

1-2014

## STAT 452.01: Statistical Methods II

Jon M. Graham

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# STAT 452 Statistical Methods Spring, 2014

<b><u>Instructor:</u></b>	Jon Graham                      jgraham@mso.umt.edu    Math 204    243-2561	
<b><u>Time/Room:</u></b>	Mon, Wed, Fri, 10:10-11:00am, Math 211	
<b><u>Textbook:</u></b>	An Intro. to Stat. Methods and Data Analysis, 6th ed. / Ott & Longnecker	
<b><u>Webpage:</u></b>	<table border="1"><tr><td><a href="http://www.math.umt.edu/graham/stat452/">http://www.math.umt.edu/graham/stat452/</a></td></tr></table>	<a href="http://www.math.umt.edu/graham/stat452/">http://www.math.umt.edu/graham/stat452/</a>
<a href="http://www.math.umt.edu/graham/stat452/">http://www.math.umt.edu/graham/stat452/</a>		
<b><u>Office Hours:</u></b>	To be announced, By appointment	
<b><u>Grading:</u></b>	Homework:    30%                      Exams 1,2:    40%                      Final:    30%	
<b><u>Prerequisites:</u></b>	STAT 451 or consent of instructor based on a previous statistics course.	

**Homework** will be assigned at the beginning of class every Friday, to be handed in at the beginning of class the following Friday. NO LATE HOMEWORK WILL BE ACCEPTED FOR ANY REASON, and the lowest homework grade will be dropped. Homework is not only a fairly substantial portion of your grade, but is vital to your success in this class. Working with other students on homework is allowed and even encouraged, as long as you hand in your own work, and do not simply copy someone else's work. Homework will be graded by me and a grader and solutions to all problems will be provided.

**Exams 1 & 2** will be cumulative and closed book. More about the exams, including the exact dates of the exams will be given later. If you cannot make it to an exam, you must let me know **BEFORE** the exam is given. No make-up exams will be given without a documentable reason for missing the exam.

The **Final exam** is scheduled for 10:10am-12:10pm on Friday, May 16. More will be said about the final at a later date.

**Course Material and Objectives:** This course is the continuation of an introduction to statistical methods for analyzing data. The course is intended primarily for students in disciplines outside of mathematics who are seeking statistical tools for data analysis. After a review of chi-square methods and simple linear regression, the course will concentrate on many areas of regression such as inference, multiple regression, logistic regression, et. al., and on areas of analysis of variance (ANOVA) such as interpretation of ANOVA tables, experimental designs, and analysis of covariance among others. This course is taught in conjunction with STAT 458 which will use the software package **R** to illustrate statistical techniques and elucidate statistical concepts.

**Additional Course Information:** The last day to add this course through Cyberbear is Tuesday, February 4. The last day to drop this course or change the grading option through Cyberbear is Friday, February 14. Between Saturday, February 15 and Monday, April 7, you can drop the course with your advisor's and instructor's signature using a Drop form only. I will not recommend approval of late drops except in EXTREME circumstances (see the UM online catalog). You can add the course or change the grading option with an Add/Change form up until Friday, May 9.

**Academic Misconduct:** All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review at [http://life.umt.edu/vpsa/student\\_\\_conduct.php](http://life.umt.edu/vpsa/student__conduct.php).

**Disability Services:** The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students (DSS). If you think you may have a disability adversely affecting your academic performance, and you have not already registered with DSS, please contact DSS in Lommasson 154. I will work with you and DSS to provide an appropriate accommodation.

Questions are strongly encouraged during class & office hours. If you are at all lost, please let me know.

# Tentative Outline of Topics

1. Summary of Chi-Square Inference Procedures (10.4-10.7)
2. Linear Regression and Correlation (Ch. 11)
  - (a) Least Squares Concepts (11.1-11.2)
  - (b) Transformations to Linearize Relationships (11.1)
  - (c) Correlation Coefficients (11.7)
  - (d) Residual Analysis (11.2)
  - (e) Inference in Simple Linear Regression: CIs and tests for  $\beta_0, \beta_1$  (11.3)
  - (f) Inference on  $E(y), y$  (11.4)
  - (g) Examining Regression Lack of Fit (F tests) (11.5)
  - (h) Bootstrapping in Regression (not in book)
3. Multiple Linear Regression (Ch. 12)
  - (a) General Linear Models, Estimation, and Examples (12.1-12.3)
  - (b) Inference for Parameter Estimates,  $E(y)$ , and  $y$  (12.4,12.6)
  - (c) Inference for Multiple Parameters Simultaneously (12.5)
  - (d) Comparing Slopes of Several Regression Lines (12.7)
  - (e) Nonlinear Regression (13.3)
  - (f) Logistic Regression (12.8)
4. More on Multiple Regression (Ch. 13)
  - (a) Model Formation and Variable Selection Techniques (13.1-13.3)
  - (b) Model Diagnostics: Residual Analysis (13.4), Influence Statistics (not in book)
5. Analysis of Variance (ANOVA) (Ch.8-9)
  - (a) Assumptions: Normality, Independence, Variance Homogeneity (8.3)
  - (b) Testing Equality of Two Population Means (8.1-8.2)
  - (c) 1-way ANOVA, 2-way ANOVA (8.2)
  - (d) Testing Homogeneity of Variance (Hartley's, Levene's Test) (7.4, 8.4)
  - (e) Variance Stabilizing Transformations (8.5)
  - (f) Kruskal-Wallis Test (nonparametric alternative) (8.6)
  - (g) Multiple Comparisons of Means (Ch. 9)
    - i. Linear and Orthogonal Contrasts (9.2)
    - ii. Procedures (Fisher's LSD, Tukey's W, SNK, Bonferoni, Scheffe's) (9.3-9.8)
    - iii. Controlling Type I error rates for Multiple Comparisons (9.3)
6. Experimental Design: The Completely Randomized Design (Ch. 14)
7. ANOVA for Experimental Designs (Ch. 15-19)
  - (a) Randomized Complete Block Design and Blocking Issues (15.2)
  - (b) Latin Square Design (15.3)
  - (c) Factorial Designs and Testing for Interactions (15.4-15.6)
  - (d) Analysis of Covariance (16)
  - (e) Fixed, Random, Mixed-effects Models (17)
  - (f) Other Designs (Split Plot, Nested, Repeated Measures, etc.) (18.2, 17.6, 18.3-18.5)