Department of Mechanical Engineering
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Uttyler.edu/engineering

MENG 3210– Experimental Measurements and Techniques
Course Syllabus

Semester / Year	Fall 2024
Catalog Description	This is an experiential learning course based on Laboratory experiments. It exposes the students to concepts of accuracy, uncertainty, and usefulness of measurements, Sensors for measuring physical phenomena such as: strain, force, displacement, acceleration, pressure, and temperature will be introduced. Data acquisition and signal processing techniques will also be applied to actual measurements. Student teams will design, analyze, and document an experimental procedure. All procedures will result in a professional quality laboratory report.
Prerequisites	C or better in ENGR 2302 Dynamics, PHYS 2326 University Physics II and PHYS 2126 University Physics II Laboratory
Section number	Lecture: 030 Lab: 031L, 032L, 033L and 034L
Instructor name(s)	Dr. Soren Maloney
Contact info	Office: HEC A206 or via Zoom (details posted on Canvas) E-mail: smaloney@uttyler.edu
Class Type/Location	Lecture: Houston Engineering Ctr C204, Face to face Lab: Houston Engineering Ctr B223
Class Time	Lecture – 030: M 10:10 to 11:05 am Lab - 031L: M 2:00 to 4:45 pm Lab - 032L: TBD Lab - 033L: W 2:00 to 4:45 pm Lab - 034L: W 2:00 to 4:45 pm
Office Hours	Mondays 9:00 am to 10:00 am and 12:00 pm to 2:00 pm or by appointment
Credit Hours	2 (1 hour lecture and 3 hours laboratory per week)
Required Textbook	Introduction to Engineering Experimentation, Third Edition, Anthony J. Wheeler and Ahmed R. Ganji., but older editions are acceptable
Optional References	Recommended textbook (available *via* library using patriots account) – Morris, Alan S., and Reza Langari. *Measurement and Instrumentation: Theory and Application*, Elsevier Science & Technology, 2015. *ProQuest Ebook Central*, https://ebookcentral.proquest.com/lib/uttyler/detail.action?docID=5754522 . Additional Material on Canvas: Websites, Class Handouts, Tutorials on MATLAB and Simulink by Mathworks, Inc.
Additional requirements	Students can use AI programs (ChatGPT, Copilot, etc.) in this course. If you utilize an AI tool to help create content for an assignment, you must acknowledge and cite the tool's contribution to your work.

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	LabVIEW by National Instruments, and MATLAB, Simulink & Simscape by MathWorks, Inc. (available through virtual desktop – one.uttyler.edu)
Evaluation Method	Grading: Exam 1 5% Final Exam 15% Assignments 30% Laboratory Reports & Participation 50%
Grading Policy / Scale	Letter grades Scale: A 90 – 100 B 80 – 89 C 70 – 79 D 60 – 69 F < 60 Grade appeal: grades can be appealed by meeting the instructor during office hours, but no later than a week after the grade has been given. Note: your final semester grade is based on the 10-point scale. No curving or scaling will be applied even if you receive borderline grade such as 79.99.
Important events / dates	Census date: Sept 9 Exam 1: October 28 Final Exam: Dec 9
Attendance / Makeup policy/Late Submission	Attendance and participation to lectures are expected per university's class attendance policy. There will be no makeup for missed in-class work. An opportunity to make up a missed exam or lab may be available to students with an excused absence. Be advised that makeup exams may be more challenging. Excused absences include absences for university sponsored events and for religious observances (see the University policy). Other makeups are granted only in extreme cases and at the discretion of the instructor. Excused absence due to illness will require evidence of treatment by medical personnel or at a medical facility. Make-up assignments or exams if approved will be administered during finals week. Any violation of the Student Behavior (see Canvas) will result in 1% or more grade reduction for each incident. Students may appeal the grade reduction to the instructor if valid excuse or reason can be given. Late submissions of assignments including project reports (e.g., if due at 11:59:00 pm, then any time after such as 11:59:30 pm is late) will result in 10% deduction per day (or 24 hours) from the graded score. All late assignments must be submitted on Canvas by last class day of the semester (before midnight). After that time, all late assignments will result in automatic grade of zero.

<table>
<tr><td>Course Learning Objectives / ABET & PEOs relation</td><td>1. Select and use sensors and instrumentation to report engineering measurements and to perform calculations using the corresponding governing equations.
2. Interpret and analyze data, obtained from Engineering Experimentation, using statistical methods and uncertainty analysis.
3. Design, perform, and report results of a mechanical engineering experiment.
4. Use software for data acquisition.
5. Write professional quality laboratory reports.</td></tr>
<tr><td>Topics</td><td>1. Basic Measurements and Uncertainty
2. Statistical Analysis
3. Signal Conditioning
4. Temperature
5. Displacement
6. Strain
7. Flow</td></tr>
<tr><td>Other</td><td>Course Schedule
<table>
<tr><th colspan="2">Week of</th><th>Lecture Activity</th><th>Lab Activity</th></tr>
<tr><td>Aug</td><td>26</td><td>Course Introduction/ Syllabus/ Significant Digits</td><td>Lab A - MATLAB tutorial completion credit</td></tr>
<tr><td>Sep</td><td>2</td><td>No Lecture – Labor Day Monday</td><td>Lab B - Lab Safety</td></tr>
<tr><td></td><td>9</td><td>Measurement Systems</td><td>Lab C – Report Writing</td></tr>
<tr><td></td><td>16</td><td>Statistical Analysis</td><td>Lab D - LabVIEW Simulink/Simscape tutorial completion credit</td></tr>
<tr><td></td><td>23</td><td>Uncertainty Analysis</td><td>Lab E - LabVIEW</td></tr>
<tr><td></td><td>30</td><td>Instrument Types</td><td>Lab F - LabVIEW</td></tr>
<tr><td>Oct</td><td>7</td><td>Data analysis/</td><td>Lab 1- How to use a Digital Multimeter</td></tr>
<tr><td></td><td>14</td><td>Dynamic Behavior of Measurement Systems</td><td>Lab 2 - Uncertainty in Measurements</td></tr>
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		21	Review for Exam	Lab 3 - Data Analysis
		28	Exam 1	Exam 1 feedback
		31	Signal Conditioning	Lab 4 - Signal Conditioning
	Nov	4	Measuring temperature	Lab 5 - Temperature Measurements
		11	Measuring Displacement	Lab 6 - Displacement Measurements
		18	Thanksgiving Week - No Classes	
		25	Measuring Flow	Lab 7 – Flow Measurement
	Dec	2	Review for Exam	Lab 8 – Solar Array Data Acquisition
		9	Finals week (No classes)	Exam 2 – Final Exam & Makeup exams
University Policies	https://www.uttyler.edu/offices/academic-affairs/files/syllabus-information.pdf			