

Course Syllabus
MTH 345: Applied Probability & Statistics
Spring Semester 2009

Course:

Title : MTH345 – Applied Probability & Statistics

Section : 201

CRN : 5033; Credit Hours: 3

Classes : TR 9:30 – 10:45 AM

Venue : SH 516

Instructor:

Dr. Alfred Akinsete

Office: Morrow Library – ML105

Phone number 696 3285

Email Address – akinsete@marshall.edu

Office Hours:

TR 11:00 AM – 1:00 PM, and 03:30 PM – 4:30 PM, &

Any other time by appointment

Prerequisites: MTH 230 or Permission

Calculator Requirements: A scientific calculator of any kind is required.

Computer Requirements: There are many statistical software, and you are free to use any of that you find applicable. You are encouraged to use Computer Lab in SH532. The SAS software is installed on those computers for those of you who would like to use SAS. Another useful statistical software is the R-package. See Statistical requirement below.

Course Description: 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.

Recommended Textbook:

Devore, J. L. (2004). *Probability and Statistics for Engineering and the Sciences, 7th Ed.*, Belmont, CA: Thomson/Brooks/Cole

Additional Textbooks (Not recommended):

Course Objectives:

This course is designed to introduce undergraduate students in Engineering and the Sciences to the applications of probability, and statistical methods and modeling, bearing in mind the GAISE guidelines for statistical literacy. Visit www.amstat.org/education/gaise/. The course is aimed at providing a comprehensive introduction to those models and methods most likely to be encountered and used

by students not only in their careers in engineering and the natural sciences, but also in other disciplines where statistical analyses are required. Presentation of theories will be minimal. The course is aimed at providing students with the following:

- a clear understanding of the descriptive statistics
- a strong foundation in statistical methods and modeling
- understanding of various discrete distributions and their applications
- a strong knowledge of the continuous distributions and their applications
- a strong foundation and adequate understanding of statistical inference, including hypothesis testing and estimation of parameters
- a strong foundation in regression analysis, experimental design and distribution-free statistics.

Student Learning Outcomes: At the end of the course, the student will be able

- to interpret and apply the results of published statistical studies
- plan and implement a statistical study
- summarize the results of a study using graphs and numerical measures
- choose appropriate probability models to describe real-world situations
- identify the appropriate statistical procedure for analyzing data
- implement the procedure both with and without computer software
- interpret statistical computer output
- report statistical results in a clear and coherent form.

Attendance

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 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.

Homework

Homework problems will be collected and graded. Make it a habit to do your homework the same day they are assigned, and ensure to submit your homework as at when due. Submission within 24 hours from when it is due will be based on 80% of full credit. No late submission will be accepted after 24 hours from when it is due. You are welcome to collaborate with other students on homework, although you must turn in your own work, and written in your own style and words. Solutions to problems must be made clear and neat. In cases where solutions require explanation and derivation, a one-number solution will not be accepted.

Student Behaviors

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.

Other Policies

- Information regarding the university policy for students with disability can be found in <http://www.marshall.edu/disable>
- Statement regarding University Computing Services Acceptable Use Policy can be located at <http://www.marshall.edu/ucs/CS/acptuse.asp>
- Statement regarding Marshall's policy about inclement weather can be found in the link http://www.marshall.edu/www/policy/policy_07.html
- Statement regarding Marshall's policy on Affirmative Action can be found in the link www.marshall.edu/eoaa/Forms/EEO-Policy.pdf

Testing and Grading

All tests will be given during the regular class sessions. No makeup quiz (if any) will be given under any circumstance. 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 scheduled tests and examination will be conducted in the classroom.

The final grade will be based on the following components:

| | |
|--------------------------|---------------------------------|
| 3 Tests | 300 points |
| Homework Exercises | 100 points |
| Quizzes | 100 points (10 best out of 12!) |
| <u>Final Examination</u> | <u>100 points</u> |
| 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 |
| 0 - 59% | -- F |

Statistical Resources

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 programming language/software from your preferred CRAN mirror. It will be needed in the course 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 being provided on the WebCT.

Cheating

Note that in a case where a student is suspected to have cheated, the student may be asked to re-take the test. And where the student is found or confirmed to have cheated, a zero grade will be awarded to the student.

You may wish to refer to other university policies concerning academic dishonesty at,

www.marshall.edu/academic-affairs/Academic%20Dishonesty%20Policy.pdf

Miscellaneous

A Free tutoring is available in SH 526 and also through the Academic Support Services (696-3169).

FINAL EXAMINATION: Tuesday, May 05, 2009 [08:00 – 10:00 AM]

Weekly Teaching Guide: MTH 345: Applied Probability and Statistics

NOTE: The following is a tentative instructional guide, and it is subject to changes as class progresses:

Chapter 1: Overview and Descriptive Statistics [Week 1, ending 1/15/2009]

- 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

Quiz* 1 [Chapter 1]

Chapter 2: Probability [Week 2, ending 1/22/2009]

- 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

Quiz 2 [Chapter 2]

Chapter 3: Discrete Random Variables and Probability Distributions [Week 3, ending 1/29/2009]

- 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

Quiz 3 [Chapter 3]

Chapter 4: Continuous Random Variables and Probability Distributions [Week 4 - Week 5, ending 2/12/2009]

- 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

Quiz 4 [Chapter 4]

Chapter 5: Joint Probability Distributions and Random Samples [Week 6 – Week 7, ending 2/26/2009]

- 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 26, 2009

*: Quiz, wherever it appears, will be given *by* the end of the corresponding chapter. In that case, there are no specific dates for quizzes, but should come not later than a class following the end of the chapter.

Chapter 6: Point Estimation [Week 8, ending 3/03/2009]

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

Quiz 5 [Chapter 6]

Chapter 7: Statistical Intervals Based on a Single Sample [Week 8, ending 3/05/2009]

- 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

Quiz 6 [Chapter 7]

Chapter 8: Tests of Hypotheses Based on a Single Sample [Week 9, ending 3/12/2009]

- 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

Quiz 7 [Chapter 8]

Chapter 9: Inferences Based on Two Samples [Week 10, ending 3/19/2009]

- 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 – 9]: Thursday, March 19, 2009

Chapter 10: The Analysis of Variance [Week 11, ending 4/02/2009]

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

Quiz 8 [Chapter 10]

Chapter 11: Multifactor Analysis of Variance [Week 12, ending 4/09/2009]

- 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

Quiz 9 [Chapter 11]

Chapter 12: Simple Linear Regression and Correlation [Week 13, ending 4/16/2009]

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

[Quiz 10 \[Chapter 12\]](#)

Chapter 13: Multiple Linear Regression [Week 14, ending 4/21/2009]

13.4 Multiple Linear Regression Analysis

13.5 Other Issues in Multiple Regression.

[Quiz 11 \[Chapter 13\]](#)

Chapter 14: Goodness of fit and Categorical Data Analysis [Week 14, ending 4/23/2009]

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

Test 3 [Chapters 10 – 14]: Thursday, April 23, 2009

Chapter 15: Distribution-free Procedures [Week 15, ending 4/30/2009]

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

[Quiz 12 \[Chapter 15\]](#)

Week 15: **Review for Final Examination**

COMPREHENSIVE FINAL EXAMINATION [Tuesday, May 05, 2009 (08:00 – 10:00 AM)]