

MARSHALL UNIVERSITY
DEPARTMENT OF MATHEMATICS
STUDENT INFORMATION SHEET AND SYLLABUS

Course Title/Number	MTH 412/512 – Regression Analysis
Section	101
CRN	3090/3107
Semester/Year	Fall 2015
Days/Time	MW 5:00 - 6:15 PM
Location	SH 516 (Smith Hall)
Instructor	Dr. Avishek Mallick
Office	SH 743C
Phone ext.	304-696-3443
E-Mail	mallicka@marshall.edu
Office/Hours	MW 3:00-4:00 PM TR 10:00-11:30 AM 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

This course covers topics in determining regression models; deriving parameter estimates using calculus; detailed coverage of tests of assumptions and remedial procedures (transformations and weighted least-squares); multiple and polynomial regression; tests and corrections for autocorrelation.

The principle objective of the course is to introduce graduate and advanced undergraduate students to the underlying theory and the practical problems that are encountered in using models in real-life situation. The models studied will be linear statistical models for regression. We will also cover the use of the statistical packages like R and Minitab to fit the models.

Prerequisite

Previous coursework in Probability and Statistics, including knowledge of estimation, confidence intervals, and hypothesis testing and its use in at least one and two sample problems. Some familiarity with Calculus and Linear Algebra, or permission of instructor.

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 understand how to use regression analysis to analyze different type of data.	In class activities, intensive reading of relevant chapters and homework	Exams and final project
Students will understand the concept of regression analysis in the context of experimental and sampling designs and also be able to interpret regression analysis results in a meaningful context for application by practitioners in the field.	In class activities, intensive reading of relevant chapters and homework	Exams and final project
Students will demonstrate competency in oral and written communication skills.	In class activities, intensive reading of relevant chapters and homework	Final project and presentation

Required Text

Title	: <i>Applied Linear Statistical Models, 5th edition.</i>
Author	: J. Neter et al.
ISBN-10	: 007310874X
ISBN-13	: 978-0-07-310874-2
Publisher	: McGraw-Hill/Irwin
Year	: 2004

Additional Requirements: Software/Computing

The R statistical package shall be used for demonstration of some topics in class. It is recommended that R be used for homework assignments and exams. R is free software that can be downloaded from the web at <http://www.r-project.org/>. It can be installed/compiled on Windows, Mac, and Linux/UNIX machines. You are encouraged to use the Computer Lab in SH532. In addition the SAS software is installed on those computers for those of you who would like to use SAS. Students are free to use any other statistical package should they prefer. However, the instructor will not be able to offer software support for other packages.

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. Although, attendance records will not be used to compute grades (except possibly in borderline cases), 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.

Grading Policy and Exam dates

The final grade will be based on the following components:

- Homework Assignments worth 25 points each (30% of the final grade).
- Midterm Exam worth 100 points (20% of the final grade). The exam will be held on Thursday, October 15. It will cover all of the materials presented in class corresponding to Chapters 1 through 5 of the book. You will be expected to know both the practical applications and the theory.
- Final Project worth 100 points (25% of the final grade). The project will be due on the last day of the class.
- Final Exam worth 100 points (25% of the final grade). It will cover all of the materials presented in class corresponding to Chapters 6 through 11 of the book.

Percentage ranges for final grades are as follows:

A = 90-100% B = 80-89% C = 70-79% D = 60-69% F = 0-59%

FINAL EXAMINATION: Monday December 07 [5:00 PM – 7:00 PM]

Course coverage

1. An introduction to regression. Motivating examples, an overview of the objectives of regression analysis.
2. Simple Linear Regression. (Most of Chapters 1 - 4: Explicit readings assigned as we move through the material)
 - The regression model (1.1-1.5)
 - Estimation of the regression coefficients and error variance (1.6-1.8).
 - Inferences for the regression coefficients. (2.1-2.3, 4.1)
 - Estimating the expected response at a particular x ; one-at-a-time and simultaneous confidence intervals.(2.4, 2.6, 4.2)
 - Predicting future observations. (2.5,4.3)
 - The Analysis of Variance approach to regression and general linear tests (2.7, 2.8)
 - Assessing model assumptions and a first look at remedial measures. (Parts of Chapter 3)
3. An introduction to multiple linear regression models (section 6.1, description of models in 8.1 and 8.2)
4. Regression models in matrix form.(Section 5.1-5.4, the definition of an inverse in 5.6, 5.8-5.9, 6.2)
5. Multiple Linear Regression (5.10-5.13, much of Chapters 6, 7 and 8)
 - Estimation of the regression coefficients and error variance.
 - Inferences for the regression coefficients.
 - Estimating the expected response at a particular x ; one-at-a-time and simultaneous confidence intervals.

- Predicting future observations.
 - The Analysis of Variance approach to regression and general linear F-tests
6. More on diagnostics and tests for assessing model assumptions with some on measures to accommodate violations of usual assumptions. (Parts of Chapters 10 and 11)
 7. Model building/variable selection (Ch. 8)
 8. An introduction to nonlinear regression models. (Some of 13 and 14) (if time permits)