



SUFFOLK UNIVERSITY

MADRID CAMPUS

STATS 250 M1 - APPLIED STATISTICS

Instructor Information:

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Course Information:

Catalog Description: Application of statistical analysis to real-world business and economic problems. Topics include data presentation, descriptive statistics including measures of location and dispersion, introduction to probability, discrete and continuous random variables, probability distributions including binomial and normal distributions, sampling and sampling distributions, statistical inference including estimation and hypothesis testing, simple and multiple regression analysis. The use of computers is emphasized throughout the course.

Prerequisites: MATH 128 or higher.

Credit Hours: 4

This course follows the US Federal Government's Credit Hour definition: "An amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutional established equivalence that reasonably approximates no less than:

- (1) One hour of classroom or direct faculty instruction and a minimum of two hours of out of class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time; or
- (2) At least an equivalent amount of work as required in paragraph (1) of this definition for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours.

For full up-to-date statement:

https://cihe.neasc.org/sites/cihe.neasc.org/files/downloads/POLICIES/Pp111_Policy_On_Credits-And-Degrees.pdf

A more detailed breakdown of the student engagement is given below:

| Assignments/Activities | Engagement Estimate | Engagement Hours |
|-------------------------------|------------------------------------|-------------------------|
| Primary Source Readings | 325 pages x 10 minutes per page | 55 hours |
| Homework Exercises | 25 sections x 1.5 hour per section | 38 hours |
| Quiz Preparation | 9 quizzes x 30 minutes per quiz | 5 hours |
| Test Preparation | 2 tests x 10 hours per test | 20 hours |
| Midterm and Final Prep. | 2 exams x 10 hours per exam | 20 hours |
| Class Attendance | 3 hours x 15 weeks | 45 hours |
| Project (Optional) | 20 hours | (20) hours |
| TOTAL | | 183-203 HOURS |

Textbook/Course Materials:

Sullivan III, Michael, Fundamentals of Statistics, Informed Decisions Using data. Pearson, 5th Ed.

A graphic calculator is required: TI-82 STATS, TI-83 or TI 84. Instructions for these calculators *only* can be found in the textbook. More advanced calculators will not be allowed in exams. The textbook and calculator must be brought to every class meeting. Questions about how to use the calculator will not be answered during quizzes or exams. Ask them earlier in class or office hours!

Course Goals & Learning Objectives:

| Upon successful completion of this course, students will understand | Upon successful completion of this course, students will be able to | How the student will be assessed on these learning outcomes: |
|---|--|--|
| <ul style="list-style-type: none"> • The basic elements of statistical thinking and practice | <ul style="list-style-type: none"> • Distinguish between descriptive and inferential Statistics • Know the basic statistical vocabulary • Identify the different kinds of variables • Know the different sources of data collection | <ul style="list-style-type: none"> • Homework exercises section 1.1 • Quiz 1 • Test 1 • Midterm Exam |
| <ul style="list-style-type: none"> • Summaries and graphs of collected data | <ul style="list-style-type: none"> • Organize and visualize categorical data using summaries, tables, and bar, pie, Pareto, side-by-side bar charts • Organize and visualize numerical data using arrays, frequency distributions, displays, histograms, ogives, etc. • Visualize two numerical variables using scatter plots and time series • Analyze all summaries and graphs above to draw conclusions | <ul style="list-style-type: none"> • Homework exercises sections 2.1 and 2.2 • Quiz 1 • Test 1 • Midterm Exam |
| <ul style="list-style-type: none"> • Numerical descriptive measures | <ul style="list-style-type: none"> • Calculate and interpret measures of central tendency: mean, median, mode, geometric mean • Calculate and interpret measures of variation: range, variance and standard deviation, coefficient of variation, z scores, distribution shape • Distinguish between sample and population measures • Explore numerical data using the five-number summary, empirical rule and Chebyshev's rule | <ul style="list-style-type: none"> • Homework exercises chapter 3 • Quiz 2 • Test 1 • Midterm Exam |
| <ul style="list-style-type: none"> • Probability and probability distributions | <ul style="list-style-type: none"> • Set up probability problems using tables, Venn diagrams and set notation, in order to solve them by means of probability rules: complement, addition, multiplication • Use conditional probability and test for independence of events • Apply discrete probabilistic models in business, economics and the social and physical sciences. The binomial probability distribution in particular • Use expected value for decision making • Apply continuous probabilistic models in business, economics and the social and physical sciences. The normal probability distribution in particular • Test for normality in a set of data | <ul style="list-style-type: none"> • Homework exercises chapters 6 and 7 • Quizzes 4, 5, and 6 • Test 1 • Midterm Exam • Test 2 |
| <ul style="list-style-type: none"> • Sampling and sampling distributions | <ul style="list-style-type: none"> • Know the different types of sampling methods: simple random, systematic, stratified, and cluster • Evaluate survey worthiness based on error knowledge • Construct simple sampling distributions • Use the sampling distribution of the mean under the conditions of the Central Limit Theorem • Work with the sampling distribution of the proportion | <ul style="list-style-type: none"> • Homework exercises chapter 8 • Quiz 7 • Test 2 • Final Exam |

