

Marshall University Syllabus

Course Title/Number	Applied Probability & Statistics/MTH 345/201/3808 (3CH)
Semester/Year	Spring/2014
Days/Time	TR / 11:00AM – 12:15PM
Location	SH 516
Instructor	Alfred Akinsete
Office	SH 524
Phone	304.696.6010
E-Mail	akinsete@marshall.edu
Office/Hours	2:00PM – 4:30PM on Tues. & Thurs. Any other time 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: From Catalog

Statistical methods in scientific/engineering research, with emphasis on applications. The course will address probability modeling, experimental design/survey sampling, estimation/hypothesis testing procedures, regression, ANOVA/factor analysis. Practical applications will be implemented with statistical software such as R, Minitab, JMP, Excel, and SAS.

The table below shows the following relationships: How each student learning outcomes will be practiced and assessed in the course.

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
Students will be able to interpret and apply the results of published statistical studies	Students are required to participate in class discussions, group work, intensive reading of relevant chapters, and most importantly, practice numerous exercises that are available at the end of every chapter of the recommended textbook.	Homework assignments, group projects, exams.
Students will be able to plan and implement a statistical study	Students are required to participate in class discussions, group work, intensive reading of relevant chapters, and most importantly, practice numerous exercises that are available at the end of every chapter of the recommended textbook.	Homework assignments, group projects, exams.
Students will be able to summarize	Students are required to participate in class	Homework assignments,

the results of a study using graphs and numerical measures	discussions, group work, intensive reading of relevant chapters, and most importantly, practice numerous exercises that are available at the end of every chapter of the recommended textbook.	group projects, exams.
Students will be able to choose appropriate probability models to describe real-world situations	Students are required to participate in class discussions, group work, intensive reading of relevant chapters, and most importantly, practice numerous exercises that are available at the end of every chapter of the recommended textbook.	Homework assignments, group projects, exams.
Students will be able to identify the appropriate statistical procedure for analyzing data	Students are required to participate in class discussions, group work, intensive reading of relevant chapters, and most importantly, practice numerous exercises that are available at the end of every chapter of the recommended textbook.	Homework assignments, group projects, exams.
Students will be able to implement appropriate statistical procedure, with and without computer software	Students are required to participate in class discussions, group work, intensive reading of relevant chapters, and most importantly, practice numerous exercises that are available at the end of every chapter of the recommended textbook.	Homework assignments, group projects, exams.
Students will be able to interpret statistical computer output and to report statistical results in a clear and coherent form	Students are required to participate in class discussions, group work, intensive reading of relevant chapters, and most importantly, practice numerous exercises that are available at the end of every chapter of the recommended textbook.	Homework assignments, group projects, exams.

Required Texts, Additional Reading, and Other Materials

1. Devore, J. L. (2009). *Probability and Statistics for Engineering and the Sciences, 8th Ed.*, Boston, MA: Brooks/Cole. ISBN – 10: 0-538-73352-7; ISBN – 13: 978-0-538-73352-6
2. An Introduction to R - Notes on R: A Programming Environment for Data Analysis and Graphics (Version 2.14.1 (2011-12-22)). This text is available online upon downloading the R package. It is intended to guide you on the implementation of statistical analysis that will be discussed in class, and NOT meant to substitute for the textbook. Students will always be pointed to the portion to be read when needed
3. Any other relevant materials will be distributed in class or at <http://webwork.marshall.edu/>

Course Requirements / Due Dates

1. Pre-requisite requirement: Grade C or better in either MTH 230 or IST 230, or by permission
2. Computer requirement: There are many statistical packages and you are free to use any that you find

applicable. You are encouraged to use the Computer Lab in SH 532. The SAS software is installed on those computers for those of you who would like to use SAS. Students will be introduced to the R-package. See Statistical Resources below.

3. Software requirement: The Student Website of the textbook at www.thomsonedu.com/statistics/devore includes some JavaTM applets. Other statistical resources may be found in www.socr.ucla.edu and www.causeweb.org/resources Also, every student is advised to visit <http://www.r-project.org/> or <http://en.wikipedia.org/wiki/R> and download the R package from your preferred CRAN mirror. It will be needed in the cause of our discussion. Note that your knowledge of the programming language is not the focus in this course. A basic R source manual needed for statistical computing in this course is listed under the required texts, and is free in R.
4. Behavioral requirement: Students are advised to turn their cell phones and other voice generating devices off prior to entering the class. In the case where a student awaits any emergency call, the volume should be restricted and made personal. And in this case, I should be notified as soon as the student enters the classroom. Food items besides water or soft drinks are not allowed in the class. The reading of newspapers and any other unrelated and unapproved materials to the course while the class is in session is prohibited. Please ensure that other students are respected
5. Withdrawal from course: Last Day to Completely Withdraw for Spring Semester is Friday, May 2, 2014.
6. Final Exam Day: Thursday, May 8, 2014 @ 10:15AM – 12:15PM. Venue is SH 516

Grading Policy

All tests will be given during the regular class sessions. No makeup quiz (if any) will be given under any circumstances. Also, no makeup test will be given unless an acceptable excuse is given to the instructor, for example, in the case of illness, a note from a physician. All excuses must be approved by the Dean of Student Affairs. All schedules tests and examination will be conducted in the classroom.

The final grade will be based on the following components:

2 Tests	200 points
Homework Exercises*	200 points
Miscellaneous**	100 points
<u>Final Examination</u>	<u>150 points</u> (Thursday, May 8, 2014 @ 10:15AM – 12:15PM. Venue is SH 516)
Total	650 points

The semester grade will be based on the percentage of the 650 total possible points, using the following scale.

