Syllabus

EL 3302 Engineering Measurements

Instructor: Scott Starks, Ph.D., P.E.
Office: Room E230B, within CREATE Office
Office Hours: 10:00 – noon, Mondays and Wednesdays
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Course Location: Room 101, Class Room Building and Room 222A, Physical Science Building
Time: Mondays and Wednesdays, 3:00 – 4:20 PM
Textbooks:

Electric Circuits, Mahmood Nahvi and Joseph Edminister, Shaum's Outline Series, McGraw-Hill Publishers.

Leadership: Theory and Practice by Peter Northouse, Sage Publishers.

Course Description

Conducting experiments and making measurements is an essential aspect of all branches of science and engineering. Nearly all of our current quantitative understanding of the natural and engineered world has come from the interplay between theory and measurements. Models and simulations of systems require experimental validation and performance of engineered systems must not only be predicted, but also measured and tested. In this course we will learn the basic tools of making physical measurements and conducting experiments. We will collect data, analyze data, conduct basic error analysis, and design experimental systems. Using inexpensive components, we will build electrical and electronic circuits and learn how they operate.

Student Outcomes (ABET)

At the end of the semester, students will have:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science and mathematics
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
8. An ability to recognize leadership issues and to apply leadership principles

Team-Based Learning

A pedagogical approach known as Team-Based Learning will be employed in the course. Students will be grouped into teams. This will enable each student to work with other students during the class. The purpose of Team-Based Learning is to increase the depth of learning that each student will achieve.

Course Topics

I. Introduction to Electric Circuit Analysis
   a. Charge, Current and Voltage
   b. Ohm's Law
   c. Kirchoff's Voltage Law
   d. Kirchoff's Current Law
   e. Combining Resistors and Simplifying Circuits

II. DC Circuit Analysis
   a. Node Voltage Analysis
   b. Loop Current Analysis
   c. Voltage Divider Principle
   d. Current Divider Principle

III. Laboratory Practice
   a. Powered Breadboards
   b. Supply Voltages and Ground
   c. Constructing Circuits

III. *Digilent Analog Discovery* – USB Oscilloscope
   a. Downloading "Waveforms" Software
   b. Simple Operations and Measurements Using the Analog Discovery

IV. Resistors and Potentiometers
   a. Resistor Color Codes
   b. Resistor Measurements
   c. Potentiometers

V. Capacitors and Inductors
   a. Voltage/Current Relationships for Capacitors and Inductors
   b. Phasor Representation for Capacitors and Inductors
   c. AC Circuit Analysis
   d. Filters
   e. Transient Response of RC and RL Circuits

V. Operational Amplifiers
   a. Circuit Configuration
   b. Measurement of Operational Amplifier Characteristics
   c. Closed-Loop Performance
   d. Negative Feedback
   e. Amplifier Design
   f. Practical Limitations

VI. Filters
   a. Passive Filters
   b. Active Filters
   c. Frequency Response (Amplitude and Phase)
   d. Bode Plots

Grading Policy

Exam 1	20 %
Exam 2	20 %
Readiness Assessment Tests (Individual and Team)	20 %
Laboratory Experiments and Reports	20 %
Final Exam	20 %

Letter grades will be assigned according to the following scale:

90 – 100 %	A
80 – 89 %	B
70 – 79 %	C
60 – 69 %	D
59 or below	F

Readiness Assessment Tests

Students will be assigned Readings to complete as homework as an introduction to the next phase of course material. The purpose of **Readiness Assessment Tests** (**RATs**) is to ensure that students have completed the readings and are prepared for the next part of the course. **Readiness Assessment Tests** are a key feature of Team-Based Learning. Students will be assessed to determine whether or not they are ready to apply or use the content contained in the assigned reading. In the Team-Based Learning Process, students will first take a **RAT** individually. The **RAT** will be a relatively short exam that can be graded in class. When finished, students will turn in their individual answers and then immediately take the same test as a team. Both tests are graded in class and both will be counted toward the class grade.

Readiness Assessment Tests will be given at the start of class. The individual and team parts of the **RAT** will take a maximum of 15 minutes to complete.

No makeups will be given on RATS.

Laboratory Experiments and Reports

Students will be required to complete a number of laboratory experiments during the term. These projects primarily deal with the design and construction of electric circuits that can be used for sensing and measurement. Laboratory Reports will be submitted to Blackboard for each project. In some case, these will be individual reports and others may be team reports.

Attendance Policy

Students are expected to attend all classes. Students who miss 3 or more classes **may be dropped** from the class.

Book: Leadership Theory and Practice

In order to build one's leadership abilities, it is essential to become aware of the contemporary issues that confront leaders. The Engineering Leadership faculty have established a policy that majors will read certain chapters from this book each semester. For this semester, you will be responsible for Chapters 6 and 15 from the text by Northouse. Students are expected to read this book, complete assignments relating to the book, and to be prepared to discuss its merits during the class. Assessment of your ability to recognize leadership issues and to apply leadership principles will occur on the Final Exam.

Cell Phone Policy

Cell phones are not permitted during the lecture. Students are required to turn off cell phones before entering the classroom. Cell phones should be placed out of sight (like in a purse or backpack). Students should **NOT** receive or make calls/text messages during class. **Students using cell phones during class will be asked to leave.**

Academic Dishonesty

Cheating is taken very seriously. Students are encouraged to collaborate on most assignments throughout the semester but all graded materials must represent the student's individual work. (When in doubt, ask your professor!) Scholastic dishonesty is the attempt to present the work of somebody else as his or her own work or attempting to pass any examination by improper means. It is a serious offense and will not be accepted. Any academic misconduct will be handled according to the current university policy and will be reported. In accordance with University regulations, scholastic dishonesty on a given assignment will be referred to the Dean of Students and may result in a zero on the assignment, an "F" in the course, or even suspension from the university. If you need assistance with your assignments, please consult authorized sources of help. For more information on Academic Dishonesty visit the Dean of Students or http://studentaffairs.utep.edu.

Special Accommodations

If you would like to request special accommodation due to a disability, we can certainly work that out. Please contact The Center for Accommodations and Support Services via their website http://sa.utep.edu/cass/.