

MENG 3210 – Experimental Measurements and Techniques
Course Syllabus

Semester / Year	Fall 2020
Catalog Description	This 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	A grade of “C” or a better grade is required in the following: ENGR 2302 Dynamics, EENG 2301 Programming Applications, PHYS2126 and PHYS2326.
Section number	Lectures: 030,031 Labs: 030L, 032L, 033L, 034L
Instructor name	Tyler Hall
Contact info	thall@uttyler.edu and through Canvas Messenger for class topics
Class Type / Location	Hybrid
Class Time	<p>Lecture: Asynchronous via Zoom, once weekly to alternate between normal lecture scheduled times which are: Tuesday 8:00-8:55 am Wednesday 12:30-1:25 pm</p> <p>Topic: MENG 3210 Lecture Time: This is a recurring meeting Meet anytime</p> <p>Join Zoom Meeting https://uttyler.zoom.us/j/96418859421?pwd=ZzJ5UWpxZVd3RHBvdnpkNFZxR0JKZz09</p> <p>Meeting ID: 964 1885 9421 Passcode: 605574</p> <p>Join by SIP 96418859421@zoomcrc.com</p> <p>Join by H.323</p>

	<p>162.255.37.11 (US West) 162.255.36.11 (US East) 115.114.131.7 (India Mumbai) 115.114.115.7 (India Hyderabad) 213.19.144.110 (EMEA) 103.122.166.55 (Australia) 64.211.144.160 (Brazil) 69.174.57.160 (Canada) 207.226.132.110 (Japan) Meeting ID: 964 1885 9421 Passcode: 605574</p> <p>Labs: Hybrid</p>
Office Hours	<p>W 1:30-2:30 pm, or by appt. Via Zoom only</p> <p>Topic: Tyler Hall's Office Hours</p> <p>Join Zoom Meeting https://uttyler.zoom.us/j/7281968249</p> <p>Meeting ID: 728 196 8249 One tap mobile +13462487799,,7281968249# US (Houston) +16699006833,,7281968249# US (San Jose)</p> <p>Dial by your location +1 346 248 7799 US (Houston) +1 669 900 6833 US (San Jose) +1 253 215 8782 US (Tacoma) +1 312 626 6799 US (Chicago) +1 646 876 9923 US (New York) +1 301 715 8592 US (Germantown)</p> <p>Meeting ID: 728 196 8249 Find your local number: https://uttyler.zoom.us/u/aXaQdiGU</p> <p>Join by SIP 7281968249@zoomcrc.com</p> <p>Join by H.323</p>

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Credits	2
Required Resources	<ol style="list-style-type: none"> 1. Measurement, Instrumentation and Data Analysis, Hall T. 2019 (will be provided) 2. Beyond Labz access (\$25 for a year) https://www.beyondlabz.com/
Optional References	<ol style="list-style-type: none"> 3. Introduction to Engineering Experimentation, Third Edition, A. J. Wheeler and A. R. Ganji, Prentice Hall, 2010, ISBN 0-13-1742760 4. Measurement and Instrumentation - Theory and Application. Morris, Alan S. Langari, Reza. (2012). Elsevier. Retrieved from https://app.knovel.com/hotlink/toc/id:kpMITA0001/measurement-instrumentation/measurement-instrumentation 5. LabVIEW 2009 Student Edition, R. H. Bishop, Prentice Hall, 2010, ISBN 0-13-214129-9.
Additional requirements	Some basic supplies will be required for performing experiments at home.
Evaluation Method	Grading Mid-Term Exam 20% Lab Assignments 40% Quizzes 20% Design Lab Project 20%
Grading Policy / Scale	Letter grades Scale: A 90 – 100 B 80 – 89 C 70 – 79 D 60 – 69 F < 60
Important events / dates	Census date: 4 September 2020 Exam date: TBD, expect late October or early November

