

**BE 2350 Experimental Methods for Engineers
Spring 2019**

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

Location and Time: 12:30-1:20 pm M/W; 1206 Patrick F. Taylor Hall
Lab: 1:30-4:20 pm, M, T 106A AgMetals Bldg. (Through PC lab)

Description: *Prerequisite: credit or registration in EE 2950 or PHYS 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 programming, electronics, and instrumentation, and the use, collection, and analysis of data from data-loggers, computers, or microprocessors.

Instructor: Nicholas P. Totaro, Instructor
Rm. 105 E. B. Doran Building
E-mail: ntotar1@lsu.edu
Office hours (subject to change):
Tuesday's 12:30 to 1:20 pm
Wednesday's 1:30 pm to 2:30 pm

Text: *Measurement and Instrumentation: Theory and Application*, first edition, by A.S. Morris and R. Langari, Elsevier, 2011.

LSU Library link: <http://libezp.lib.lsu.edu/login?url=http://app.knovel.com/web/toc.v/cid:kpMITA0001>

Criteria for Determining Grade:

Homework	22.5%	225 pts
Laboratory	22.5%	225 pts
Midterm Exam	20%	200 pts
Final Exam	35%	350 pts

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

100% ≥ A+ > 97.45%, 97.44% ≥ A > 91.45%, 91.44% ≥ A- > 89.45%
89.44% ≥ B+ > 87.45%, 87.44% ≥ B > 81.45%, 81.44% ≥ B- > 79.45%
79.44% ≥ C+ > 77.45%, 77.44% ≥ C > 71.45%, 71.44% ≥ C- > 69.45%
69.44% ≥ D+ > 67.45%, 67.44% ≥ D > 61.45%, 61.44% ≥ D- > 59.45%
F = less than 59.44%

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 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 p.m. the following day.

Exams will typically be divided into no note & no calculator and allowed formula sheet & calculator and 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. An excuse for an exam or lab absence will be accepted in very few cases; these include illness (and then only with a valid doctor's note) and a death in the family (and then only with a valid obituary) or other stated by LSU policies.

Office of Disability Services:

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.

Louisiana State University is committed to providing reasonable accommodations for all persons with disabilities. The syllabus is available in alternate formats upon request. Any student with a documented disability needing academic adjustments is requested to speak with Disability Services and the instructor, as early in the semester as possible. All discussions will remain confidential. This publication/material is available in alternative formats upon request. Please contact Disability Services in 115 Johnston Hall, 225-578-5919 or www.lsu.edu/disability.

I am available for questions outside of class. I recommend that you make an appointment by e-mail (ntotar1@lsu.edu). If we make an appointment and you cannot attend, please call or email 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 website on a regular basis. The course website 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 = 1,000 pts.

C-I course: Technology and Visual

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 <https://www.lsu.edu/academicaffairs/cxc/>.

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>. As faculty members of LSU, it is our responsibility to uphold academic integrity, and the reputation of this university. We take this responsibility very seriously.

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 in room 1269 PFT, Chevron Center.

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, ~~35,000.276~~ is 35,000 Reynolds Number, ~~\$5.315~~ is \$5.32)
- **Provide 1-3 sentences that effectively explain how your solution to the problem makes sense.**

Executive Summary Format / Final Project Format

Laboratory sessions 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 a report and presentation. Expected formatting examples and tips are available on the course Moodle page.

Career Development

You will be assigned to apply for a summer job/internship/research opportunity specific to your career goals and you will have to write and give an elevator pitch to a fellow classmate. These assignments are incorporated within the class to better prepare you for obtaining acceptance to the next step, i.e. industry, professional or graduate school.

BE 2350 Lecture and Lab Tentative Schedule for Spring 2019 (subject to change)

<u>Date</u>	<u>Topic</u>	<u>Reading Assn.</u>
1/9 LAB	Lecture 1: Introduction to the course, Executive Summaries No lab	
1/14 1/16 LAB	Lecture 2: Measurement Systems and Units, Instrument Types Lecture 3: Static and Dynamic Characteristics of Instruments Lab 1: Safety and Introduction to Lab, Multimeters, Soldering	Chap 1 – 2.2 Chap 2.2 – 2.5 Exec Summary
1/17 1/18	Final date for dropping classes without receiving a grade of “W,” 4:30 pm deadline Final date for adding courses and making section changes, 4:30 pm deadline	
1/21 1/23 LAB	MLK day – no class Lecture 4: Measurement Uncertainty No lab	Chap 3
1/28 1/30 LAB	Lecture 5: Measurement Uncertainty Lecture 6: Calibration and Electrical Testing Instruments Lab 2: Introduction to the Arduino microcontroller – Part 1	Ch. 3, handout Chaps 4, 7 Exec Summary
2/4 2/6 LAB	Lecture 7: Voltage Dividers, Variable Conversion Elements Lecture 8: VCEs, Oscilloscopes Lab 3: Introduction to the Arduino microcontroller – Part 2	Chap 9.1-9.3 Chap 9.4-9.9 Exec Summary
2/11 2/13 LAB	Lecture 9: Reliability and Safety Systems Lecture 10: Sensor Technologies Lab 4: Basic Electronic Circuits (voltage dividers, 555 timer)	Chap 12 Chap 13 Exec Summary
2/18 2/20 LAB	Lecture 11: Temperature Measurement: Part 1 Lecture 12: Temperature Measurement: Part 2 Lab 5: Programming/Coding	Ch. 14.1 Ch. 14.2-14.15 Exec Summary
2/25 2/27 LAB	Lecture 13: Pressure Measurement Lecture 14: Flow Measurement Lab 6: Data Analysis / Hypothesis testing, lab exam review	Ch. 15 Chap 16 Exec Summary
3/4 3/6 LAB	Mardi Gras Holiday – No Class Midterm exam review No lab	
3/11 3/13 LAB	Midterm exam review MIDTERM EXAM LAB PRACTICAL	

3/18	Lecture 15: Flow Measurement, Level	Chap 16, 17
3/20	Lecture 16: Mass, Force, and Torque Measurement	Chap 18
LAB	Lab 7: DAQ and Logging – Pace loggers	Exec Summary
3/22	Final date for dropping courses, 4:30 pm deadline	
3/25	Lecture 17: Translation Motion	Chap 19
3/27	Lecture 18: Vibration and Shock, Rotational Motion	Chap 19, 20
LAB	Lab 8: LabVIEW DAQ Examples	Exec Summary
4/1	Lecture 19: Other Sensors (ISE, biosensors)	Reading
4/3	Lecture 20: Signal Processing with Amplifiers and Filters	Chap 6, Handout
LAB	Lab 9: Experiment Design Project	Final Report
4/8	Lecture 21: PC and Device Communications	Chap 11, Handout
4/10	Lecture 22: PC and Device Communications	Chap 11, Handout
LAB	Lab 10: Experiment Design Project	
4/15	Spring Break – No Class	
4/17	Spring Break – No Class	
LAB	No lab	
4/22	Lecture 23: Guest Speaker	
4/24	Final Review	
LAB	Final Project Presentations and Report due onto Moodle	

FINAL EXAM: Thursday May 2, 2019 – 7:30 a.m. to 9:30 a.m.