Elementary Statistics - Math 243.
Syllabus and guidelines 2009-2010
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Primary Text: *The Basic Practice of Statistics, 4th edition*, by Moore. We typically cover chapters 1-5, 8-12 and 14-21.
Secondary Text: *Collaborative Statistics* by Illowsky and Dean, available at
`http://cnx.org/content/col10522/latest/`

There are roughly three parts to the course. In the first part, general concepts about data and statistics are covered. The second part is basic probability theory. The third part covers confidence intervals and hypothesis testing.

Goals of Course: The primary goal of the course is to have students be able to use, and more importantly understand, basics of confidence intervals and hypothesis testing. They should be able, for example, to read about a poll with a 3% margin of error and know that such a number is driven solely by the number of respondents, which in this case must be over one-thousand people. They should also know about some basic sources of systematic error in sampling and polling, a part of the course which isn't really mathematics but is central in understanding the field of statistics.

The trickiest part of planning for the course is that while it is naturally divided into three parts, these parts are far from equal. The first general nonsense should take a week or so, the probability theory two to three weeks, and then give yourself over half of the term for confidence intervals and hypothesis testing.

Most students are able to understand confidence intervals fairly well (though of course they cannot really understand the central limit theorem which underlies them), and become proficient at calculating them. Hypothesis testing is another matter, since it involves something akin to proof by contradiction. I have had some success in, after both have been studied for a while, illuminating hypothesis testing using the language of confidence intervals. For example, I'll say something like "If the hypothesis were true, then the 99% confidence interval would be... but we observed something outside of this confidence interval, so..." More important than this particular teaching perspective is what allowed it to be implemented, which is that I gave myself enough time (the second time I taught the course) to teach these concepts in different ways. My course perhaps became a bit boring to the very few students who got these concepts right away. For the rest, having time to come back to things from different perspectives helped most of them finally come around. I also found summarizing all of the tests in somewhat abstract language (which any mathematician would do for themselves) to be surprisingly welcomed.

Unlike any other course in our undergraduate curriculum, real-world examples are possible and quite helpful in getting the students engaged. It is well-worthwhile to find examples from scientific literature and from newspapers, etc. Ideally, we could share some of these since they can take some effort to incorporate into classes.