Marshall University
Syllabus

Course Title/Number	Applied Probability & Statistics/MTH 345/101/3087 (3CH)
Semester/Year	Fall/2015
Days/Time	TR/09:30AM – 10:45AM
Location	SH 509
Instructor	Alfred Akinsete
Office	SH 524
Phone	304.696.6010
E-Mail	akinsete@marshall.edu
Office/Hours	11:00AM – 1:00PM 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. The policy on university excused absences is provided at the bottom of the syllabus.

Course Description: From Catalog

Statistical methods in scientific/engineering research, with emphasis on applications. The course will address probability modeling, statistical analyses, estimation and hypothesis testing procedures, regression, and analysis of variance (ANOVA). Practical applications will be implemented using the R statistical package. Students may use any other statistical software, provided they are able to navigate through their procedures on their own.

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, quizzes, and 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, quizzes and exams.

Students will able to summarize the results of a study using graphs and numerical measures	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, quizzes and 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, quizzes and 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, quizzes and 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, quizzes and 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, quizzes and 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 3.2.0 (2015-04-16). This text is available online upon downloading the R package. It is intended to guide you on the implementation of statistical analysis with R (needed in this class) and NOT meant to substitute for the textbook or studied with the aim to become an expert in R implementations. Students will always be pointed to the portion to be read when needed.

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. There are other computers laboratories on the campus. RStudio, an open source, powerful and productive user interface for R runs on many machines on the campus. Students will be introduced to the R-package. The SAS software is also installed on campus computers for those who would like to use SAS.

   Downloading R: The R package is available for download from http://www.r-project.org/ or http://en.wikipedia.org/wiki/R , through any preferred CRAN mirror.

3. Here are links to few other statistical resources: www.thomsonedu.com/statistics/devore, www.causeweb.org/resources, and www.socr.ucla.edu.

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. Final Exam Day: Tuesday, December 8, 2015 @ 08:00AM – 10:00PM. Venue is SH 509.

Grading Policy. All tests will be given during the regular class sessions. For makeup tests, please see the university's policy on excused absences.

The final grade will be based on the following components:

2 Tests	200 points
Homework Exercises	200 points
Quiz	050 points
Final Examination	150 points (Tuesday, December 8, 2015 @ 08:00AM – 10:00AM. Venue is SH 509)
Total	**600 points**

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

%	Point	Grade
90 -100%	[540, 600]	-- A
80 - 89%	[480, 540)	-- B
70 - 79%	[420, 480)	-- C
60 - 69%	[360, 420)	-- D
0 - 59%	[0, 360)	-- F

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, depending on the coverage status 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 and Set Theory
2.2 Axioms, Interpretations, and Properties or Laws 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 (t-distribution and χ^2- distribution (Additive property only)
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, October 15, 2015

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, November 12, 2015

Chapter 10: The Analysis of Variance [Week 12]
10.1 Single-Factor ANOVA

Chapter 11: Multifactor Analysis of Variance [Week 12]
11.1-3 Factor Analysis

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
#: These chapters may not be covered, unless there is enough time

NOTE:
Test 1 [Chapters 1 – 5]: Thursday, October 15, 2015
Test 2 [Chapters 6 – 11]: Thursday, November 12, 2015
Final Examination Day: Tuesday, December 8, 2015 @ 08:00AM – 10:00AM. Venue is SH 509

Excused Absences

Undergraduate

Students are expected to attend punctually all class meetings, laboratory sessions and field experiences and to participate in all class assignments and activities as described in the Course Syllabus. Absences are counted from the first class meeting after the student registers. Students registering late are expected to make up all missed assignments in a manner determined by the instructor. Students should be aware that excessive absences, whether excused or unexcused, may affect their ability to earn a passing grade.

The instructor of each class shall establish a policy on class attendance and make-up work, and provide the policy to students in the Course Syllabus. This policy must not conflict with university policies, including this policy. Class attendance may be a criterion in determining a student's final grade in the course if the instructor provides a statement to this effect in the course syllabus.

Students must promptly consult with their instructors about all class absences. Instructors will work with students to identify appropriate documentation and discuss any missed class time, tests, or assignments. Except in the case of University Excused Absences, it is the decision of the instructor to excuse an absence or to allow for additional time to make up missed tests or assignments. A student may not be penalized for an excused absence, provided that the student, in a manner determined by the instructor, makes up the work that has been missed.

Instructors are required to honor valid University Excused Absences and to provide reasonable and equitable means for students to make up work missed as a result of those absences. Academic obligations that cannot be made up should be addressed by the course instructor in consultation with the student to ensure that continued enrollment is feasible while there is still an opportunity to drop the course within the established withdrawal period.

This policy excludes academic endeavors that require the completion of a specific number of clock hours, such as clinical experiences, practica, and internships. For those courses, the department chair or program supervisor will determine the maximum number of absences. This policy does not supersede program accreditation requirements. This policy also excludes laboratory courses that require significant preparation and monitoring. For such courses, departments will determine the minimum number of

laboratories a student must complete to pass the course. If a student cannot complete this number of labs, the instructor my recommend that the student withdraw from the class.

If the instructor believes that the number of absences accrued under the terms of this policy (whether excused or unexcused) is such that a student cannot fulfill the learning experience and mastery that a course requires, the instructor may recommend that the student withdraw from the class.

University Excused Absences

These are addressed by the instructor or the Dean of Student affairs as described in each item. Appropriate documentation is required for each absence. The Dean of Student Affairs will notify course instructors of his or her actions using the University email system.

- **University-sponsored activities.** Student participation in authorized activities as an official representative of the university. Such activities include official athletic events, ROTC, student government and student organization activities, regional or national meetings or conferences when endorsed by an academic or organization faculty advisor, performances, debates, and similar activities. The Dean of Student Affairs addresses these absences.
- **Medical circumstances.**
    1. A student who is briefly ill or injured with fewer than three consecutive hours of class, and is therefore unable to attend class, should first consult with his or her course instructor about the absence. If necessary, the instructor may refer the student to the Dean of Student Affairs.
    2. The Dean of Student Affairs will address absences of three or more consecutive hours of class. This includes absences of three consecutive one-hour class meetings, one three-hour class meeting, etc.
- **Death or critical illness of an immediate family member.** Immediate family is defined as parents, legal guardians, siblings, children, spouse or life partner, grandparents, and grandchildren. The Dean of Student Affairs addresses these absences.
- **Other official activities.**
    1. **Short-term military obligations.** The Dean of Student Affairs addresses these absences. Students who are subject to federal military activation are covered by a separate policy. Please consult the catalog for this policy.
    2. Jury duty, subpoenas for court appearance, religious holidays, and other official activities deemed by the Dean of Student Affairs to warrant an excused absence.

Extreme personal emergencies. Examples of such events include house fires, serious crimes, and other grave emergencies deemed by the Dean of Student Affairs to warrant an excused absence.