I. **Course Title:** Stat 104, Elementary Statistics, 3 credits


III. **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.

IV. **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  
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

V. **Topics Covered:**

The course can be roughly divided into three Parts, as follows:

1. Introduction and Descriptive Statistics (1.1-1.3, 2.1-2.4, 3.1-3.6, 4.1-4.3).
2. Probability and Probability Distributions (5.1-5.4, 6.1-6.5).

VI. **Assessment:**

Final grades will be based on following weights:
Two semester exams 50% (3/11 and 4/29), One computer assignment 20% and Final Exam 30% (5/13).
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 Spread. All topics in this section are required.

3.3 Working with Grouped Data. This section is optional.

3.4 Measures of Position. All topics in this section are required.

3.5 Chebyshev’s Rule and the Empirical Rule. The Empirical Rule is required. Chebyshev’s Rule is recommended.
3.6 Robust Measures. 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 Tables and Graphs for the Relationship between Two Variables. Crosstabulations and scatter plots are required. Clustered bar graphs are optional.

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

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

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 Continuous Random Variables and the Normal Probability Distribution. All topics in this section are required. Emphasize Figure 6.15 on page 287 as a bridge between histograms and continuous probability distributions.

6.4 Standard Normal Distribution. However, 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 6.32 on page 305 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 6.7 on page 298 are used in Chapter 9 to find the p-value for Z-tests about μ and p.

6.5 Applications of the Normal Distribution. All topics in this section are required, except the normal application to the binomial distribution, which 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, except Normal Probability Plots, which is recommended.

7.2 Central Limit Theorem for Means. Shown on page 356, 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. Analogous 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 \( \geq 30 \). 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 \( \geq 30 \). 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 \( < 30 \). Can use neither Z-inference nor t-inference for \( \mu \). A statistician would turn to nonparametric methods. This chapter will soon be available as a pdf chapter from the book website.

8.1 Z-Interval for the 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 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.

8.5 Sample Size Considerations. All topics in this section are required.

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 \( \text{data} \) (such as \( Z_{\text{data}} \)) are test statistics, while numbers subscripted \( \text{crit} \) (such as \( Z_{\text{crit}} \)) 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 \( \mu \): p-Value Method. If possible, emphasize the Essential Idea about Hypothesis Testing for the Mean on page 464. All the steps and all the calculations are really just explanations of how to implement this essential idea. Finally, professional statisticians use the p-value method almost exclusively,
which is why it is presented first. The topic of Assessing the Strength of Evidence Against the Null Hypothesis is optional.

9.3 Z-Test for the Population Mean Mu: Critical Value Method. Objectives 1 – 3 are required. Objectives 4 and 5 are optional.

9.4 t-Test for the Population Mean Mu. 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 4, 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 Power of Hypothesis Test (optional)

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.
Students with Special Needs: If you need course adaptations or accommodation because of a disability, if you have emergency medical information to share with me or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible. I will need a copy of the accommodation letter from Student Disability Services in order to arrange your class accommodations. Contact the Learning Center, Willard 101. Student Disability Services maintains the confidential documentation of your disability and assists you in coordinating reasonable accommodations with your faculty.

In the event of a weather emergency which requires curtailment or cancellation of classes, listen to WTIC (1080 AM) or call (860) 832-3333 for the "general snow message."

The last day to withdraw from a course is March 14. 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 3/14, 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.

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.

Final Grade will be determined as follows: two semester exams given on March 11 and April 29 (50%), Computer assignment (20%) and May 13 Final Exam (30%). If you miss more than 3 days of class without proper documentation, you will fail the course.

Office Hours: Arranged (just before or just after class is best) WF- 1:05PM – 1:50PM

I can be reached at kinsellam@CCSU.EDU
Central Connecticut State University strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment based upon age; ancestry, color; gender identity and expression; intellectual disability; learning disability; mental disorder; physical disability; marital status, national origin; race; religious creed; sex, (including pregnancy, transgender status, sexual harassment and sexual assault); sexual orientation; or any other status protected by federal or state laws. Any student who has concerns about should contact the Office of Diversity and Equity (ODE) at 860-832-1652, Student Affairs at 860-832-1601, or his/her faculty member. The ODE is located on the main floor of Davidson Hall, room 102.

Central Connecticut State University is committed to providing a learning and working environment that emphasizes the dignity and worth of every member of its community. Sexual harassment (including sexual assault) in any form will not be tolerated. Sexual harassment means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. For additional information, please consult the CCSU policies at http://www.ccsu.edu/page.cfm?p=1333. All faculty members and staff have a duty to report incidents of sexual harassment including sexual misconduct, intimate partner violence and stalking to Rosa Rodriguez, Title IX Officer, Office of Diversity and Equity, Davidson Hall, 102.

To file a report contact: Diversity and Equity (860-832-1652); Student Affairs (860-832-1601); Student Conduct (860-832-1667) or the University Police (860-832-2375).

For support and advocacy contact: Office of Victim Advocacy and Violence Prevention at 860-832-3795 or sarahdodd@ccsu.edu; Student Wellness Services at 860-832-1945 (confidential); Women's Center at 860-832-1655; the local YWCA’s Sexual Assault Crisis Services Hotline at 860-223-1787 (confidential) and Prudence Crandall Center for Domestic Violence (confidential) at 888-774-2900(24-hour hotline)