

Instructor: Prof. Michael Levine

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Course webpage [http://www.stat.purdue.edu/~mlevins/STAT512\\_13/Notes/Stat512.html](http://www.stat.purdue.edu/~mlevins/STAT512_13/Notes/Stat512.html)

Class meetings: TTh, noon-1.15 pm, REC 225 or 3pm-4.15 pm, REC309

Office hours: TTh, 10am -11am or by appointment

## COURSE INFORMATION

### Course Description

Thorough applied course in regression and analysis of variance including experience with the SAS statistical software package. Topics include inference in simple and multiple linear regression, residual analysis, transformations, polynomial regression, model building with real data, and nonlinear regression. One-way and two-way analysis of variance, multiple comparisons, fixed and random factors, and analysis of covariance are covered. This course is not mathematically advanced, but covers a large volume of material. It requires calculus, and simple matrix algebra is helpful. This course is recommended for graduate students and for serious undergraduates from all areas.

### Prerequisite

STAT503 or STAT 511

### Textbook

1. Kutner et al, "Special reprint of Applied Linear Statistical Models" (see bookstores), 2013 Edition, Required. Special reprint of *Applied Linear Statistical Models* (see bookstores) by Kutner, Neter, Nachtsheim & Li (KNNL). (*Required*). You may use the edition from this semester or from last semester which is slightly different. Another option (if you can find it) is to use the original *Applied Linear Statistical Models*, 5th edition (*it is out of print*).
2. (*Optional*) *Applied Statistics and the SAS Programming Language*, 5th edition, by Cody and Smith. A lighter book, this book provides a fairly readable introduction to the SAS Programming Language which could prove to be helpful during all parts of the course. However, most of the material in this book can be obtained online.
3. (*Optional*) SAS manuals (besides the Recommended Text) are available in the bookstore. If you are looking for an easy to read book please look for the optional books for STAT 501 (in particular, *SAS Essentials* by Elliott and Woodward).

**SAS Computer Software:** We will use SAS 9 to perform data analysis in this class. The intent of using software is to allow the computer to perform routine calculations and graphing, while we focus on choosing the appropriate analysis tools and interpreting the results. Computer software is NOT a substitute for understanding the statistical methods, and you will not have access to a computer during exams. SAS is available in the Purdue computing labs. You may also obtain a copy of SAS for your own PC for class purposes free of charge by going to the reception area on the 5<sup>th</sup> floor of Young Hall and showing your student ID. Learning SAS will be one of the biggest challenges in this course, and you should be prepared to devote some time to this, especially in

the first few weeks. Make use of the SAS help system within the program to look up specific details. If you need help in person, the Statistics Department provides a software consultant in MATH G-175, M-F, 10am-4pm (494-5100) ([www.stat.purdue.edu/scs/](http://www.stat.purdue.edu/scs/)). In addition, there are SAS evening help sessions offered by the Department of Statistics; the exact time and location TBA. There are also links on the SAS files Web page. In addition, you can get help from the instructor in office hours or by e-mail.

## **Reading**

I expect you to read the text as we cover the material. It can help to read about a topic *before* it is covered in class. This does not mean that I expect you to learn it all on your own. Rather, your reading before the class should be a "first pass" at the subject – trying to get a big picture! Don't get bogged down in formulas or details; just try to get a rough idea of the material and get familiar with the vocabulary. This will prepare you for what is to come in the class, and will make the class easier to follow. Later, as you are working on problem sets and studying for tests, you will find it helpful to read the material again. This time, read at a much more detailed level. It will be a lot easier to follow then, since you have heard this material in class already.

## **Lectures**

To help you with studying, I will be posting the class notes in the form of slides on the course web site. Slides will contain some basic theoretical points, examples and graphs that will be mentioned in class; however, I will be fleshing them out in class to a much greater extent. Therefore, your personal attendance will be of great help to you. We will cover roughly two chapters per week.

## **Homework**

Weekly homework problems will be handed out (almost) every week to be collected one week later. Solutions for homework will be provided soon after the due date and will be posted online on the course website. Collaboration on homework assignments is permitted, even encouraged, but each student should write up his/her own solution. Identical solutions are NOT acceptable. Your homework must reflect YOUR understanding of the material. If identical solutions are found, all the parties involved will receive a 0 on that assignment. No late homework will be accepted UNDER ANY CIRCUMSTANCES; instead, the two lowest homework scores will be dropped at the end of semester. The homework is responsible for **30%** of your final grade.

