

EL 3302 Engineering Measurements

The University of Texas at El Paso – Spring 2022

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 and apply them in measuring common signals.

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Office Hours: by appointment, but he's around a lot so you can also stop by

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In-person Office Hours (Tu. & Th. only): https://calendly.com/mrkendall/spring22_inperson

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Teaching Assistant: Sebastian Palacios

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Office Hours: Thursday and Friday by appointment

Course Goals and Objectives

This course will provide development and assessment of the following competencies:

- Conducting engineering measurements with a range of instruments
- Experimentation
- Written Technical Communication
- Quantitative Data Analysis
- Model Validation
- Graphical Representation of Data
- Posing and Testing Hypotheses
- Business Acumen
- Leadership skills

Student Outcomes – ABET

ABET Student Outcome 1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science and mathematics.

ABET Student Outcome 6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

ABET Student Outcome 8. An ability to recognize leadership issues and to apply leadership principles.

Required Texts and Materials

Dunn, Patrick F., and Davis, Michael P. (2017). *Measurement and Data Analysis for Engineering and Science*, 4th Ed. CRC Press. ISBN-13: 978-1351686402

Kouzes, James M., and Barry Z. Posner. *The student leadership challenge: Five practices for becoming an exemplary leader*. John Wiley & Sons, 2018. ISBN-13: 978-1119421917

Kouzes, James M., Barry Z. Posner, Beth High, and Gary M. Morgan. *The student leadership challenge: Student workbook and Personal Leadership Journal*. John Wiley & Sons, 2018. ISBN-13: 978- 1118390092

A note on the readings: many of the readings deal with learning to do things (e.g., work with MATLAB). Reading alone does not help you learn to do things -- rather, you need actually to DO the thing. Therefore, the approach you take to this reading should be somewhat different from the approach you might take when reading (insert your favorite author here). Rather than relaxing on a couch, sipping tea, and casually contemplating the beauty of modeling as you read, you should be trying stuff out on your computer or on paper as you read. Much of the reading is written in a way that encourages you to do exactly this; you'll find you learn a lot more from the reading if you try the examples, etc. as you read. Yes, this will take longer. But you will learn the material so much better and thank yourself for it in the long run!

Equipment & Software: You will need reliable and frequent access to a computer with sufficient capacity to run **MATLAB** and TinkerCad. *Each student must obtain a current copy of MATLAB for their personal computer.* The most recent version can be obtained from the University at https://www.utep.edu/technologysupport/ServiceCatalog/SOFTWARE_PAGES/soft_matlab.html. The online version works great! But you can also download a free copy to install directly on your computer. The ETC Staff can also assist you in the installation if you need help. To collect most of the experimental data this semester, we will be using an **Analog Discovery** and the associated **Waveforms** software. We will provide the Analog Discoveries and will discuss this more in class about how to download Waveforms. ***Failure to return the Analog Discovery assigned to your team at the end of lab will result in a ZERO on that lab for your team and your team may have to purchase a replacement.*** We will also be using **TinkerCad** throughout the semester. TinkerCad is also available online. You can confirm that your computer has the minimum requirements to run this software here: <https://tinkercad.zendesk.com/hc/en-us/articles/205849108-What-are-Tinkercad-s-Browser-Platform-and-Hardware-requirements-> *If your computer doesn't meet these minimum requirements or you are concerned about your internet access, please contact the teaching team as soon as possible and we'll help you find the resources you need to be successful this semester!*

Course Schedule: The complete and up-to-date course schedule can be found on Blackboard. This schedule is likely to change, so be sure to check it often!

Grading

Weights Used to Determine Final Averages

- Pre-Labs (9 total) 20 %
 - Lab Reports (8 total) 25 %
 - Team Project 35 %
 - Business Acumen Assignments 10 %
 - Leadership Assignments 10 %
- 100 %

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

Attendance

With the ongoing challenges of the COVID pandemic, we realize that life for all of us is going to be unpredictable this semester. We are doing our best to structure this course such that you are able to meet the course objectives, while having flexibility for when life happens. Therefore, we are not making attendance an individual component of your grade. Further, we are happy for you to coordinate with us or another student in class if you wish to have a virtual connection to class established via Zoom or Blackboard.

