

MARSHALL UNIVERSITY
DEPARTMENT OF MATHEMATICS
STUDENT INFORMATION SHEET AND SYLLABUS

Course Title/Number	STA 225 – Introductory Statistics (CT)
Section	202
CRN	4985
Semester/Year	Spring 2018
Days/Time	MWF 11:00 - 11:50 AM
Location	WAEC 3121
Instructor	Dr. Avishek Mallick
Office	SH 743C
Phone ext.	304-696-3443
E-Mail	mallicka@marshall.edu
Office/Hours	MWF 10:00-11:00 AM TR 2:00-3:00 PM and by appointment.
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on “Marshall University Policies.” Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description and Objectives

A critical thinking course in applied statistical reasoning covering basic probability, descriptive statistics and fundamental statistical inference procedures. Parameter estimation and hypothesis testing for variety of situations with wide applications. More on course objectives and learning outcomes appear on the 2nd and 3rd page of this document.

Required Texts and Other Materials

Title	: <i>Elementary Statistics: A step by step approach (A Brief Version)</i> , 7 th edition.
Author	: Allen G. Bluman
ISBN	: 978-0-07-772058-2
Publisher	: McGraw-Hill, New York, NY.
Additional Supplies	: You will need a <u>calculator</u> . It is recommended that you use a TI-83/TI-83 plus or similar graphing calculator. You may use the calculator on all work and assignments in this class. You need access to a <u>computer with Microsoft Excel</u> . You may not use your phone, iPad, laptop, etc. as a calculator on any quiz or exam. No other technology may be used in class without permission.
MUOnline	: Assignments, announcements, grades and other course materials will be posted regularly on MUOnline.

CRITICAL THINKING “CT” RELATED LEARNING OUTCOMES ADDRESSED, PEDAGOGICAL METHODS, AND CLASSROOM ASSESSMENTS

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be assessed in this Course
1: Integrative Thinking: Students will make connections and transfer skills and learning among varied disciplines, domains of thinking, experiences, and situations.	<ul style="list-style-type: none"> • Homework • Quizzes • Classroom discussions 	Exams and course project.
2: Communication Fluency: Students will develop cohesive oral, written, and visual communications tailored to specific audiences. <ul style="list-style-type: none"> • Students will select and produce appropriate graphical, tabular, and numerical summaries of the distributions of variables in a data set. Summarize such information into verbal descriptions. 	<ul style="list-style-type: none"> • Classroom discussions • Homework • Quizzes • Project report 	Exams and course project.
3: Inquiry Based Thinking: Students will formulate focused questions and hypotheses, evaluate existing knowledge, collect and analyze data, and draw justifiable conclusions. <ul style="list-style-type: none"> • Given research questions involving a single population or two populations, student will be able to formulate null and alternative hypotheses. Describe the logic and framework of the inference of hypothesis testing. Make decisions using classical and p-value approaches and draw appropriate conclusions. Interpret statistical and practical significance in this setting. 	<ul style="list-style-type: none"> • Classroom discussions • Homework • Quizzes 	Exams and course project.
4: Metacognitive Thinking: Students will evaluate the effectiveness of a project plan or strategy to determine the degree of their improvement in knowledge and skills.	<ul style="list-style-type: none"> • Classroom discussions • Project report drafts 	Exams and course project.
5: Quantitative Thinking: Students will analyze real-world problems quantitatively, formulate plausible estimates, assess the validity of visual representations of quantitative information, and differentiate valid from questionable statistical conclusions. <ul style="list-style-type: none"> • Students will construct a model for a random phenomenon using outcomes, events, and the assignment of probabilities. Use the addition rule for disjoint events and the multiplication rule for independent events. • Students will be able to recognize the difference between discrete and continuous random variables and probability distribution. Especially use the normal distribution to interpret z-scores and compute probabilities. • Students will estimate a population mean, a population proportion or difference between means and difference between proportions using point estimates and confidence intervals and interpret the confidence level and margin of error. Understand the dependence of margin of error on sample size and confidence level. 	<ul style="list-style-type: none"> • Classroom discussions • Homework • Quizzes • Project report 	Exams and course project.