Please do not pad your homework with endless printouts of SAS output. Only hand in those parts of the output that are directly relevant to your solution. You should edit any SAS output you plan to hand in by pasting it into an editor such as MS-Word, and getting rid of extra space or unnecessary output. It is helpful to circle or highlight the portions of the output to which you refer in your solution. As a rule of thumb, only hand in what you actually expect the grader to read. Your SAS input file should be attached at the end of the homework. The input is not given a grade *per se*, but it can be helpful to the grader in trying to figure out what you did wrong and in assigning partial credit. Homework must be stapled if it is longer than one page. The first page must include your name, my name (Dr. Levine), the number of the problem set (e.g., HW #2), the due date and the course: STAT 512

## Exams

There will be two evening midterm exams as well as the final project. Both midterms will be evening exams. I will provide you the exam times/dates/locations once Purdue has scheduled them on the exam web page. Each examination will contain both mathematical and conceptual (written or short answer) components. Each midterm will be worth **25%** of your total grade. The midterms are not cumulative. Contact me as soon as possible if you are unable to take the exam at the scheduled time. Students having exam conflicts or requesting special accommodations (these should be documented) must inform me as early as possible so that alternative plans may be arranged. It is YOUR responsibility to contact me **IN ADVANCE** to check if a make-up is possible. You may use a calculator during all exams if you wish. The exams are open book and open notes.

**Re-grading:** Since all humans make mistakes (including the professor and the grader), errors will occur in the grading. The following procedure is required if you want your assignment re-graded.

1. Attach a new piece of paper to the *front* of the work to be re-graded which contains the following information:
  - a) The word “Re-grade” displayed prominently.
  - b) Your name
  - c) STAT 512. Be sure that this is clear so we know which course you are enrolled in.
  - d) Which homework, project, or midterm is involved (e.g., HW 1)
  - e) The relevant problem number(s) (e.g. problem 2a) or “Addition error”
  - f) A detailed explanation of the suspected error (“Please look at problem 4” is **NOT** considered a detailed explanation) or provide the total number of points which you calculated if the assignment was added incorrectly
  - g) date of resubmission
2. Print out the solutions from the web page (at least the relevant portions) and circle the relevant piece of the solution. Attach this *behind* the work to be re-graded. (This is not required if you think that the points were added incorrectly.)
3. Give this packet to me, or put it in my mailbox.

## Final Project

Each group is asked to find a real-world problem/data set to analyze and summarize. You should select an original problem (not one already analyzed) and one likely to result in a more elaborate analysis than simple t-tests or simple linear regression. Each group must get approval of their problem from the instructor by Tuesday, October 8th; the earlier the better. To get approval, the group should provide the instructor with a brief summary that contains 1) a description of the problem, 2) any preliminary analysis that helps in that description, and 3) preliminary plans of analysis (this can always change). If a group is having problems finding a project, please contact the instructor for ideas or possible assignment of a project. Groups will be assigned through a randomization process by the instructor and announced prior to Sep 10th. Your overall grade in the project involves several individual and group components.

First, each group will write a final report that will be due on Tuesday, Dec 3rd.

The report is limited to 10 pages and should take the structure of a journal article in that it contains 1) background and description of the problem 2) design and analysis 3) results and 4) conclusions. Tables and plots should be integrated into the text and not included in the back.

Second, each member of a group will evaluate his/her and the other group member's participation on the project. This evaluation form will be handed out near the end of the semester and will be due by the last day of class (Dec 5th). This evaluation is to summarize each person's effort in trying to do his/her fair share, not the knowledge of the individual.

Finally, the last week of the semester (two or three lectures), each group will give a 10 minute presentation of their problem and analysis. This oral report can involve the whole group, a subset, or just one member. The order of these presentations will be chosen near the end of the semester. To summarize, each member's grade will be based on a combination of

1. Final written summary and oral presentation (instructor's evaluation)
2. Evaluation of participation (individual and other group members' evaluation)

## Grades

**Final Grade:** The final scores will be determined as follows: homework 30%, final project 20%, midterm I 25%, midterm II 25%. Grades will be calculated on the 100% scale. Let the score be  $x$ ; then  $90 < x \leq 100$  results in A,  $80 < x \leq 90$  results in B,  $70 < x \leq 80$  in C and  $60 < x \leq 70$  in D. Any score below 60 equals the grade of F. Doubtful cases (within a few hundredth of the dividing point) will result in the addition of the minus or plus to the respective grade.

**Academic Dishonesty:** Penalties for academic misconduct range from a 0 on the assignment to failure in the course with referral to the Dean of Students for further sanctions. *Note that we punish not only the person who cheats but also the person who enables the cheater.*

**Attendance:** Though I do not take roll in class, students are responsible for all material covered in the lectures. Not all of the material discussed in class is available in the textbook. If a student misses a class it is up to that student to check with their classmates to obtain the missed material.

**Grief Absence Policy for Students:** Purdue University recognizes that a time of bereavement is very difficult for a student. The University therefore provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS). GAPS Policy: Students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for missed assignments or assessments in the event of the death of a member of the student's family.

**Students with Disabilities:** Purdue University is required to respond to the needs of the students with disabilities as outlined in both the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 through the provision of auxiliary aids and services that allow a student with a disability to fully access and participate in the programs, services, and activities at Purdue University. It is the student's responsibility to notify the Disability Resource Center of an impairment/condition that may require accommodations and/or classroom modifications.

**Emergencies:** in the event of a major campus emergency or other circumstances beyond the instructor's control, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar. Relevant changes to this course will be posted onto the course website; you can also e-mail me at [mlevins@purdue.edu](mailto:mlevins@purdue.edu) with any questions you may have if/when this happens.