1. Lecture Schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Topic 1: Basic Concepts  Topic 1: cont'd</td>
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<tr>
<td>2</td>
<td>Topic 2: Intro. to statistics and sampling; Measures of central tendency and dispersion  Topic 2: Graphical representation of a finite sample</td>
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<tr>
<td>3</td>
<td><strong>Monday, 1/18: Holiday</strong>  Topic 3: Statistics of Infinite Populations: Gaussian Distribution</td>
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<tr>
<td>5</td>
<td>Topic 4: Confidence Intervals from Finite Samples  <strong>Wednesday, 2/3: EXAM 1</strong> (Covers Topics 1-3; no lab material)</td>
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<tr>
<td>6</td>
<td>Topic 4: Confidence Intervals from Finite Samples (cont'd)  Topic 5: Other Aspects of Sampling</td>
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<tr>
<td>7</td>
<td><strong>(Tuesday, 2/16)</strong> Topic 5: Other Aspects of Sampling (Cont'd)  Topic 6: Uncertainty Analysis: General, Fractional</td>
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<tr>
<td>8</td>
<td>Topic 6: Uncertainty Analysis: Sequential Perturbation  <strong>Wednesday, 2/24: EXAM 2</strong> (Covers Topics 1-6; no lab material)</td>
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<tr>
<td>9</td>
<td>Topic 7: Regression Analysis, Part I  Topic 7: Regression Analysis, Part I (cont’d)</td>
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<tr>
<td>10</td>
<td>Topic 8: Regression Analysis, Part II  Topic 8: Regression Analysis, Part II (cont’d)</td>
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</tbody>
</table>

**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 (Hours: See website)  
Phone: 756-2118  
Website: [www.calpoly.edu/~gthorncr](http://www.calpoly.edu/~gthorncr)  
Email: gthorncr@calpoly.edu (Note: see me in person)

3. Text:  
Course notes and other material is available on the PolyLearn page for Section 01. Students of all sections have been granted access to this page.

4. Grading:  
Weighting: Exams 40%, Laboratory 30%, Final 30%.  
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; **come see me during office hours** if you have questions on any problem, assignment, or experiment.

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. Failure to attend a lab session
at any time could result in you receiving an F 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

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 never 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. Ability to take measurements and perform experiments, understand experimental methods and measurement techniques, and obtain knowledge of some 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:
   
   \[
   \begin{align*}
   1 \text{ in} &= 0.0160934 \text{ m} \\
   1 \text{ ft} &= 0.3048 \text{ m} \\
   1 \text{ l} &= 1000 \text{ cm}^3 \\
   1 \text{ in}^3 &= 16.3871 \text{ cm}^3 \\
   \end{align*}
   \]

9. **Include units in answer!** Pay attention to significant figures. (4 sig. figs. maximum in Thermodynamics)

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?
I expect you to grade each problem as thoroughly as possible within the limited time you have. This means that I do not expect you to find every mistake the student makes— it is their responsibility to check their work against the posted solution— but I do expect you to do more than just check their final answer. You can check for some basic or common errors. I provide some guidance below.

- Before grading any problems, work the problems on your own, and then verify your solution with mine. This will speed up the grading process. Feel free to ask me questions about the assignment. Please alert me to any errors that you think may exist in the solution.
- Grade only one problem at a time; look at the other problems, one at a time, later. Again, this will speed the grading process.
- Do not grade any assignment that is not legible. Do not waste your time wading through problems that are difficult to read. Return them to me ungraded.

Each problem is worth 10 points. Below are some rough guidelines as to how to deduct points from the graded problem. Above all, use your best judgment.

**Basic Format** (Format of assignments is given on the other side of this page)

- NOT beginning with a problem statement (whole statement, or GIVEN:)
- NOT stating the goal of the analysis (FIND: or WANT:)
- NOT drawing a schematic, when appropriate
- NOT defining the control volume
- NOT beginning with the most general form of the equation
- NOT listing the relevant assumptions
- NOT simplifying the general equation
- NOT solving the equation algebraically (and symbolically) first, and simplifying the equation (with the unknown quantity on the LHS of the equation), BEFORE substituting values and units
- NOT substituting values and units for the variables first, and THEN following with unit conversions (so you can track the substitutions easily)
- NOT making unit the easiest unit conversions easy to follow, verify, and track, and less prone to mistakes. Examples:
  - to covert in³ to ft³:  \( \text{in}^3 \left( \frac{1\text{ft}}{12\text{in}} \right)^3 \)  instead of  \( \text{in}^3 \left( \frac{1\text{ft}^3}{1728\text{in}^3} \right) \)
  - to convert ml to in³:  \( \text{ml} \left( \frac{1\text{cm}^3}{1\text{ml}} \right) \left( \frac{1\text{in}}{2.54\text{cm}} \right)^3 \)  instead of  \( \text{ml} \left( \frac{0.0610237441\text{in}^3}{1\text{ml}} \right) \)
- NOT reporting the answer to the appropriate units or reasonable significant figures (4 maximum for this course)
- NOT commenting on the answer when appropriate (does the answer make sense? Does it not? Was the answer supposed to help make some kind of point? Do you get the point of the problem?)

**Analysis**

Typical things to look for are as follows. These are ranged roughly from more severe to less severe, and deductions might range from 0 to 3 points.

- Plagiarism of each other's work or the solution manual: **SEE ME.**
- Correct answer, even though the analysis or calculations are wrong: **Assign a grade of zero for the entire homework assignment, and SEE ME.**
- Inappropriate governing equation, incorrect assumptions, inappropriate free-body diagram or control volume
- Fundamental mathematical errors (integration/differentiation, fractions, etc.)
• missing unit conversions (even conversion from N to kg·m/s²)
• incorrect unit conversions (pay particular attention to “pound-mass” and “slug” unit systems)
• not using the given unit system (as in converting English to SI, solving the problem in SI, then converting the answer back to English)

• Simpler mathematical errors. Examples:
  • failure to convert degrees to radians in trig calculations
  • failure to convert RPM to rad/s
  • incorrect interpolation
  • reading tables incorrectly (common error: reading the column heading \( \times 10^3 \) as meaning “multiply the value of \( v \) by 10³.” It should be interpreted as “\( v \) has been multiplied by 10³, so I must multiply the value by 10⁻³ to get the original value.”
  • Calculation errors (typos)