

ME 360 - Instrumentation & Control Components - Spring 2000

Description: An introduction to the selection and use of electrical, pneumatic, and other components found in mechanical system instrumentation and control. Demonstrations and both pre-assembled and open-ended experiments will provide significant “hands-on” opportunities for learning. Specific components include modern electrical measurement devices, signal conditioning, force and torque measurement, proximity sensors, AC and DC motors, pneumatic system components and programmable logic controllers.

Texts: *Introduction to Engineering Experimentation*, Wheeler & Ganji, Prentice-Hall
ME 360 Course Manual, University of Alabama Supe Store

Instructor: Dr. Joey K. Parker, Room 282 Hardaway, 348-1654, jparker@coe.eng.ua.edu

Prerequisites

- EE 320 / EE 225 (concepts of voltage, current, resistors, capacitors, DC circuit analysis, op-amp)
- ESM 250 (uniaxial & biaxial strain, pure tension/compression, bending, torsion)
- ME 110 or GES 123 or GES 131 (unit conversions, significant digits, graphing, spreadsheets)

Office Hours

Students are encouraged to see me outside of class to discuss homework, grading, or any other problems. If my door is open and no one else is already there, then you are always welcome to come in. The most important part of my job is to help you learn the material in this course.

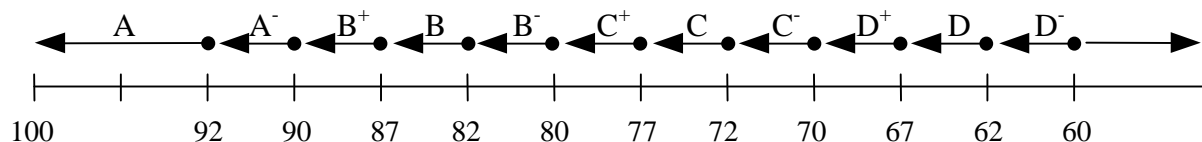
Attendance Policy

ME 360 covers a great deal of material. Some of this material is well covered by the reading assignments noted in the schedule. Other topics not adequately covered by the text will be covered exclusively in class. Several of the classes will be used to prepare students for upcoming lab exercises. Therefore, students are expected to attend ALL classes. The instructor reserves the right to limit the quality and/or quantity of outside assistance to students with excessive absences.

Grading

Labs [†]	45 %
Homework, quizzes, graded in-class activities	15 %
Three Exams (2 best @ 15% each, 1 @ 10%)	40 %

[†] ME 360 carries the University Core Curriculum "W" (writing) requirement. In order to pass the course, each student must demonstrate the ability to write "coherent, logical, and carefully edited prose" in addition to the grade requirements given above. This requirement will be met by passing the "English" portion of the lab reports.



Homework and Pop Quizzes

Homework will be assigned and collected regularly. *No late homework will be accepted.* Some of the problems will be graded and credit given for attempting the remaining problems. Short unannounced (pop) quizzes may also be given. These quizzes are designed to test the concepts covered in the daily assignments, and may be given at the beginning, middle, or end of the class. Each pop quiz counts as one homework assignment. No make-up is given for pop quizzes.

Examinations

There are three exams scheduled for this course. No make-up exams will be given except under extenuating circumstances as determined by the instructor.

Labs, Lab Reports, and Teaming

Twelve regular labs are scheduled, plus an introductory lab. Two of the labs will require individual formal reports. Three of the remaining labs will require formal group reports. Each of these formal reports will be graded both on technical content (graded by me) and English quality (graded by English grader). Make-up labs are given only when approval is obtained in advance. Each lab assignment is mandatory. All lab reports are due one calendar week later at the beginning of the lab period. *Late lab reports will not be accepted.*

In order to reduce the workload of the students, and to reinforce necessary teaming skills, each student will be assigned to a group for conducting labs and writing laboratory reports. The responsibilities and assignments of each student and the overall grading process will be described in detail in class.

In the event that a group member fails to do his or her share of the work, the group may elect to “fire” that member. This will require a hearing with the ME instructor, appropriate and detailed documentation, and sufficient justification of such action. If a team member is “fired,” they will be individually responsible for completing and writing up all remaining laboratories. The “fired” team member will not be able to join another group.

There are four types of lab reports in ME 360. A summary of lab report grading:

Category	Maximum Points			
	Formal Group	Formal Individual	Short Group	Short Individual
Technical Writing Rules, Grammar, Organization, Sentence Structure	100	100
Technical Quality	120*	67	40	40
Format, Appearance, "Following the Rules for Reports"	60*	33	10	10
Quality, Thoroughness of Editing	20
Total:	300	200	50	50

* - 50% your individual contribution, 50% your team's average for this category

Outline of Topics

Dates	Material
1/5	Introduction (Ch. 1), Unit Conversions, Significant Digits
1/7	General Characteristics of Measurement Systems (Ch. 2) Indicating and Recording Devices (Sec. 3.3)
1/10	Statistics (Ch. 6), Breadboard Circuit Techniques
1/12	Experimental Uncertainty Analysis (Ch. 7)
1/14	Dynamic Behavior of Measurement Sys. (Sec. 11.1 - 11.3)
1/19- 1/21	Electrical Signal Measurement Systems (Sec. 3.1), Operational Amplifiers (Sec. 3.2.1 - 3.2.2)
1/24- 1/26	In-class exercises with op-amps (Notes) Formal report writing requirements (Notes)
1/31	Low-pass Filters (Sec. 3.2.3 - 3.2.6)
2/2	<i>Exam #1 material ends here (exam on Friday, 2/11)</i>
2/4	Strain Gages (Sec. 8.1)
2/9	Force and Torque Measurement (Sec. 8.6 - 8.7)
2/11	Exam #1
2/14	Position, Velocity, and Acceleration Sensors (Sec. 8.2-8.5)
2/16	Vibration Measurement (Sec. 8.5)
2/21	Data Acquisition (Sec. 4.2.3, 4.3, 4.4)
2/23	Discrete Sampling and Analysis (Sec. 5.1, 5.4)
2/28	DC Motors
3/1	DC Motor Speed Control, Stepper Motors
3/6	AC Motors
3/8	AC Motor Speed Control
	<i>Exam #2 material ends here (exam on Friday, 3/17)</i>
3/13	Proximity Sensors, Electrical Control Components
3/15	Industrial Fluid Power (Pneumatic) Components
3/17	Exam #2
3/20-22	Relay Ladder Logic Control and PLC Introduction
4/3-4/5	PLC Examples: Clamp/Work and Palletize
4/10-4/12	PLC Programming, Design Problems
4/17-4/19	PLC Debugging, Operator Safety
4/24-26-28	PLC Hardware (Options and Selection), Review
5/6	Final Exam - Saturday, May 6, 8:00 - 10:30 AM

Lab Schedule

Labs	Dates
Lab 0	1/11 – 1/13
Lab 1	1/18 – 1/20
Lab 2	1/25 – 1/27
Lab 3	2/8 – 2/10
Lab 4	2/15 – 2/17
Lab 5	2/22 – 2/24
Lab 6	2/29 – 3/2
Lab 7	3/7 – 3/9
Lab 8	3/14 – 3/16
Lab 9	3/21 – 3/23
Lab 10	4/4 – 4/6
Lab 11	4/11 – 4/13
Lab 12	4/18 – 4/20

Disclaimer - Assignment sheets and course contents are subject to modification when circumstances or sound pedagogy dictate and as the course progresses. If changes are made, you will be given due notice.