| Upon successful completion of this course, students will understand | Upon successful completion of this course, students will be able to | How the student will be assessed on these learning outcomes: |
|---|--|--|
| <ul style="list-style-type: none"> Confidence Interval estimation | <ul style="list-style-type: none"> Construct and interpret confidence intervals for the population mean whether or not the population standard deviation is known Construct and interpret confidence interval for the population proportion Determine the minimum sample size required in order to limit the error of the estimate | <ul style="list-style-type: none"> Homework exercises chapter 9 Quiz 8 Test 2 Final Exam |
| <ul style="list-style-type: none"> The basics of hypothesis testing | <ul style="list-style-type: none"> Determine the appropriate null and alternative hypothesis for a two tail test or a one tail test Calculate test statistics (z or t) and regions of rejection and non-rejection Arrive to a test decision using the classical and p-value approaches concerning a population mean or a population proportion Connect confidence interval estimation with hypothesis testing | <ul style="list-style-type: none"> Homework exercises chapter 10 Quiz 9 Test 2 Final Exam |
| <ul style="list-style-type: none"> Linear correlation and regression | <ul style="list-style-type: none"> Distinguish between the types of regression models Determine the simple linear regression model Compute and interpret the slope and y-intercept of the linear regression equation Make careful predictions based on the model: interpolation and extrapolation Test whether two variables have a statistically significant linear relationship Develop a model for linear multiple regression | <ul style="list-style-type: none"> Homework exercises chapter 4 and handout Quiz 3 Test 1 Midterm Exam Final Exam |

Assignments/Exams/Papers/Projects:

Students will be evaluated in the following areas: Homework assignments, class participation, weekly quizzes, one project, two tests, a midterm exam and a final exam. See below the percentage weight for each.

Grading/Evaluation:

There is a continuous evaluation based on your participation, homework presented, quizzes and examinations. See the semester schedule below for more information. The following percentages indicate how the final grade is calculated. The actual percentages applied vary from student to student—within the given ranges below. The percentages applied in each case will be those which give the highest grade.

| | |
|---------------------------------|------------|
| Quizzes and class participation | 10% to 25% |
| Tests and project | 25% to 40% |
| Midterm and Final Exams | 40% to 55% |

For example, a student with scores of 98, 84, and 92, respectively, in the above three areas will have percentage weights of 25%, 25% and 50%, but another student with scores of 80, 85, and 92 will have weights of 10%, 35% and 55%.

Class participation. In order to earn full class participation grade you must come prepared to class by having done the homework and engage during the class by solving problems on the board, asking questions, and participating actively in the proposed activities. *You may discuss homework with other students and with your tutor who can help you work similar problems, but the answers you submit should be your own.*

PARTICIPATION RUBRIC

| POINTS | WHAT YOU NEED TO DO TO GET THOSE POINTS |
|--------|---|
| 5 | Be punctual; have the homework written down in a separate paper (not in the textbook); have class materials ready–book, notebook, calculator; engage actively in class; be attentive; have your phone switched off and out of sight; don't chat; don't leave the classroom. |
| 4 | All of the things above granting 5 points, except one of them |
| 3 | All of the things above granting 5 points, except two of them |
| 2 | All of the things above granting 5 points, except three of them |
| 1 | None of the things above granting 5 points |
| 0 | You did not attend class |

Quizzes. There will be a short quiz weekly with questions similar to homework problems. You may not use your book during quizzes; however, you may use your own handwritten notes.

