Developing an Experiment
Student Learning Objectives

• #1 apply knowledge
• #2 design and conduct experiments
• #3 contemporary issues
• #4 broad education
• #5 multi-disciplinary teams
• #6 professional and ethical responsibility
• #7 communicate effectively
• #8 life-long learning
Designing an Experiment

• Engineering Design
  – Identify need (criteria), research, develop solutions, plan, create (prototype), test (evaluate), and improve (redesign)

• Experiment Design
  – Begin with a hypothesis
  – Follow with the seven steps
Experiment Design – 7 Steps

1. Select relevant variables for testing.
   - Have fun?
   - Become aware of engineering?
   - Learn lesson?

2. Specify the levels of treatment.
   - Universal results?
   - Control group?

3. Control the environmental and extraneous factors.
   - Weather, distractions, materials
Experiment Design – 7 Steps

4. Choose an experimental design suited to the hypothesis.
   • Survey
   • Interview
   • Assessment
Surveys

• Demographics
• Wording of questions
• Using the Likert Scale
• Statistical analysis
• Set criteria before testing
• Error analysis
Case Studies / Interviews

• Single sampling
• Detailed analysis
• Unforeseen factors
• Representative of population?
Assessment Technique

• Define student learning objective
• Measure level of learning
  – Not just opinion
• Select measurement instrument
  – Quiz
  – Written report
  – Presentation
  – Worksheet
Experiment Design – 7 Steps

5. Select and assign subjects to groups (demographics).

6. Pilot-test, revise, and conduct the final test.

7. Analyze the data.
   - Statistical analysis (careful with significant digits)
Experiment Design – 7 Steps

1. Select relevant variables for testing.
2. Specify the levels of treatment.
3. Control the environmental and extraneous factors.
4. Choose an experimental design suited to the hypothesis.
5. Select and assign subjects to groups (demographics).
6. Pilot-test, revise, and conduct the final test.
7. Analyze the data.
SLO # 2: Design and conduct experiments as well as to interpret data

• Select an experiment you designed and conducted
• Discuss the hypothesis and seven steps
• Illustrate how dealt with data (statistics, outliers, validity, reliability)