

LAGUARDIA COMMUNITY COLLEGE
CITY UNIVERSITY OF NEW YORK

DEPARTMENT OF MATHEMATICS, ENGINEERING, AND COMPUTER SCIENCE

MAT 118 – INTRODUCTORY STATISTICS

2 Lecture Hours, 1 Lab Hour, 3 Credits

Pre-Requisite: MAT 096 or Waiver

Catalog Description:

This course introduces eligible non-STEM majors to fundamental concepts and methods of elementary statistics. Topics studied include statistical graphs, measures of central tendency and spread, probability, binomial and normal distributions, confidence intervals, hypothesis testing, and linear correlation/regression. Students will use a statistical software package to work on data analysis projects related to current issues. ePortfolio use for projects is recommended. A calculator is required.

Purposes and Goals:

Upon the completion of this course, students should be able to:

1. Perform basic statistical analyses of real-life data sets. They should be able to use standard statistical software on these data.
2. Transfer to four-year colleges and universities and pursue upper division courses and academic programs.
3. Review statistical analyses that involve the statistical procedures and methods presented in this course.
4. Communicate statistical ideas and analyses to audiences who may have little or no knowledge of statistics.

Instructional Objectives:

The instructor is expected to:

1. Explain the meaning of statistics to students and introduce them to basic procedures for selecting sample data.
2. Describe how data sets can be constructed and summarized through the use of tables, graphical displays and descriptive measures.
3. Introduce the basic concepts of probability and the rules that apply in calculating the probability of both simple and compound events.
4. Introduce the binomial, normal, and Student's t-distributions and explain how they can be applied to estimate population parameters; in particular introduce students to the concept of statistical test via the sampling distribution of the mean and the central limit theorem.
5. Introduce the concepts of linear correlation and regression and explain how to use them to study bivariate data.
6. Explain how to use a statistical computer software package (such as SPSS) to organize, analyze and summarize data sets in applied settings.

Performance Objectives:

As a result of successful completion of this course, students should be able to:

1. Compare and contrast descriptive versus inferential statistics; distinguish between populations and samples in the latter case, compare different sampling methods and describe possible sample biases.
2. Construct and interpret frequency distributions and other graphs using data sets, classify (random) variables as either qualitative or quantitative, discrete or continuous; also compute descriptive measures of univariate data for both samples and populations.
3. Apply the basic computational rules of probability.
4. Determine the sampling distribution of the mean for a normally distributed variable for both small and large sample cases; state and apply the central limit theorem and use these (smooth) distributions to estimate population parameters and conduct hypothesis tests.

6. Use a statistical software package to obtain the linear regression equation (use it to
5. Use a statistical software package to construct and analyze data sets and their descriptive measures; furthermore, simulate probabilistic experiments, simulate the sampling distribution of the mean, obtain a one-sample t-confidence interval and perform a one-sample t-test on a population parameter.

Attendance:

Students are expected to attend all class meetings. Students are responsible for all information, material, and assignments covered in class regardless of class attendance. Students should consult the college catalog to find out the terms and conditions under which a WU, incomplete, or F grade may be given by an instructor.

Course Materials: Textbook + Online Platform

1. Textbook (package available at the college bookstore ONLY)


Fundamentals of Statistics: Informed Decisions Using Data; Custom (4th) Edition for LaGuardia Community College of CUNY, Michael Sullivan, III; Pearson Prentice Hall (Pearson Education, Inc. Copyright 2014, 2011, 2008)



2. Online Course Platform (personal access code is included with a textbook package)




MyStatLab on www.pearsonmylab.com, including


- Interactive Multimedia eText
 - Online HW, Quizzes and Tests
 - Study Plan/ Tutorial
 - SPSS technology tutorial videos
 - Gradebook
3. (optional) SPSS 11.0 for Windows, Prof. Prabha Betne, MEC, LaGCC



Course Content Outline


Symbol  refers to the [SPSS technology tutorial videos](#) linked to the [Tools for Success](#) tab of the toolbar menu on [MyStatLab](#) homepage.