Tests. The tests cover a fair amount of material. Review all the homework and study well previous quiz questions to prepare for them. You may not use your book or notes during tests.

Project. Please come to Office Hours to discuss the topic and get guidance if you want to embark on a project. Then meet deadlines for full grade. The project is optional, you do not have to do it, but the decision to do it must be made early in the semester, see schedule below.

PROJECT RUBRIC

| PERCENT | GRANTED FOR |
|---------|--|
| 20% | Meeting all deadlines: Topic choice, first draft, and final draft |
| 20% | Appropriateness of topic, chosen in consultation with the instructor, and sticking to it |
| 20% | Quality and completeness in the first draft |
| 20% | Final draft, in particular incorporating changes suggested by instructor |
| 20% | Class Presentation |

Midterm and Final. The midterm and final exams together cover all course material. The final exam is not cumulative, since it covers the material covered after the midterm exam.

Grading scale:

| Percentage | Grade | Percentage | Grade | Percentage | Grade |
|------------|-------|------------|-------|------------|-------|
| 93-100 | A | 79-82 | B- | 63-66 | D+ |
| 90-92 | A- | 75-78 | C+ | 59-62 | D |
| 87-89 | B+ | 70-74 | C | 55-58 | D- |
| 83-86 | B | 67-69 | C- | 54 or less | F |

Course and Classroom Policies:

Each topic will be covered in the classroom through lecturing or collaborative learning, using examples and illustrations. After new material has been presented, homework exercises corresponding to this material should be attempted and presented in the next class. Sometimes you will be asked to study a lesson at home on your own–flipped class–and then do homework in class. Homework corrections of the most challenging exercises will be shared by the professor or students who can solve them. The homework must be presented in the classroom the day it is due to earn credit for it.

The level of difficulty and type of exercises that you are asked to solve in exams are very similar as you find in the homework from the textbook. Thus, it is essential that you study the textbook and familiarize yourself with it. There will not be make-up exams, although a justified absence in an exam

will allow you to recuperate it during the midterm or final exam. To encourage daily study of the material, short quizzes covering the homework assignments will be given weekly. If you miss a quiz due to a justified reason, you are encouraged to come to Office hours to do a make-up, but always before the next test or exam.

For students having difficulties with the material or falling behind the rhythm of the class, it is crucial to use office hours to recuperate. The teacher is always available for consultation, do not hesitate to approach with a difficulty, small as it may seem.

Punctuality: Students must be punctual for classes. If a student arrives repeatedly late (5 minutes or more), the professor may refuse entry and mark him/her absent.

Cellular phones, being ready for class: Before you enter the classroom, be sure you have solved all your businesses so that you do not have to leave in the middle of the class, which is always an undesirable interruption. That includes taking care of all your physiological needs, bringing your own calculator, and a Kleenex or similar if you are having a cold and switching off your cellular phone. Thanks for your cooperation! Any student who uses his/her cellular phone during class will be asked to leave the class immediately and will not be allowed to return.

Food and drinks: Students may consume water during class but no other kind of drinks and no food may be brought to class. Students may not leave the classroom to get water, but should bring it at the beginning of the class. Just come prepared so that you do not have to leave the class.

Assignments/Exams/Papers/Projects:

Students will be evaluated in the following areas: daily homework assignments, weekly quizzes, two noncumulative tests, four short projects, a midterm exam, and a final exam.

Participation/Attendance Policy:

The SUMC Student Handbook states the following:

Once a student is registered for a course, attendance at every meeting of every class is expected, including those held in the first week of the semester. A maximum of two unjustified absences is permitted. Each additional absence will cause the final course grade to be lowered by one-third of a letter grade, i.e., from A to A-; A- to B+; B+ to B, etc.

Excessive absences in a course will have a negative effect on the final grade. When a student is absent, the quality of his or her work in a course will deteriorate since material missed in class sessions can rarely be made up satisfactorily, even though the student remains responsible for that work.

