

## CHE 384 - Fall 2014

From Data to Decisions: Measurement, Uncertainty, Analysis, and Modeling

Unique # 15290, Room: CPE 2.218, MWF 2:00 – 3:00 pm

**Instructor:** Chris Mack, [chris@lithoguru.com](mailto:chris@lithoguru.com)

**Office Hours:** MWF 11:00am – 11:45am, and M 3:00pm – 4:00pm, CPE 1.450A, or by appointment

**Class Website:** <http://www.lithoguru.com/scientist/statistics/>

**Course Objective:** Standard undergraduate treatments of data analysis and modeling include important basic ideas of regression and goodness of fit. However, several significant real-world issues are rarely addressed adequately in these introductory courses. This course will discuss many of the problems scientists and engineers routinely encounter when dealing with data and will provide rigorous methods for handling them: measurement uncertainty analysis, data flyer removal, impact of sampling on model quality, dealing with correlated inputs, and residual analysis. In the end, students should have the tools necessary to answer one of the foundational problems in science: given two competing scientific models (theories), does the data contain sufficient information to choose one over the other?

### Course Outline:

- I. Prework: Review of Statistics, Regression and Goodness of Fit
- II. Motivation – the three Anscombe problems
- III. Measurement Uncertainty and Error Propagation
- IV. Anscombe Problem #1 – Data Flyer Removal
- V. Anscombe Problem #2 – Sample Planning
- VI. Total Regression, Data Modeling with Correlated Inputs
- VII. Residual Analysis
- VIII. Anscombe Problem #3 – Systematic Residuals
- IX. The Foundational Problem of Science: Theory Choice

**Prerequisites:** Graduate standing in chemical engineering, or graduate standing and consent of instructor.

**Text:** Handouts

<b>Grading:</b>	Homework/Quizzes	15%
	Exam #1	25%
	Exam #2	25%
	Final	35%

This class will use +/- grades. Attendance will not count towards the grade in this class, though all students are responsible for all material discussed during the lectures and assigned as reading and practice homework.

Students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 471-6259, <http://www.utexas.edu/diversity/ddce/ssd/>.

By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

I take the UT Honor Code very seriously:

The core values of the University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.