Course Title: Stat 104, Elementary Statistics, 3 credits

Instructor: Alqi Angjeli

Email: a.angjeli@ccsu.edu,

Office: 209 – 211 MS (Maria Sanford)

Office Hours: Tuesday and Thursday from 3:30 pm – 4:30 p.m. and by appointment.

Class Meeting Times: TR 4:30p.m. – 5:45 p.m. at 204 LD


II. Students for Whom the Course is Intended: Stat 104 is intended for students who wish to become familiar with the methods of descriptive and inferential statistics. Stat 104 may be counted toward General Education Skill Area II. As of June 2009, it is a part of the following major programs: criminology, economics, general science (environmental interpretation), physical education, electronics technology, engineering technology, civil engineering technology, manufacturing engineering technology, mechanical engineering technology, industrial technology, and technology and engineering education.

III. Basic Goals: Citizens of the information age need to become savvy consumers of statistical knowledge. Toward this end, the major objectives of Stat 104 are to introduce students to the methods and interpretations of (a) descriptive statistics and (b) inferential statistics. The course description reads as follows:

STAT 104 Elementary Statistics 3
Prereq.: MATH 101 (C- or higher) or placement exam. Intuitive treatment of some fundamental concepts involved in collecting, presenting, and analyzing data. Topics include frequency distributions, graphical presentations, measures of relative position, measures of variability, probability, probability distributions (binomial and normal), sampling theory, regression, and correlation. No credit given to students with credit for STAT 108, 200, 215, 314 or 315. Skill Area II

IV. Topics Covered:

The course can be roughly divided into three Parts, as follows:
1. Introduction and Descriptive Statistics (Chapters 1 – 4)
2. Probability and Probability Distributions (Chapters 5 – 6)
3. Statistical Inference (Chapters 7 – 9)
Here follows a chapter-by-chapter enumeration of required, recommended, and optional topics.

Chapter 1 – The Nature of Statistics

1.1 Data Stories. This section is intended to show the students that statistics is about real human being going through real human experiences. It is not all dry numbers. The instructor may assign it as reading.

1.2 An Introduction to Statistics. The most important section in Chapter 1. Some very important definitions, including variable, sample, population, and statistical inference.

1.3 Gathering Data. To save time, the instructor may wish to omit most of this material. The only required topic is random sampling.

Chapter 2 – Describing Data Using Graphs and Tables
Chapters 2 – 4 are about descriptive statistics. The students’ role is to describe data sets using graphs, tables, and numbers (statistics).

2.1 Graphs and Tables for Categorical Data. The following should be covered: frequency distributions, relative frequency distributions, and bar graphs. Pareto graphs are optional. It is not recommended that students be required to construct a pie chart, since it involves a protractor.

2.2 Graphs and Tables for Quantitative Data. Required topics are frequency distributions, relative frequency distributions, histograms, symmetry and skewness. Recommended topics are stem-and-leaf displays and dotplots. Frequency polygons are optional.

2.3 Further Graphs and Tables for Quantitative Data. All topics in this section are optional.

2.4 Graphical Misrepresentations of Data. This is a great section for increasing quantitative literacy. However, it is optional.

Chapter 3 – Describing Data Numerically

3.1 Measures of Center. All topics in this section are required.

3.2 Measures of Variability. All topics in this section are required, except Chebyshev’s Rule, which is recommended.

3.3 Working with Grouped Data. This section is optional.

3.4 Measures of Relative Position and Outliers. All topics in this section are required.
3.5 Five-Number Summary and Boxplots. All topics in this section are strongly recommended.

**Chapter 4 – Describing the Relationship between Two Variables**

Note that both Stat 104 and Stat 215 require coverage of correlation and regression, unlike Stat 200.

4.1 Scatterplots and Correlation. All topics in this section are required.

4.2 Introduction to Regression. All topics in this section are required.

4.3 Further Topics in Regression Analysis. This section is optional, but is one of the author’s favorite sections 😊.

**Chapter 5 – Probability**

Avoid getting bogged down in probability. The goal of the course is statistical inference. The purpose of covering probability is to provide a way to quantify the uncertainty associated with statistical inference.

Emphasize to the students that we have changed perspective. No longer are we given a data set and asked to describe it. Instead, we are provided with an experiment (Chapter 5), or a population distribution (Chapter 6), and we are asked to answer interesting questions about the experimental situation or distribution.