Please note that even when a student has a justified reason for missing class, such as illness, the negative academic impact on learning will be the same as if the absence were for spurious reasons.

In this course, any absence due to illness should be justified by a note from the student's physician or other health professional confirming the day(s) on which the student was unable to attend class. This note should be presented the class following the absence or the following week at the latest. Written justifications will not be accepted afterwards. Medicine prescriptions or plane tickets are not valid justifications.

If a justified absence occurs in an examination day, the make-up will occur during the midterm or final exam, or the make-up days assigned for these.

Students are responsible for all material and assignments for the days missed, regardless of the reason for the absence. Students are also expected to pay attention in class and to participate in classroom activities, such as solving problems in group or presenting them on the board to the other students.

In the event that a class meeting is unexpectedly cancelled, students will be expected to continue with readings or other assignments as originally scheduled. Any assignments due or class activities (e.g., a quiz,

exam or presentation) planned for such a cancelled class are due at the next class meeting unless other instructions are communicated.

Disability Statement:

If you anticipate issues related to the format or requirements of this course, please meet with me. I would like us to discuss ways to ensure your full participation in my classroom.

If formal, disability-related accommodations are necessary, it is very important that you be registered with the Office of Disability Services (ODS) at the main Campus in Boston so that I am notified of your eligibility for reasonable accommodations. We can then plan how best to coordinate your accommodations. Check the ODS web site at www.suffolk.edu/disability for information on accommodations.

Student Resources:

SUMC provides a range of student services, both academic and personal. To learn more about course-related tutorials and academic workshops, refer to the SUMC Student Handbook, Section 2 “Academic Policies and Services”. Section 5, “Living in Madrid”, contains information on the medical and mental health resources, including an English-speaking therapist, available to you.

Midterm Review:

At midterm, around week 6, you will be given a midterm grade based on your progress to date and performance on assignments, quizzes and midterm exam. Midterm grades of C- or below will be reported to the Madrid Campus Academic Standing Committee, with an explanation of what I believe has contributed to that grade: excessive absences, poor time management or study skills, lack of effort, difficulty with the course material or with writing or language skills, etc. The Academic Standing Committee or I may contact you to suggest strategies for addressing these difficulties, which may include mandatory participation in Math Tutorials. I strongly encourage you to visit me during my office hours so we may discuss how you can be successful in this class.

Academic Misconduct:

www.suffolk.edu/about/mission-history/policies-procedures/academic-misconduct-policy

Suffolk University expects all students to be responsible individuals with high standards of conduct. Students are expected to practice ethical behavior in all learning environments and scenarios, including classrooms and laboratories, internships and practica, and study groups and academic teams. Cheating, plagiarism, unauthorized collaboration, use of unauthorized electronic devices, self-plagiarism, fabrication or falsification of data, and other types of academic misconduct are treated as serious offenses that initiate a formal process of inquiry, one that may lead to disciplinary sanctions.

Student work will be thoroughly examined for academic integrity and may be scanned using plagiarism detection software. A faculty member suspecting academic misconduct will contact the student using the Suffolk email address to schedule a meeting and will make all effort to do so within five business days of detecting the incident. During the meeting, the faculty member will present the documentation that led to suspected academic misconduct. Resolution of the incident will be according to the procedures outlined in the SUMC Student Handbook.

Academic Grievances Policy:

www.suffolk.edu/student-life/student-services/student-handbook/university-policies-for-student-cas-sbs/grievances-academics

Course Schedule:

The schedule, policies, procedures, and assignments in this course are subject to change in the event of extenuating circumstances, by mutual agreement, or to ensure better student learning.

