BE 2350 Experimental Methods for Engineers  
Spring 2017

Credit hours: 3 (2 hours lecture; 3 hour. lab)

Location and Time:  0149 Electrical Engineering Building; 12:30-1:20 pm M/W;  
Lab:  1:30-4:20 pm, M, T 106A Ag Metals Bldg. (Through PC lab)

Description:  Prerequisite: credit or registration in EE2950 or PHYS 2102/2113. Introduction to  
experimental methods, technical report writing, and instrumentation for engineering  
applications; measurement of temperature, pressure, flow, and strain in biological  
products; microprocessor data loggers, computer data acquisition systems

Objectives:  To understand basic experimental design, measurement, control, data acquisition and  
analysis. Hands-on work will include electronics and instrumentation, and the use,  
collection, and analysis of data from data-loggers, computers or microprocessors.

Instructor:  Ashley Flynn, Teaching Associate  
Rm. 102-A2 Ag Metals Building  
Phone # 225-578-1086  
E-mail: aflynn5@lsu.edu  
Office hours: by appointment only

Instructor on Record:  W. David Constant, PhD, PE  
Rm. 155 E. B. Doran Building  
E-mail: DConstant@agcenter.lsu.edu  
Office hours: by appointment only


Criteria for Determining Grade:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>22.5%</td>
</tr>
<tr>
<td>Laboratory</td>
<td>22.5%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>35%</td>
</tr>
</tbody>
</table>

The final course grade will be determined from the following scale:

100 ≥ A+ > 95%, 95 ≥ A > 92%, 92 ≥ A- > 90%  
90  ≥ B+ > 85%, 85 ≥ B > 82%, 82 ≥ B- > 80%  
80  ≥ C+ > 75%, 75 ≥ C > 72%, 72 ≥ C- > 70%  
70  ≥ D+ > 65%, 65 ≥ D > 62%, 62 ≥ D- > 60%  
F    = less than 60%
Course Policies, Regulations and Procedures:

Attendance and participation is required. The instructor is not responsible for makeup work or informing students of makeup work.

Homework is due at the beginning of class on the due date. Homework problems (6-8) will be assigned weekly. Late homework will immediately result in a 50% grade deduction and 100% deduction (zero points) will be rewarded if the homework is not received by 12:30 pm the following day.

Exams will typically be divided into allowed formula sheet & calculator and no note & no calculator sections.

Examinations and labs missed due to an unexcused absence cannot be made up and a grade of zero will be given for each one missed.

Any students requiring special arrangements for taking exams, taking notes, and other special arrangements please see or contact the instructor within the first two weeks of class.

I am available for questions outside of class. I recommend that you make an appointment by e-mail (aflynn5@lsu.edu). If we make an appointment and you cannot attend, please call and cancel as soon as you can.

Web Page/ Supplemental Course Material

A course web page will be made available through Moodle to enhance the course contents. Students are requested to visit this web site on a regular basis. The course web site contains the course syllabus, the lecture schedule, homework assignment, homework submission portals, and review materials. Grades will be recorded on Moodle, however do not believe the calculations of overall grade or projected final grade until the very end of the class. You can manually calculate your grade by summing your points earned and dividing it by the sum of the total points available for each assignment that has been due, and then convert it to a percentage. Total points for the course = 400 pts.

C-I course: Written and Technology

This is a certified Communication-Intensive (C-I) course which meets all of the requirements set forth by LSU’s Communication across the Curriculum program, including

• instruction and assignments emphasizing informal and formal visual and technical;
• teaching of discipline-specific communication techniques;
• use of draft-feedback-revision process for learning;
• practice of ethical and professional work standards;
• 40% of the course grade rooted in communication-based work; and
• a student/faculty ratio no greater than 35:1

Students interested in pursuing the LSU Distinguished Communicators certification may use this C-I course for credit. For more information about this student recognition program, visit www.cxc.lsu.edu.

Academic Integrity and Academic Misconduct

Students are expected to comply with the Code of Student Conduct at all times throughout this course. For your information, the Code of Student Conduct can be found at: http://saa.lsu.edu/code-student-conduct
Homework Problem Format

Homework should be completed on 1-sided engineering paper or white printer paper. It can be handwritten or completed on the computer. Hand-written homework submissions will need to be scanned to be uploaded to Moodle. Therefore, please use dark #2 pencil or ink scribing to complete your work. Work may be scanned by Ms. Angie in the BAE main office (149 E.B. Doran).

