add/drop ([ACADEMIC CALENDAR](#)). You must attend at least one meeting of all of your classes during that period. If you do not, you will be dropped from the course(s) and your Financial Aid will be reduced accordingly.

Part IV: Attendance

Horry-Georgetown Technical College maintains a general attendance policy requiring students to be present for a minimum of 80 percent (80%) of their classes in order to receive credit for any course. Due to the varied nature of courses taught at the college, some faculty may require up to 90 percent (90%) attendance. Pursuant to 34 Code of Federal Regulations 228.22 - Return to Title IV Funds, once a student has missed over 20% of the course or has missed two (2) consecutive weeks, the faculty is obligated to withdraw the student and a student may not be permitted to reenroll. **Instructors define absentee limits for their class at the beginning of each term; please refer to the Instructor Course Information Sheet.**

For online and hybrid courses, check your Instructor's Course Information Sheet for any required on-site meeting times. Please note, instructors may require tests to be taken at approved testing sites, if you use a testing center other than those provided by HGTC, the center may charge a fee for its services.

Part V: Student Resources

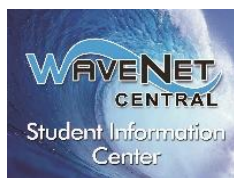


The Student Success and Tutoring Center (SSTC)

The SSTC offers to all students the following **free** resources:

- 1. Academic coaches** for most subject areas, **Writing Center Support**, and **college success skills**.
- 2. On-line student success and academic support resources.**

Visit the SSTC website: [Student Success & Tutoring Center](#) and visit the student services tab in your WaveNet account to schedule appointments using TutorTrac. For more information, call: SSTC Conway, 349-7872; SSTC Grand Strand, 477-2113; and SSTC Georgetown, 520-1455 or go to the [Online Resource Center](#) to access on-demand resources any time.



Student Information Center: WaveNet Central (WNC)

WNC offers to all students the following **free** resources:

- 1. Getting around HGTC:** General information and guidance for enrollment!
2. Use the [Online Resource Center \(ORC\)](#) for COMPASS support, technology education, and online tools.
- 3. Drop-in technology support or scheduled training** in the Center or in class.
- 4. In-person workshops, online tutorials and more services** are available.

Visit the WNC website: [Wavenet Central](#). Live Chat and Center locations are posted on the website. Or please call one of the following locations: WNC Conway, 349-5182; WNC Grand Strand, 477-2076; and WNC Georgetown, 520-1473.

Student Testing:

Testing in an **online/hybrid** course may be accomplished in a variety of ways:

- Test administered within D2L
- Test administered in writing on paper
- Test administered through Publisher Platforms

Furthermore, tests may have time limits and/or require a proctor.

Proctoring can be accomplished either face-to-face at an approved site or online through RPNOW, our online proctoring service. To find out more about proctoring services, please visit the [Online Testing](#) section of the HGTC's Testing Center webpage.

The **Instructor Information Sheet** will have more details on test requirements for your course.

Disability Services:

HGTC is committed to providing an accessible environment for students with disabilities. Inquiries may be directed to Beth Havens, Director of Student Development on the Conway Campus Jaime Davis, Counselor/Advisor on the Georgetown Campus or Kristin Griffin, Counselor on the Grand Strand Campus. These individuals will review documentation of the student's disability and, in a confidential setting with the student, develop an educational accommodation plan.

Note: It is the student's responsibility to self-identify as needing accommodations and to provide acceptable documentation. After a student has self-identified and submitted documentation of a disability, accommodations may be determined, accepted, and provided.

Statement of Equal Opportunity/Non-Discrimination Statement

Horry-Georgetown Technical College prohibits discrimination and harassment, including sexual harassment and abuse, on the basis of race, color, sex, national or ethnic origin, age, religion, disability, marital or family status, veteran status, political ideas, sexual orientation, gender identity, or pregnancy, childbirth, or related medical conditions, including, but not limited to, lactation in educational programs and/or activities.

Inquiries regarding the non-discrimination policies: Students and prospective student inquiries concerning Section 504, Title II, and Title IX and their application to the College or any student decision may be directed to the Vice President for Student Affairs, Dr. Melissa Batten, VP Student Affairs, Title IX Coordinator, Building 1100, Room 107A, Conway Campus, PO Box 261966, Conway, SC 29528-6066, 843-349-5228, Melissa.Batten@hgtc.edu. Employee and applicant inquiries concerning Section 504, Title II, and Title IX and their application to the College may be directed to the Vice President for Human Resources, Jacquelyne Snyder, VP Human Resources, Section 504, Title II, and Title IX Coordinator, Building 200, Room 212A, Conway Campus, PO Box 261966, Conway, SC 29528-6066, 843-349-5212, Jacquelyne.Snyder@hgtc.edu.

Title IX Requirements

All students (as well as other persons) at Horry-Georgetown Technical College are protected by Title IX—regardless of their sex, sexual orientation, gender identity, part- or full-time status, disability, race, or national origin—in all aspects of educational programs and activities. Any student, or other member of the college community, who believes that he/she is or has been a victim of sexual harassment or sexual violence may file a report with the college's Chief Student

Services Officer, campus law enforcement, or with the college’s Title IX Coordinator, or designee.

*Faculty and Staff are required to report incidents to the Title IX Coordinators when involving students. The only HGTC employees exempt from mandatory reporting are licensed mental health professionals (only as part of their job description such as counseling services).

<p>Inquiries regarding the non-discrimination policies:</p>	
<p>Student and prospective student inquiries concerning Section 504, Title II, and Title IX and their application to the College or any student decision may be directed to the Vice President for Student Affairs.</p>	<p>Employee and applicant inquiries concerning Section 504, Title II, and Title IX and their application to the College may be directed to the Vice President for Human Resources.</p>
<p>Dr. Melissa Batten, VP Student Affairs <i>Title IX Coordinator</i></p> <p>Building 1100, Room 107A, Conway Campus PO Box 261966, Conway, SC 29528-6066 843-349-5228 Melissa.Batten@hgtc.edu</p>	<p>Jacquelyne Snyder, VP Human Resources <i>Section 504, Title II, and Title IX Coordinator</i></p> <p>Building 200, Room 212A, Conway Campus PO Box 261966, Conway, SC 29528-6066 843-349-5212 Jacquelyne.Snyder@hgtc.edu</p>