%	Point	Grade
90 -100%	[585, 650]	-- A
80 - 89%	[520, 585)	-- B
70 - 79%	[455, 520)	-- C
60 - 69%	[390, 455)	-- D
0 - 59%	[0, 390)	-- F

*All homework exercises will be posted here: <http://webwork.marshall.edu/>. You will log into WebWork with your usual username and password, like you normally log into the university computer. To start with, please log in and read the file named "Orientation", to familiarize you with how things work in WebWork.

**This may include quizzes, classroom participation, projects, and group work

Attendance Policy

Attendance requirement: Students are advised to attend all scheduled classes. It is the student's responsibility to find out what was discussed in a missed class. Attendance will be taken, but will not be used to compute grades, except possibly in borderline cases. You should note that missing classes can be expected to significantly reduce your chances of success.

Course Topics/ Course Schedule

Weekly Teaching Guide

NOTE: The following is a tentative instructional guide, and is subject to changes as class progresses, reflecting the coverage of the contents:

Chapter 1: Overview and Descriptive Statistics [Week 1]

- 1.1 Populations, Samples, and Processes
- 1.2 Pictorial and Tabular Methods in Descriptive Statistics
- 1.3 Measures of Location
- 1.4 Measures of Variability

Chapter 2: Probability [Week 2]

- 2.1 Sample Spaces and Events
- 2.2 Axioms, Interpretations, and Properties of Probability
- 2.3 Counting Techniques
- 2.4 Conditional Probability
- 2.5 Independence

Chapter 3: Discrete Random Variables and Probability Distributions [Week 3]

- 3.1 Random Variables
- 3.2 Probability Distributions for Discrete Random Variables
- 3.3 Expected Values of Discrete Random Variables
- 3.4 The Binomial Probability Distribution
- 3.5 Hypergeometric and Negative Binomial Distributions
- 3.6 The Poisson Probability Distribution

Chapter 4: Continuous Random Variables and Probability Distributions [Weeks 4 & 5]

- 4.1 Probability Density Functions
- 4.2 Cumulative Distribution Functions and Expected Values
- 4.3 The Normal Distribution
- 4.4 The Exponential and Gamma Distribution
- 4.5 Other Continuous Distributions
- 4.6 Probability Plots

Chapter 5: Joint Probability Distributions and Random Samples [Weeks 6 & 7]

- 5.1 Jointly Distributed Random Variables
- 5.2 Expected Values, Covariance, and Correlation
- 5.3 Statistics and Their Distributions
- 5.4 The Distribution of the Sample Mean
- 5.5 The Distribution of a Linear Combination

Test 1 [Chapters 1 – 5]: Thursday, February 27, 2014

Chapter 6: Point Estimation [Week 8]

- 6.1 Some General Concepts of Point Estimation
- 6.2 Methods of Point Estimation

Chapter 7: Statistical Intervals Based on a Single Sample [Week 8]

- 7.1 Basic Properties of Confidence Intervals
- 7.2 Large-Sample Confidence Intervals for a Population Mean and Proportion
- 7.3 Intervals Based on a Normal Population Distribution
- 7.4 Confidence Intervals for the Variance and Standard Deviation of a Normal Population

Chapter 8: Tests of Hypotheses Based on a Single Sample [Week 9]

- 8.1 Hypothesis and Test Procedures
- 8.2 Tests about a Population Mean
- 8.3 Tests concerning a Population Proportion
- 8.4 P-Values
- 8.5 Some Comments on Selecting a Test

Chapter 9: Inferences Based on Two Samples [Week 10 & 11]

- 9.1 z Tests and Confidence Intervals for a Difference between Two Population Means
- 9.2 The Two-Sample t Test and Confidence Interval
- 9.3 Analysis of Paired Data
- 9.4 Inferences Concerning a Difference between Population Proportions
- 9.5 Inferences Concerning Two Population Variances

Test 2 [Chapters 6 – 11]: Thursday, April 3, 2014**Chapter 10: The Analysis of Variance [Week 12]**

- 10.1 Single-Factor ANOVA
- 10.2# Multiple Comparisons in ANOVA
- 10.3# More on Single-Factor ANOVA

#Chapter 11: Multifactor Analysis of Variance [Week 12]

- 11.1 Two-Factor ANOVA with $K_{ij} = 1$
- 11.2 Two-Factor ANOVA with $K_{ij} > 1$
- 11.3# Three-Factor ANOVA
- 11.4# 2p Factorial Experiments

Chapter 12: Simple Linear Regression and Correlation [Week 13]

- 12.1 The Simple Linear Regression Model
- 12.2 Estimating Model Parameters
- 12.3/4 Statistical Inference for Simple Linear Regression Parameters
- 12.5 Correlation

Chapter 13: Multiple Linear Regression [Week 14]

- 13.2 Regression with Transformed Variables
- 13.4 Multiple Linear Regression Analysis
- 13.5 Other Issues in Multiple Regression.

Chapter 14: Goodness of fit and Categorical Data Analysis [Week 15 – Dead Week]

- 14.1 Goodness-of-Fit Tests When Category Probabilities are Completely Specified
- 14.2 Goodness of Fit for Composite Hypotheses
- 14.3 Two-Way Contingency Tables

#Chapter 15: Distribution-free Procedures [Week 15 – Dead Week]

- 15.1 The Wilcoxon Signed-Rank Test
- 15.2 The Wilcoxon Rank-Sum Test
- 15.3# Distribution-Free Confidence Intervals
- 15.4# Distribution-Free ANOVA

NOTE:

Test 1 [Chapters 1 – 5]: Thursday, February 27, 2014

Test 2 [Chapters 6 – 11]: Thursday, April 3, 2014

Final Examination Day: Thursday, May 8, 2014 @ 10:15AM – 12:15PM. Venue is SH 516