5.1 Introducing Probability. All topics in this section are required, except simulation, which is optional.

5.2 Combining Events. All topics in this section are required.

5.3 Conditional Probability. Independence and the multiplication rule are required. The remaining topics are recommended.

5.4 Counting Methods. The topic of combinations is required, but it is recommended to cover it only just before covering the binomial probability formula. The other topics in this section are optional.

**Chapter 6 – Random Variables and the Normal Distribution**

Section 6.4 is one of the most important sections in the course, since we build upon this material in Chapters 7 – 9.

6.1 Discrete Random Variables. All topics in this section are required, except the variability of a discrete random variable, which is optional.

6.2 Binomial Probability Distribution. All topics in this section are required. However, different instructors may choose to emphasize different ways of calculating
binomial probabilities: the formula or the tables or the calculator. If you are using the calculator, then the tables are not required since the calculator is more precise.

6.3 Poisson Probability Distribution. There is not enough time to cover this.

6.4 Continuous Random Variables and the Normal Probability Distribution. All topics in this section are required, except for the Uniform probability distribution, which is recommended.

6.5 Standard Normal Distribution. Different instructors may choose to emphasize different ways of calculating normal probabilities: the table or the calculator. If you are using the calculator, then the table is not required since the calculator is more precise. Note that Example 6.36 is a preview of finding the critical values for a Z-confidence interval from Chapter 8. Also note that Case 1 and Case 3 from Table 6.6 are used in Chapter 9 to find the p-value for Z-tests about \( \mu \) and \( p \).

6.6 Applications of the Normal Distribution. All topics in this section are required.

6.6 Normal Approximation to the Binomial Probability Distribution. This section is optional.

Chapter 7 – Sampling Distributions
This chapter is pivotal, taking us from probability back to statistics. Chapter 7 teaches us about the behavior of the sample mean and the sample proportion under certain conditions.

7.1 Introduction to Sampling Distributions. All topics in this section are required.

7.2 Central Limit Theorem for Means. The Central Limit Theorem (CLT) for Means is the most important result in all of statistical inference. The confidence intervals and hypothesis tests for the population mean in later chapters depend on it.

7.3 Central Limit Theorem for Proportions. Similar in importance to the CLT for means. However, if you are pressed for time, you may decide to postpone coverage of this until you cover confidence intervals for the population proportion in Section 8.3.

Chapter 8 – Confidence Intervals
Make sure you budget enough time to cover Chapters 8 and 9 without rushing. Statistical inference is the major objective of the course.

Some textbooks use incorrect methodology for Z-inference. This textbook corrects this, giving us the following cases for inference about \( \mu \):

a. Sigma is known, and the population is normal. Use the Z-interval (Section 8.1) or Z-test (Sections 9.2 and 9.3) for \( \mu \).
b. Sigma is known, and the sample size is >= 30. Use the Z-interval (Section 8.1) or Z-test (Sections 9.2 and 9.3) for mu.

c. Sigma is unknown, and the population is normal. Use the t-interval (Section 8.2) or t-test (Section 9.4) for mu.

d. Sigma is unknown, and the sample size is >= 30. Use the t-interval (Section 8.2) or t-test (Section 9.4) for mu.

e. The population is not normal (or unknown), and the sample size is < 30. We can use neither Z-inference nor t-inference for mu. A statistician would turn to nonparametric methods (Chapter 14 – completely optional).

8.1 Z-Interval for the Population Mean. All topics in this section are required. Emphasize that it is the interval that is random (thanks to x-bar), not the parameter.

8.2 t-Interval for the Population Mean. All topics in this section are required.

8.3 Z-Interval for a Population Proportion. All topics in this section are required.

8.4 Confidence Intervals for the Population Variance and Standard Deviation. This section is optional.

**Chapter 9 – Hypothesis Testing**

Students are often intimidated by this subject. There are a lot of statistics and numbers flying around in this chapter. To differentiate test statistics from critical values, all statistics subscripted *data* (such as Z_data) are test statistics, while numbers subscripted *crit* (such as Z_crit) are critical values.

9.1 Introduction to Hypothesis Testing. All topics in this section are required. The Type I and Type II Errors topic can be covered quickly if time is short, but state that alpha is the probability of incorrectly rejecting the null hypothesis.