HOUR	TOPIC	SECTION	PAGE	<u>MyStatLab</u>
1 – 2	<p><u>Data Collection</u> (Chapter 1)</p> <ul style="list-style-type: none"> Introduction to Practice of Statistics <i>Population, Sample, Individual, Types of Variables, Parameter vs. Statistic</i> Sampling Methods 	1.1 1.3 1.4 (optional)	3 – 11 22 – 26 30 – 36	Section 1.1 HW Section 1.3-1.4 HW Chapter 1 Review Quiz Chapter 1 Review HW
LAB 1	<p>Introduction to SPSS Opening /creating/editing SPSS data file Data Manipulation: Sorting and Sampling (optional)</p>		<ul style="list-style-type: none"> <u>Introduction to SPSS</u> <u>Sampling</u> (optional) 	
4	<p><u>Summarizing Data in Tables and Graphs</u> (Chapter 2)</p> <ul style="list-style-type: none"> Organizing Qualitative data <i>Frequency Distribution, Relative Frequency Distribution, Pareto Chart</i> 	2.1	62 - 69	Section 2.1 HW
5	<ul style="list-style-type: none"> Organizing Quantitative Data <i>Frequency Distribution and Histogram for discrete and continuous data, Stem-and-leaf Plot, Shape of a distribution</i> 	2.2	77 - 105	Section 2.2 HW Chapter 2 Review Quiz Chapter 2 Review HW
LAB 2	<p>Using SPSS to obtain frequency distributions, graphs and charts, and to interpret output.</p>		<ul style="list-style-type: none"> <u>Descriptive Statistics, Histogram and Boxplot, Assessing Normality etc.</u> 	
7	<p><u>Numerically Summarizing Data</u> (Chapter 3)</p> <ul style="list-style-type: none"> Measures of Central Tendency (raw data) <i>Mean, Median, Mode and the shape of a distribution</i> 	3.1	116 - 124	Section 3.1 HW

	<ul style="list-style-type: none"> Measures of Central Tendency (<i>grouped data</i>) <p>Mean of a variable from grouped data</p>	3.3	147 - 151	Section 3.3 HW
8	<ul style="list-style-type: none"> Measures of Dispersion (<i>raw data</i>) <p>Basic Concepts, Range, Standard Deviation and Variance for sample and population</p>	3.2	130 - 140	Section 3.2 HW
LAB 3	Using SPSS to obtain descriptive statistics : mean, median, mode, standard deviation, variance	 <ul style="list-style-type: none"> <u>Descriptive Statistics, Histogram and Boxplot, Assessing Normality etc.</u> 		
10	<ul style="list-style-type: none"> Measures of Position and Outliers <p>Z-score, Quartiles and Percentiles, Outliers</p>	3.4	153 - 159	Section 3.4 -3.5 HW
	<ul style="list-style-type: none"> The Five-Number Summary and Boxplots 	3.5	163 - 172	Chapter 3 Review Quiz Chapter 3 Review HW
11	Review for Instructors Test #1 (Chapters 1, 2 and3)			
LAB 4	More SPSS Graphs and Charts: Stem-and-Leaf Plot, Quartiles, Box-Plot, comparing data	 <ul style="list-style-type: none"> <u>Descriptive Statistics, Histogram and Boxplot, Assessing Normality etc.</u> 		
13	Instructors Test #1 (Chapters 1, 2 and3)			
14	<p><u>Describing the Relation between Two Variables</u> (Chapter 4)</p> <ul style="list-style-type: none"> Scatter Diagram and Correlation: <p>Scatter plot: draw and interpret, Pearson's Linear Correlation Coefficient: Meaning and Properties</p> <ul style="list-style-type: none"> Regression Line /Equation: <p>Interpret Coefficients , Use for Prediction</p>	4.1	178 - 186	Section 4.1 HW Section 4.2-4.3 HW
		4.2	194 - 202	Chapter 4 Review Quiz Chapter 4 Review HW
LAB 5	Use SPSS to make a Scatter-plot with a Regression Line, produce and understand Linear Correlation and Regression Output	 <ul style="list-style-type: none"> <u>Scatter-plot</u> <u>Regression and Residual Plots</u> <u>Correlation</u> 		