Course Requirements

Prerequisite: MTH 121 with a grade of C or higher, or at least 21 on Math ACT, or at least 500 on Math SAT.

Homework: For each topic we discuss in class, homework problems from the textbook will be assigned. It is your responsibility to understand the homework because test and quiz questions will be based on these problems. You are encouraged to work with your peers on the homework outside of class and to ask me if you have any questions. The problems may not always be graded, they are for your benefit in assisting you with understanding the material.

Quiz: Quizzes will be given every other week. Any unexcused absence on the day of a quiz will result in a score of zero.

Project: It is an integral part of this course. Please make sure that you get your project idea and data collection technique approved by me within the first two weeks of the course. Find out more about the project on page 6 of this syllabus.

Attendance Policy

Students are expected to attend all scheduled classes. It is the student's responsibility to find out what was discussed in a missed class. Attendance records will not be used to compute grades, however, missing class can be expected to significantly reduce your chances of success. Note also that it is the student's responsibility to present approved notice of any absence that would be excused under the terms and regulations stipulated by the university.

Student behavior

Students are advised to turn their cell phones and other noise generating devices off prior to entering the class. In the case where a student awaits any emergency call, the noise should be restricted and made personal. And in this case, I should be notified as soon as the student enters the class. Food items, apart from water or soft drink, are not allowed in the class. The reading of newspapers and other unrelated materials while the class is in session is prohibited. Please ensure that other students are respected.

Tutoring Facilities

The Department of Mathematics offers a **free** tutoring lab for Marshall students enrolled in mathematics courses. The tutors can help with all classes from MTH 098 to MTH 231. No appointment is necessary; just stop in and ask for a tutor. The lab location and tutoring hours are:

- In Smith Hall 625: 10:00am - 4:00pm and 5:00pm – 6:30pm Monday to Thursday
10:00am - noon on Friday.

The Tutoring Center in Communications Building has tutors who are available for **free**, by appointment. Please consult their web page for additional information.

More information about these facilities can be accessed by going to <http://www.marshall.edu/math/tutoring/>

Grading Policy and Exam dates

The final grade will be based on the following components:

3 Regular Exams	300 points
Quizzes	100 points
Project	100 points
Final Examination	100 points (Comprehensive)
Total	600 points

The semester grade will be based on the percentage of the 600 total possible points, using the following scale:

90 -100% -- A
 80 - 89% -- B
 70 - 79% -- C
 60 - 69% -- D
 00 - 59% -- F

EXAM I : Friday, February 2 (tentative)
EXAM II : Friday, March 2 (tentative)
EXAM III : Wednesday, April 4 (tentative)
FINAL EXAMINATION : Tuesday, May 1 [10:15 AM – 12:15 PM]

STA 225 (CT): Introductory Statistics (Section 202)
Tentative Coverage

Spring 2018

1-8	1.1 – 1.5 The Nature of Probability & Statistics
1-10	1.1 – 1.5 The Nature of Probability & Statistics
1-12	2.3 Other Types of Graphs (categorical)
1-15	Martin Luther King Jr.'s Birthday
1-17	2.1 Organizing Data (frequency tables) 2.2 Histograms, Frequency Polygons, ...
1-19	3.1 Measures of Central Tendency Project approval from the Instructor.
1-22	3.2 Measures of Variation
1-24	3.3 Measures of Position
1-26	3.4 Exploratory Data Analysis
1-29	COMPUTER LAB – Graphs, Numerical Measures (Location TBA)
1-31	Review Project Part I due.
2-2	Exam I
2-5	4.4 Counting Rules
2-7	4.1 Sample Spaces and Probability
2-9	4.2 The Addition Rules for Counting
2-12	4.3 The Multiplication Rules and Conditional Probability
2-14	4.3 The Multiplication Rules and Conditional Probability (cont'd)
2-16	4.5 Probability and Counting Rules Project Part II due.
2-19	5.1 Probability Distributions
2-21	5.2 Mean, Variance, St. Dev., and Expectation
2-23	5.3 The Binomial Distribution
2-26	5.3 The Binomial Distribution
2-28	Review
3-2	Exam II