That being said, this class does have a team-based project component and will use class-time heavily to complete assignments and practice what you are learning. Therefore, missing class is likely to impact your course grade significantly.

However, if you are absent more than three times without approval, you will be required to meet with Dr. Kendall to avoid being dropped from the course.

Health-related Class Absences (See also Accommodations section below):

Please regularly evaluate your own health according to current [CDC](#), State of TX, and your local city guidelines. In the event that you are feeling ill, you are encouraged to seek appropriate medical attention for treatment and worry about class later. Then, email your professors about your absence as soon as you are able so that appropriate accommodation can be explored.

Course Deliverables

Laboratory Assignments

Throughout the first half of the semester, you will be completing a series of nine laboratory assignments designed to walk you through some of the most common measurement tools and the signals they measure. You will be assigned to a random team of 4-5 people for each of these assignments. For these labs, you will submit two assignments, a Pre-lab and a Lab Report. For the *Pre-Labs*, you will have some assigned reading and practice problems to complete individually related to the main principles of the associated lab. For the Lab Reports, you and your team will write up a response to specific prompts from the lab assignment and summarize the work you completed in the lab. We will provide you with a basic template to follow. Pre-labs are submitted individually while the reports are submitted by each lab team. Both are graded based on quality of the writing, depth of content, and accuracy of answers. The Pre-Labs count 20% towards the final grade in the course and the reports count for 25%.

Project

In the fall, we began working through the modeling and simulation process, with just a touch of experimentation (think doughnuts...). This semester we are going to close the loop and introduce the experimentation process, i.e., the collection of data to validate your model and simulation. Therefore, this semester's project will have you and your team identify a research question, define the model, design and execute an experiment, and compare your model data with your experimental data. Yet again, you will have a series of *Deliverables* to complete. These deliverables will walk you through the major components of your project and together comprise the major components of your final *Project Report*. This report will document all phases of your project and your findings. You will then present an overview of your project during your final *Presentation*. This presentation will need to hit the highlights, but the report should contain all the details. These projects will again be completed on a team and will last through the end of the semester. Therefore, you will have the opportunity to lead and grow as a teammate, which we evaluate through team evaluations at the end of the term. The Team Project will count 35% toward the Final Average in the course.

Leadership & Business Assignments

Throughout the semester, we will be completing a series of leadership and business assignments. For each weekly topic, you will need to:

- Complete the associated reading.
- Discuss topics or complete an activity related to the reading during class.
- Complete a short assignment on the material.

The grades on the Leadership and Business Assignment count toward 20% of the final grade in the course.

Submitting and Completing Assignments

You are required to submit all materials to be graded via the course's Blackboard website as PDF files, unless otherwise indicated. Because you will be submitting your materials electronically, please use PDF files for written assignments or reports. If you are asked to write code, say in MATLAB, or create a presentation, please upload in the native format. The files that you submit should include your Last Name along with the name of the Deliverable/Assignment. For example: *Mendez-Assignment2.pdf*.

Academic Dishonesty

Academic Dishonesty 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 instructor!) 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

We are committed to working with students with pre-existing medical and mental health needs, as well as new needs that may arise during the semester. We encourage you to reach out to us as early as possible to discuss any adjustments you think may be necessary in this course. Reasonable accommodations may include leveraging the course modules that have been developed in creative ways to maximize your access during times when students need to quarantine due to COVID exposure, or during an absence related to a disability or COVID-19 diagnosis for yourself or someone you care for. While we cannot guarantee any specific outcome, we are committed to working with you to explore all the options available in this course. If you would like to request special accommodation due to a disability or illness, we can certainly work that out. Please also contact The Center for Accommodations and Support Services via their website <http://sa.utep.edu/cass/>.

Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let us know as soon as possible so that we can work on appropriate accommodations. If you have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu, so that the Dean of Students Office can provide you with support and help with communication with your professors. The Student Health Center is equipped to provide COVID-19 testing.

The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area, and will be available at no charge on campus during the first week of classes. For more information about the current rates, testing, and vaccinations, please visit epstrong.org.