| Month | Topic covered and Main Activity | Homework exercises or other assignments due |
|-----------------|---|---|
| <i>January</i> | Section 1.1 Introduction to the Practice of Statistics | |
| | Section 2.1 Organizing Qualitative Data | 1.1 1 to 6, 8, 11, 16, 19, 24, 27, 32, 35, 40, 43, 48, 51, 56, 59. |
| | Section 2.2 Organizing Quantitative Data Quiz 1 | 2.1 1 to 4, 8, 11, 16, 19, 24, 27, 32. |
| | Sections 3.1 & 3.2 Measures of Central Tendency and Dispersion | 2.2 1 to 8, 11, 16, 19, 24, 27, 32, 35, 40, 43, 48, 51, 56, 59. |
| | Sections 3.4 & 3.5 Measures of Position and Outliers The 5-Number Summary and Boxplots Quiz 2 | 3.1 1 to 6, 8, 11, 16, 19, 24, 26, 32, 43, 48. 3.2 1 to 3, 11, 16, 19, 24, 27, 32, 40, 51, 56, 59. |
| <i>February</i> | Sections 4.1 Least-Squares Regression | 3.4 1 to 4, 8, 11, 16, 19, 24, 27, 35. 3.5 1, 2, 3, 8, 11, 16, 19. |
| | Sections 4.2 & 4.3 Scatter Diagrams and Correlation The Coefficient of Determination Quiz 3 | 4.1 1 to 12, 16, 19, 24, 27, 32, 35, 40, 43, 51, 56. |
| | Test 1 preparation | 4.2 1 to 4, 16, 19, 24, 26, 32. 4.3 1 to 5, 9, 16. |
| | Test 1 | |
| | Sections 5.1 to 5.3 Probability Rules | |
| | Section 6.1 Discrete Random Variables Quiz 4 | 5.1 1 to 6, 8, 11, 16, 19, 24, 27, 32, 35, 56, 59. 5.2 1 to 4, 8, 11, 16, 19, 24, 27, 32, 35, 40. 5.3 1 to 6, 8, 11, 16, 19, 24, 27. |
| | Midterm Exam Preparation | 6.1 1 to 4, 8, 11, 16, 19, 24, 27, 32. |
| | Midterm Exam | |
| <i>March</i> | Section 6.2 The Binomial Probability Distribution | Project topic must have been discussed and decided by today |
| | Section 7.1 Properties of The Normal Distribution Quiz 5 | 6.2 1 to 6, 8, 11, 16, 19, 24, 27, 32, 35, 40, 43, 48, 51, 56. |
| | Sections 7.2 & 7.3 Applications of The Normal Distribution Assessing Normality | 7.1 1 to 12, 18, 19, 24, 27, 32, 35. |
| | Section 8.1 Distribution of the Sample Mean Quiz 6 | 7.2 1 to 4, 8, 11, 16, 19, 24, 27, 32, 35, 40, 43, 48, 51, 56. 7.3 1, 2, 3, 8, 11. |
| | Section 8.2 Distribution of the Sample Proportion | 8.1 1 to 8, 11, 16, 19, 24, 27, 32, 35, 40. |
| | Section 9.1 Estimating a Population Proportion Quiz 7 | 8.2 1 to 6, 11, 16, 19, 24, 27. |
| <i>April</i> | Test 2 preparation | 9.1 1 to 6, 8, 11, 16, 19, 24, 27, 32, 35, 40, 43, 48, 51. |

| <i>Month</i> | <i>Topic covered and Main Activity</i> | <i>Homework exercises or other assignments due</i> |
|--------------|--|--|
| | Test 2 | |
| | Sections 9.2 & 9.3 Estimating a Population Mean Putting it Together: Which Procedure Do I Use? | |
| | Section 10.1 The Language of Hypothesis Testing Quiz 8 | 9.2 1 to 6, 8, 11, 16, 19, 24, 28, 32, 35, 40, 43, 48, 56. 9.3 1 to 4, 8, 11, 15, 19, 24. |
| | Section 10.2 Hypothesis Tests for a Population Proportion | 10.1 1 to 14, 16, 19, 24, 27, 32, 35, 40, 43. Project first draft is due today |
| | Sections 10.3 & 10.4 Hypothesis Tests for a Population Mean Putting it Together: Which Method Do I Use? Quiz 9 | 10.2 1 to 6, 8, 11, 16, 19, 24, 27, 32, 35, 43. |
| | An Introduction to Multiple Regression Analysis Project presentations begin | 10.3 3, 8, 11, 16, 19, 24, 28, 32, 35, 40. 10.4 3, 8, 11, 16, 19, 24. |
| | Reading Day (no class) Project presentations end | Homework handout Project final draft is due today |
| | Final Exam | |