

Course Syllabus

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**Course  
Rationale**

The main objectives of MATH 474 – Applied Statistics are for the students to develop the ability to apply statistical methods correctly to analyze data from experimental and observational studies; to develop the ability to interpret the analysis results properly; and to gain the experience of communicating the results effectively. In this course, students will “write to learn” and “learn to write”. Write to learn means to promote learning the statistics through writing. Learn to write means to develop students’ writing skills to use statistics to make effective arguments in the presence of uncertainty.

Specifically, students will learn to apply statistical methods taught in the class for analyzing real world data and write a scientific paper for the analysis. The writing should show a path of reasoning from the problem statement to the final conclusion including the justification of the underlying assumptions for the methodology applied, the data analysis, and the interpretation of the analysis. The statistical methods used for data analysis in this course include two sample comparison methods, ANOVA, multiple comparisons, bootstrap and non-parametric methods, simple and multiple linear regression, analysis of counts data, and logistic regression methods.

**Textbook**

There is one required textbook:

**Required: The Statistical Sleuth: A Course in Methods of Data Analysis** -- Fred Ramsey and Daniel Schafer  
Duxbury Press, Second Edition

**Prerequisite**

Completion of at least one college level statistics course is assumed. Basic computer programming experience is desirable.

**Software**

Much of the homework will require the use of computing software. We'll primarily use an open-source software *R*, though another package SAS may be used occasionally. Homework needs to be typeset with LaTeX, Instruction for the installation and the use of LaTeX and statistical computing software *R* will follow shortly.

**Grading**

1. Your grade is comprised of homework, class participation, a

## Policy and Criteria

midterm exam and a final exam. Exams are open-book and open-notes. You can not miss any of the exams. Bring a calculator to exams.

2. Homework includes computational and data-analysis exercises. You need to do all of the assigned problems, although a randomly chosen subset of homework will be graded. For the computational exercises, you can perform the computations by hand or using *R*. For the data analysis exercises, you need to analyze the data set collected with *R* or *SAS* to answer questions of interest and to write a paper to report the analysis. The paper should contain a problem description section, a methods section, a results section, and a discussion and conclusion section. Homework needs to be typeset with LaTeX (a template will be provided later) and submitted only the compiled pdf write-ups. Late homework will be downgraded with 25% penalty per day late. A checklist for writing the data analysis problems is included as follows:

- Problem - Is the problem clearly written?
- Results - Are the statistical methods and results clearly presented? Are all tables and figures numbered? Do all tables and figures have descriptive titles? Are all tables and figures clearly introduced in the prose? Can the tables and figures tell their part of the story without reference to the prose? Are all axes clearly labeled? Are units of measurement clearly defined? Is your explanation of the results free of statistical jargon?
- Discussion - Are the data collection methods clearly described? Are the inferences of the statistical analyses clearly discussed? Have you pointed out any shortcomings or limitations of the analysis method used? Is your discussion consistent with the statistical results?
- Conclusion - Have you summarized the main points of your report for the questions of interest?

### Grading Criteria

The final course grade is computed according to the following percentage:

70%	Homework
10%	Class participation
10%	Midterm exam
10%	Final exam

## Academic Honor Code

Students are expected to be honest in all of their academic endeavors and present original work. So, you must complete all of your homework assignments by yourself. I'll give failing grades on papers that look essentially the same.