3-5	6.1 Normal Distributions
3-7	6.2 Applications of the Normal Distribution
3-9	6.3 The Central Limit Theorem
3-12	6.4 The Normal approximation to the Binomial
3-14	7.1 Confidence Intervals (CI) for the Mean (large samples)
3-16	7.2 CIs for Mean (small samples) <i>(Last Day to Drop)</i>
3-19	SPRING BREAK
3-21	SPRING BREAK
3-23	SPRING BREAK
3-26	7.2 CIs for Mean (small samples)
3-28	7.3 CIs for Proportions
3-30	COMPUTER LAB (Location TBA)
4-2	Review
4-4	Exam III
4-6	8.1 Steps in Hypothesis Testing Project Part III due.
4-9	8.2 z Test for a Mean
4-11	8.3 t Test for a Mean
4-13	8.4 z Test for a Proportion
4-16	9.1 Testing Two Means: Large Samples
4-18	9.2 Testing Two Means: Small Independent Samples
4-20	9.2 Testing Two Means: Small Independent Samples
4-23	9.3 Testing Two Means: Small Dependent Samples
4-25	9.4 Testing the Difference Between Proportions
4-27	Review <i>(Last Class)</i> Project Part IV due.
5-1	Final Exam 10:15 AM – 12:15 PM

Project Description: For this project, you will be assigned to a group. Your group will choose from a selection of data sets, and then select one **quantitative** variable from this data set for analysis. Also you must have a **minimum of 30** observations in your data set.

All of the people in your group will be working on the same variable from the same data set, and you are encouraged to work cooperatively on all computational aspects of the project. You are also encouraged to discuss interpretations with all of the people in your group. However, all written submissions must be entirely **your own individual work**. Any submission of the same (or extremely similar) written work from two or more students will be considered academic dishonesty and will be dealt with accordingly.

The project will consist of 4 distinct parts, described below. Note that each part has its own due date. For each part, you will be given written instructions with additional detail regarding what is required for the submission.

We will be going to a computer lab few times during the semester, at which point you will receive instruction on using Excel for your analysis. You should bring your group data with you to each of these labs so that you can work on your own data at that time.

Part I – 15 pts.

Introduction (Due Wednesday 1-31-2018)

Talk about your project idea, how you came up with the idea, what your null and alternative hypotheses are, and how you gathered your data.

Part II – 25 pts.

Data description (Due Friday 2-16-2018)

Create a histogram or any other appropriate graphical display for your data

Compute summary statistics for your data.

Discuss what the graphs and summary statistics tell you about your data. Indicate which summary statistics (based on the shape of your distribution) would most accurately summarize your variable.

Part III – 20 pts.

Estimation (Due Friday 4-6-2018)

Estimate the appropriate parameter of interest using point estimation as well as by constructing a confidence interval. In your own words, interpret the interval.

Part IV – 40 pts. (Due Friday 4-27-2018)

A. Hypothesis Testing

Conduct the one-sample t-test. Write out your null and alternative (or research) hypotheses. Talk about the results of your hypothesis test. What was the p-value? Interpret the p-value in your own words. Based on the results of the hypothesis test, do you reject or fail to reject the null hypothesis? Then write down your conclusion. (Keeping in mind that the conclusion should be in terms of your alternative hypothesis.)

B. Final Report

Briefly summarize what you did for this project and what are your findings. Discuss any shortcoming(s) of the methods you have used to summarize data. Did you discover anything that surprised you when you analyzed the data? Do you think the results would have been different if you had bigger sample sizes? If you had to do the project again, how would you do it differently?