16	<p><u>Probability and Probability Distributions:</u> (Chapter 5)</p> <ul style="list-style-type: none"> Probability Rules <p>Empirical and Classical methods</p>	5.1	233 - 242	Section 5.1 HW
17	<ul style="list-style-type: none"> Addition Rule & the Complements Independence and the Multiplication Rule 	5.2 5.3	247 - 254 258 -262	Section 5.2-5.3 HW Chapter 5 Review Quiz Chapter 5 Review HW
LAB 6	Use SPSS to Simulate Randomness	 <ul style="list-style-type: none"> <u>Sampling</u> (if not covered in Lab 1) <u>Generating Random Numbers</u> 		
19	<p><u>Discrete Probability Distributions</u></p> <p>(Chapter 6)</p> <ul style="list-style-type: none"> Discrete Random Variables <p>A Discrete Probability Distribution Table, Probability Histogram, Expected value</p>	6.1	298-305	Section 6.1 HW
20	<ul style="list-style-type: none"> Binomial Probability Distributions <p>Criteria for a binomial probability experiment, Computing Binomial Probability: Table and Formula, Mean, and Standard Deviation of a Binomial Random Variable, Unusual Results</p>	6.2	309-320	Section 6.2 HW Chapter 6 Review Quiz Chapter 6 Review HW
LAB 7	Simulate Binomial Random Variable, obtain Table of Binomial Probabilities Generate and study shape of Binomial bar graph, as the value of 'p' changes			
22	<p><u>The Normal Probability Distributions</u></p> <p>(Chapter 7)</p> <ul style="list-style-type: none"> Properties of the Normal Distribution The Standard Normal Distribution <p>Using z-table to find Probabilities, given z scores, and z scores for given Areas</p>	7.1 7.2	329-335 338-345	Section 7.1-7.2 HW

23	<ul style="list-style-type: none"> Applications of the Normal Distributions <p>Finding Probabilities for given Values, Finding Values corresponding to Probabilities</p>	7.3	350-353 361	Section 7.3 HW Chapter 7 Review Quiz Chapter 7 Review HW
LAB 8	Simulating normal random variable, finding Probabilities for given scores, finding scores for given probabilities, Determining Normality (Q-Q Plot)	 <u>Finding Inverse Normality (Finding z-Scores Given an Area) and the Area under the Normal Curve</u>		
25	<u>Sampling Distributions</u> (Chapter 8) <ul style="list-style-type: none"> Distribution of the Sample Mean <p>Sampling distribution, Mean and Standard Deviation of the Sampling Distribution, The Central Limit Theorem</p>	8.1	367 -376	Section 8.1 HW Chapter 8 Review Quiz Chapter 8 Review HW
26	Review for Test #2			
LAB 9	Test #2			
28-29	<u>Estimating the Value of a Parameter</u> (Chapter 9) <ul style="list-style-type: none"> Estimating a Population Mean <p>Point Estimates, Confidence Intervals and their Interpretations, Critical Values, Margin of Error, Determining Sample Size Required Construct and Interpret a Confidence Interval using Student's t-distribution</p>	9.2	405-412	Section 9.2 HW Chapter 9 Review Quiz Chapter 9 Review HW
LAB 10	Access normality using Q-Q plots and Estimating a Population Mean with SPSS using Confidence Intervals	 <u>Descriptive Statistics, ..., Assessing Normality and Generating Confidence Intervals.</u>		
31	<u>Hypothesis Test Regarding a Parameter</u> (Chapter 10) <ul style="list-style-type: none"> The Language of Hypothesis Testing <p>Null and Alternate Hypothesis, Conclusions to Hypothesis Tests, Type I and Type II errors (optional)</p>	10.1	429-434	Section 10.1 HW