Each problem solution must include:

- Paraphrase the question. What is the thing you are trying to solve? However, don’t waste your time writing the question word-for-word.
- List your known information (constants, givens) including the units.
- Write down the equations you plan to use, include the name of the equation if there is one.
- Although, good for error checking, I do not require step-by-step algebra in which you use to solve the problem(s).
- Highlight your final answer (e.g. a box around it) and don’t forget the units. **I will not accept a number without its units and you must provide the number in logical significant digits.** (ex: 500.25 paces is 501 paces, 35000.276 is 35000 Reynolds Number, $5.315$ is $5.32$)
- Provide 1-4 sentences that effectively explain how your solution to the problem makes sense.

Executive Summary Format / Final Project Report Format

Some of your laboratory sessions in BE 2350 will be summarized using a 2-page executive summary. Proper formatting will be explained in laboratory session 1. Expected formatting examples and tips are also available on the course Moodle page.

The final laboratory sessions will be an opportunity to design an experiment, which will be communicated in an 8-10 page report. Expected formatting examples and tips are available on the course Moodle page.

BE 2350 Lecture and Lab Tentative Schedule for Spring 2017 (subject to change)

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading Assn.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/11</td>
<td>Lecture 1: Introduction to the course, Executive Summaries</td>
<td></td>
</tr>
<tr>
<td>LAB</td>
<td>no lab</td>
<td></td>
</tr>
<tr>
<td>1/16</td>
<td>MLK day – no class</td>
<td></td>
</tr>
<tr>
<td>1/18</td>
<td>Lecture 2: Measurement Systems and Units, Instrument Types</td>
<td>Chap 1 – 2.2</td>
</tr>
<tr>
<td>LAB</td>
<td>no lab</td>
<td></td>
</tr>
<tr>
<td>1/23</td>
<td>Lecture 3: Static and Dynamic Characteristics of Instruments</td>
<td>Chap 2.2 – 2.5</td>
</tr>
<tr>
<td>1/25</td>
<td>Lecture 4: Measurement Uncertainty</td>
<td>Chap 3</td>
</tr>
<tr>
<td>LAB</td>
<td>Lab 1: Safety and Introduction to Lab, Multimeters, Solder</td>
<td>Exec Sum exercise</td>
</tr>
<tr>
<td>1/30</td>
<td>Lecture 5: Measurement Uncertainty</td>
<td>Ch. 3, handout</td>
</tr>
<tr>
<td>2/1</td>
<td>Lecture 6: Calibration and Electrical Testing Instruments</td>
<td>Chaps 4, 7</td>
</tr>
<tr>
<td>LAB</td>
<td>Lab 2: Introduction to the Arduino microcontroller – Part 1</td>
<td>Exec Summary</td>
</tr>
<tr>
<td>2/6</td>
<td>Lecture 7: Voltage Dividers, Variable Conversion Elements</td>
<td>Chap 9.1-9.3</td>
</tr>
<tr>
<td>2/8</td>
<td>Lecture 8: VCEs, Oscilloscopes</td>
<td>Chap 9.4-9.9</td>
</tr>
<tr>
<td>LAB</td>
<td>Lab 3: Introduction to the Arduino microcontroller – Part 2</td>
<td>Exec Summary</td>
</tr>
</tbody>
</table>
2/13 Lecture 9: Reliability and Safety Systems Chap 12
LAB Lab 4: Basic Electronic Circuits (voltage dividers, 555 timers) Exec Summary
2/20 Lecture 11: Temperature Measurement: Part 1 Ch. 14.1
2/22 Lecture 12: Temperature Measurement: Part 2 Ch. 14.2-14.15
LAB Lab 5: Programming/Coding, lab exam review Exec Summary
2/27 Mardi Gras Holiday – No Class
3/1 Lecture 13: Pressure Measurement Ch. 15
LAB no lab
3/6 Midterm exam review
3/8 MIDTERM EXAM
LAB LAB PRACTICAL
3/13 Lecture 14: Flow Measurement Chap 16
LAB Lab 6: Data Analysis / Hypothesis testing Exec Summary
3/22 Lecture 17: Translation Motion Chap 19
LAB Lab 7: DAQ and Logging – Pace loggers Exec Summary
3/27 Lecture 18: Vibration and Shock, Rotational Motion Chap 19,20
3/29 Lecture 19: Other Sensors (ISE, biosensors) Reading
LAB Lab 8: LabVIEW DAQ Examples Exec Summary
4/3 Lecture 20: Signal Processing with Amplifiers and Filters Chap 6, Handout
4/5 Lecture 21: PC and Device Communications Chap 11, handout
LAB Lab 9: Experiment Design Project Final Report
4/10,12 Spring Break – No Class
LAB no lab
4/17 Lecture 22: PC and Device Communications Chap 11, handout
4/19 Lecture 23: TBA
LAB Lab 10: Experiment Design Project
4/24 Final Review
4/26 no class
LAB Final Group Lab Report due onto Moodle

FINAL EXAM: Tuesday, May 2nd at 12:30pm – 2:30pm