## 1. Lecture Schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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</table>
| 1    | Topic 1: Basic Concepts  
      | Topic 1: cont'd       |
| 2    | Topic 2: Intro. to statistics and sampling; Measures of central tendency and dispersion  
      | Topic 2: Graphical representation of a finite sample |
| 3    | Topic 3: Statistics of Infinite Populations: Gaussian Distribution  
      | Topic 3: Statistics of Infinite Populations: Confidence Intervals |
| 4    | Topic 3: Statistics of Infinite Populations: Confidence Intervals (cont'd)  
      | Topic 4: Confidence Intervals from Finite Samples |
| 5    | Topic 4: Confidence Intervals from Finite Samples (cont'd)  
      | 10/26 ± one period: EXAM 1 (Chapters 1-3; no lab material) |
| 6    | Topic 5: Other Aspects of Sampling  
      | Topic 5: Other Aspects of Sampling (Cont'd) |
| 7    | Topic 6: Uncertainty Analysis: General, Fractional  
      | Topic 6: Uncertainty Analysis: Sequential Perturbation |
| 8    | Topic 7: Regression Analysis, Part I  
      | 11/19 ± one period: EXAM 2 (Chapters 1-6; no lab material) |
| 9    | Thanksgiving Week 11/21-11/25; All classes and labs canceled. |
| 10   | Topic 7: Regression Analysis, Part I (cont’d)  
      | Topic 8: Regression Analysis, Part II |
| 11   | Topic 8: Regression Analysis, Part II (cont’d)  
      | Topic 8: Regression Analysis, Part II (cont’d) |

**Final Exam:** In this room, at the date/time posted on the campus schedule for your section.

## 2. Instructor Information:

Instructor: Glen Thorncroft  
Office: 13-228  
Phone: 756-2118  
Hours: T 10-11, 1-2 | Th 10-11, 1-2 | F 11-12  

*Note: Office hours subject to change. See website or door for latest hours.*

Website: [www.calpoly.edu/~gthorncr](http://www.calpoly.edu/~gthorncr)  
Email: gthorncr@calpoly.edu  

*Note: e-mail is not for homework help*

## 3. Text:


## 4. Grading:

Weighting: Exams 1&2: 35%; Laboratory 30%, Final 35%.  
You must pass the lecture and lab independently to pass this course.  
You must pass the cumulative final independent of other grades in order to pass the course.

## 5. Homework:

Homework assignments in the lecture are not due, but are required. You cannot perform well in this course without doing the homework – it is the most important factor in your success in this course. Homework solutions for all the problems in the coursepack are available on PolyLearn.

**Extra Problems:** I will also provide extra problems as the course proceeds. These are good review problems for exams, and are in some cases old exam questions. Their solutions will not be posted; the idea is to encourage you to see me during office hours throughout the
quarter, not just the day before an exam. In fact, if you have questions on any problem, assignment, or experiment, please see me.

6. Attendance: Attendance in the lecture and lab is mandatory. Failure to attend lecture or laboratory during the first week will result in your being dropped in the course. If for any reason you cannot attend a lab, contact the instructor of your lab immediately. Prior arrangements may be possible.

7. Professionalism and Academic Integrity:

I expect the professionalism in your writing, oral communication, and behavior that I would expect from any employee in the workplace. This means that good writing and grammar and spelling counts. Hand calculations will be neat, complete, and fully explained. I expect you to be prepared for class and lab, ready to participate in discussions, and giving the instructor and your colleagues your full attention (hint: Put away your cell phones and newspapers!).

To be clear, you will develop and improve these skills your entire career, but in the short run my goal for you is to be “internship ready” by the end of this course.

Cheating:

I will not condone academic dishonesty, cheating, or plagiarism in any form. Any infraction will be reported to the Office of Academic Rights and Responsibilities, and punishment may lead to dismissal from the course and being assigned a grade of F. Please review Cal Poly’s Policy (C.A.M. 684), and the Code of Student Conduct, Rights and Responsibilities:

http://www.academicprograms.calpoly.edu/academicpolicies/Cheating.htm

http://osrr.calpoly.edu/index.html

Collaboration:

My approach to teaching this course requires students to work independently on assignments. Except where otherwise explicitly stated by me, collaboration on any assignment is prohibited. Failure to abide by this policy constitutes academic dishonesty, and will result in the disciplinary action described above.

8. Crashers:

I will make every effort the run the course with the maximum safe and appropriate enrollment as established by the faculty (35 students per lecture, 16 per lab). In this course, the limiting factor is usually the labs. I never allow more than 16 students in a lab. But even if the labs are full, the enrollment can change in the first week, so don't give up yet.