32	<ul style="list-style-type: none"> Hypothesis Tests for a Population Mean Choosing the Appropriate Distribution; Traditional or P-value Methods (introduce both if time permits)	10.3	449 - 454 462-463	Section 10.3 HW Chapter 10 Review Quiz Chapter 10 Review HW
LAB 11	Hypothesis Testing about Population Mean	 <u>Hypothesis test for One Sample Mean and Associated Confidence Intervals</u>		
34	Review for Test #3			
35	Test #3			
36	Final Examination Review			

Data Analysis Projects

Instructors will assign and evaluate at least 3 mini-projects or one course-long master project with at least 3 parts (due on or before week 5, week 10 and week 12, respectively). Students should prepare a project report for each project/part assigned by the deadline. The report must include the method(s) used for the data analysis and the interpretations of the numerical results. Some suggested projects from the course textbook are listed below. The case studies are available in the Student resource CD (SR-CD) attached to the front cover of the binder. (Use of SPSS is recommended for data analysis projects)

Topic	Chapter	Page	Exercise #
Understanding Data Collection	1	44 60	#35 Making an Informed Decision: What college should I attend (1-3)
Organizing Qualitative Data	2	75	Consumer Reports: Consumer Reports Rates Treadmills
Organizing Quantitative Data		114 SR-CD	# 5, 6 Chap. 2: Case study (<i>The Day the Sky Roared</i>)
Measure of Central Tendency Measure of Dispersion Five number Summary and Box-plot	3	129 146 169,170 SR-CD	# 43 Consumer Reports: Basement Waterproofing # 17 Chap. 3: Case study WA Final Project, Page 1
Scatter Diagram and Correlation Least Square Regression The Co-efficient of Determination	4	213	Consumer Reports: Fit to Drink (a – d)
Probability	5	SR-CD	Chap. 5: Case study (<i>The Case of the Body in the Bag</i>)
The Binomial Probability Distribution	6	327	Making an Informed Decision: Should we convict?

The Standard Normal Distribution Applications of Normal Distribution	7	348	Consumer Reports: Sunscreens Chap. 7: Case study (<i>The Tale of Blood Chemistry and Health</i>)
Estimating The Value of a Parameter	9	SR-CD	Consumer Reports: Consumer Reports Tests Tires
Hypothesis Testing	10	SR-CD	Chap. 10: Case study (<i>How old is Stonehenge</i>)

Course Grading:

Test #1	15%
Test #2	15%
Test #3	15%
Quizzes, Assignments	10%
Data Analyses Projects	15%
Departmental Final Examination	30%

ATTENTION

*If your major is NOT listed below, you should NOT take Mat118!
 Instead, consult your program advisors and register for either **Mat120**
(Elementary Statistics I) or **Mat115 (Elementary Algebra)***

Majors eligible to take Mat118 (Introductory Statistics)

Business and Technology

- Accounting (AS)
- Business Administration (AS)
- Business Administration: Aviation Management (AS)
- Travel, Tourism & Hospitality Management (AAS)

Health

- Human Services: Gerontology (AA)
- Human Services: Mental Health (AA)

Liberal Arts

- Commercial Photography (AAS)
- Commercial Photography Certificate
- Commercial Photography: Fine Arts Photography Option (AAS)
- Communication Studies (AA)
- Education: Teachers Education (AA),
Including Childhood Ed and Secondary Ed options
- Fine Arts (AS)
- Fine Arts: Design Studies Option (AS)
- Liberal Arts: Deaf Studies Option (AA)
- Liberal Arts: History Option (AA)
- Liberal Arts: International Studies Option (AA)
- Liberal Arts: Labor & Community Organizing Option (AA)
- Liberal Arts: Latin American Studies Option (AA)
- Liberal Arts: Media Studies Option (AA)
- Liberal Arts: Psychology Option (AA)
- Liberal Arts: Social Science & Humanities (AA)
- Music Recording Technology (AAS)
- Philosophy (AA)
- School Food Management (AAS)
- Spanish Translation Major (AA)
- Theatre (AS)
- Writing & Literature (AA)