9.2 Z-Test for the Population Mean Mu: Critical-Value Method. If possible, emphasize the Essential Idea about Hypothesis Testing for the Mean. All the steps and all the calculations are really just explanations of how to implement this essential idea.

9.3 Z-Test for the Population Mean: p-Value Method. Objective 1 is required. The other objectives are recommended.

9.4 t-Test for the Population Mean. All topics in this section are required.

9.5 Z-test for the Population Proportion p. All topics in this section are required, except Objective 3, which is optional.

9.6 Chi-Square Test for the Population Standard Deviation Sigma. This section is optional.
9.7 Probability of Type II Error and the Power of a Hypothesis Test. This section is optional.

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**Technology.** The TI83 or TI84 or TI83Plus or TI84Plus is required. *Discovering Statistics* provides explicit instruction for all necessary computations using this calculator, in the **Step-by-Step Technology Guide** located at the end of most sections.

**Access to the Author.** Instructors are encouraged to contact the author, Daniel Larose, a member of our Department, with any questions regarding the use of the textbook. Email larosed@ccsu.edu.

**Resources Available:**
1. If you need help, take advantage of your instructor's office hours. Do not wait until just before the first test to do so.
2. The Learning Center is located in Rooms 101, Willard Hall. Free tutoring is available. A schedule for hours the Center is open will be posted soon after the beginning of the semester.
3. Form a study group with other students in your section. Explaining solutions to homework problems to each other is a good way to learn.
4. A list of private tutors for hire is available in the math department office, Room 107 Marcus White, 832-2835.

**Evaluation:**
The average for the course will be based on the following weights:

<table>
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<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Two Tests (15% each)</td>
<td>30%</td>
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<tr>
<td>Three Quizzes (10% each)</td>
<td>30%</td>
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<tr>
<td>Class Participation</td>
<td>5%</td>
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<tr>
<td>Attendance</td>
<td>5%</td>
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<tr>
<td>Assignments/Homework</td>
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<tr>
<td>Final Examination</td>
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Class attendance points: maximum is 5 %

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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>6 or more unexcused</th>
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<tr>
<td>Total %</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>F grade in the course</td>
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Class participation: maximum is 5%
This is based on volunteering to answer questions, asking questions to get explanations, doing all class examples, being courteous and respectful to everyone in the class, and staying focused in class. You lose points for such things as falling asleep in class as well as being distracting, which includes having personal conversations or walking in and out of the room during class.

Minimum averages have been established for each of these grades:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Minimum Average</th>
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<tr>
<td>B</td>
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**Students with Disability:**
Please contact me privately to discuss your specific needs if you believe you need course accommodations based on the impact of a disability, medical condition, or if you have emergency medical information to share.

I will need a copy of the accommodation letter from Student Disability Services in order to arrange your class accommodations. Contact Student Disability Services, room 101-04, Willard Hall if you are not already registered with them. Student Disability Services maintains the confidential documentation of your disability and assists you in coordinating reasonable accommodations with your faculty.

**Academic Integrity:**
You are responsible for understanding and abiding by the University’s policy on academic integrity. Information on the policy may be found at http://www.ccsu.edu/AcademicIntegrity/. This policy is rigorously enforced by the Department of Mathematical Sciences.

**Withdrawal Policy:**
The last day to drop a course without “W” is …………………. The last day to withdraw from a course is …………………. Approvals for withdrawal are not required; however, it is strongly recommended that students consult with their academic advisors prior to deciding to withdraw. Cessation of attendance, notice to the instructor, or telephone calls to the Enrollment Center are not considered official notice of a student’s intention to drop the course.

After …………………… withdrawals are allowed only under extenuating circumstances and require approval of the course instructor, department chair and dean of the School of Arts and Sciences. Poor academic performance is not considered an extenuating circumstance.

**Attendance:**
It is essential that you attend class regularly, and on-time. Attendance will be taken, 6 or more Unexcused Absences will result in an F grade in the course.

**Make-up exams:**
Only extraordinary circumstances would permit the make-up of a missed exam or quiz. (e.g., certified illness, death in the family, religious observances).

**Final Examination:** it will be announced
Cell Phones and other communication devices: Must be turned off at all times during class.

NOTE:
DEPARTURES FROM THE OUTLINE MAY BE MADE AT THE DISCRETION OF THE INSTRUCTOR