To be eligible to be added, make sure you attend any one of the lab sections during the first week of the course. There will be a sign-up list there. In fact, I will add only students who attend (and participate, and complete) the first week's lab. By the middle of the second week, I will contact you by e-mail with a permission code if there is an opening.

On the lab sign-up lists, you will indicate ANY lab and lecture sections you could fit in your schedule. You will be added if there are openings in both a lecture and lab that you can attend. If there is more than one crasher for a given seat, I will add the student in order of the lecture-section waitlists. However, don't assume you will not be added just because you are low on the waitlist. Student
schedules often conflict with the available slots. Don't give up until I tell you to.

Lastly, even if you don't get the class this term, like most required ME courses this class is offered every quarter. I have rarely seen a student have to crash this course twice. You should not fall behind in your progress toward degree if you are delayed in taking this course by one quarter. If you are concerned about your degree progress, go see the department chair immediately. They can help you develop a strategy or plan to keep on track.
ME 236 Outline

Three general outcomes of the course:

1. Take measurements and perform experiments; analyze, convert, and interpret readings taken from selected instruments; and explain the basic operation and theory of selected measurement technologies.
2. Analyze real data, apply statistical models, and calculate and communicate the uncertainty in measurements, calculations, and plots.
3. Communicate effectively the results of experiments, and present experimental data effectively in graphical and tabular form.

General Outline of Topics

I. Taking Measurements
   - How to take readings from instruments
   - How to measure physical quantities like pressure, temperature, force/weight, length, etc.

II. How accurate is my measurement?
   - Significant figures review
   - Error and uncertainty

III. How does taking repeated measurements help?
   - Sampling
   - Histograms
   - Probability, probability distributions
   - Confidence intervals
   - Using samples to estimate population behavior
   - Using sample statistics to predict the future?
   - Are there “bad” data? What do I do with them?

IV. Performing calculations with real data
   - Example: volume of a cylinder, \( V = \pi D^2 L / 4 \), where \( D \) and \( L \) have uncertainties (±).
   - How do the uncertainties affect the calculated result?
   - How can I improve the calculated result – which measurement should I spend money on to improve?

V. Plotting data – relationships between measurements
   - How do trendlines (curve-fits) work?
   - Is this the “correct” trendline for the data?
   - How accurate is the trendline?
   - What do I do with “bad” data?
Format for Homework/Hand Calculations

1. One column, one-sided, and legible. Organize your work and explain your analysis. If I don't understand it or can't read it, I can't grade it!

2. Problem description and objective. “Given” and “Find” are okay for homework solutions. Even better, write the entire problem statement, which reduces the chances that you'll misinterpret the problem or miss an important fact. You may scan/copy the original text and figure.

3. Schematic. Draw free-body diagram (or control system/control volume) when necessary. This is not the same as the figure given in the problem statement!

4. List all assumptions. You need not list them at the outset; it might make more sense to write them as you need them in your analysis. Just make them clear!

5. Start with general equation...

6. ...Then solve algebraically BEFORE substituting values. Values or units should NEVER be on the left side of the equal sign!

7. Substitute values in the same order as the variables (for easy traceability). THEN add unit conversions.

8. Use basic unit conversions whenever possible, for better understanding:
   - (1 ft = 12 in, not 1 ft = 144 in)
   - (1 ml = 1 cm³, not 16.3871 ml = 1 in³)

9. Include units in answer! Pay attention to significant figures.

10. Consider commenting on the result:
    - Describe the answer in words (e.g., “Thus the object will slide about 5 m down the incline”)
    - Does the number make sense physically?
    - Is the answer consistent with theory?
    - Is the result as expected?
    - What about the sign of the answer?

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**Problem 2-6**

**Given:** Object of known mass sliding down an incline
- Mass: 20 kg
- Initial speed: 10 m/s
- Inclined angle: 30°
- Frictionless

**Cubic:** Distance traveled along ramp
- Distance: 7 m

**Schematic & Given Data:**

**Assumptions:**
- Mass is a closed system
- No friction forces
- No air resistance

**Analysis:**
By assumption (3), the only force on the mass is the incline. Thus (2.11) applied:

\[
\frac{1}{2} m (v_f^2 - v_i^2) = mgd \sin \theta
\]

Solve for \( \theta = 30° \):

\[
\frac{v_i}{2} = \frac{1}{2} \frac{1}{\sin 30°} 20\ \text{kg} \text{m/s}^2 \times 9.81 \text{m/s}^2 = 2.497 \text{ m}
\]

Solve for \( d \):

\[
d = \frac{v_i^2}{2g \sin \theta} = 2.497 \text{ m}
\]

Solve for \( x \):

\[
x = \frac{A_2}{2 \sin 30°} = 4.994 \text{ m}
\]