	Final date: No Final Exam
Attendance / Makeup policy	<p>The lecture will be asynchronous via Zoom. It will be recorded so that you can view it whenever you would like to, and as many times as you need. All lectures will remain available in Zoom until the end of the semester.</p> <p>Attendance will not be taken. Live attendance is optional and encouraged. Questions or interaction is encouraged during the live recording, and during office hours as well.</p> <p>The labs will be closed at HEC until October 5th, at the earliest. The course and labwork has been restructured to handle this, understanding that the re-open date may be extended. Additionally, the ability to form groups in the lab space will be dramatically different. Hence, attendance cannot be tracked nor taken, and is thus not a component of the grade. Additionally, group formation will be postponed and much more strictly limited, if permitted at all. Expect to work individually with some virtual teamwork to be announced.</p>
Course Learning Objectives / ABET & PEOs relation	<p>Expected Learning Outcomes</p> <p>By the end of this course students will be able to:</p> <ol style="list-style-type: none"> 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 of software tools for data acquisition. 5. Write professional quality laboratory reports. <p>Program Expected Outcomes:</p> <ol style="list-style-type: none"> 1. Apply science, mathematics and modern engineering tools and techniques to identify, formulate and solve engineering problems. 3. Develop and conduct experiments, collect, analyze, and interpret data, and formally communicate the results.
Tentative Topics	<ul style="list-style-type: none"> • Basic Measurements and Uncertainty • Signal Conditioning • Pressure • Temperature • Displacement • Force, Angular Velocity, and Acceleration • Strain
Other	

Table 1. Lab assignments with brief description of activity, required equipment, tentative order and its ability too be performed remotely. This is **NOT** the order in which the labs will be assigned. This table is intended to be a guide and for informational purposes. See the Canvas course page for assignments, labs and schedule.

LAB ID	Name	1. <i>Equipment</i> 2. <i>Description of Exercise</i>	Team option	Method
A	Determining Uncertainty in Measurements	1. <i>Digital multi-meter, electrical power supply, linear potentiometer.</i> 2. Measure the voltage drops across the potentiometer as it steps Hi to Lo.		Modify [1,2,3]
B	Labview Introduction	1. <i>Computer with installation of LabView 2016, V16.0 64-bit or Virtual Desktop</i>		[1]
C	Data Analysis	1. <i>Digital multi-meter, electrical power supply, rotary potentiometer or global specialties protoboard.</i> 2. Perform linear regression techniques to fit curves to data collected.		Modify [1,2,4]
D	Moment of Inertia I	1. <i>Flat surface like a tabletop, cylinder to roll, stopwatch, riser blocks</i> 2. Roll a cylinder down an incline plane many times and measure time of arrival to known markers. Plot mean and error against theoretical prediction.		[3]
E	Moment of Inertia II Hybrid	1. <i>None</i> 2. Digest data from the entire class using the collected results of Lab D	Yes	[1,4]
F	Professional Report Rewrite	1. <i>None</i> 2. Find a published technical paper of interest to the student and regenerate it verbatim, plots and figures included.	Yes	
G	Analog sampling	1. <i>Computer with LabView, DAQ (similar to NI USB-62111), signal generator (similar to global specialties proto-board)</i> 2. Sampling an analog signal into the digital domain at various settings.		Modify [4,1]
H	Design of Experiment	1. <i>Whatever equipment specified in the design.</i> 2. This exercise requires the student to design their own lab experiment and then perform it.	Maybe	
I	Measuring Viscosity	1. <i>A long transparent cylinder, spherical ball(s), stopwatch, thermometer, weight scale, liquid</i>		[3]

		2. From the direct measurements of T, L, F & time, determine the viscosity of the lique		
J	Measuring Pressure & Temperature	1. <i>Thermocouples, Pressure Transducers, DAQ, LabView</i> 2. Determine if a gas in a cylinder piston arrangement is behaving as a perfect gas.		[2]
K	To Be Added	1. <i>Placeholder for additional lab TBD</i>		[2]

Table 2. Method table, containing the descriptions of how individual experiments have been modified such that they may be performed without laboratory access.

Note ID	Description	Hardware required
1	Virtual, software only required, primarily LabView	No
2	Virtual, Beyond Labz	No
3	Home setup	Yes
4	Instructor provided data	No

University, College, and Department Policies:

1. Modifications

The instructor reserves the right to change this syllabus partially or fully at any point in time. Sufficient time and notice will be provided to the class before the activation of the changes.

2. UT Tyler Honor Code

Every member of the UT Tyler community joins together to embrace: Honor and integrity that will not allow me to lie, cheat, or steal, nor to accept the actions of those who do.

3. Student Standards of Academic Conduct

Disciplinary proceedings may be initiated against any student who engages in scholastic dishonesty, including, but not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, or material which has been submitted within a different course without explicit approval of the instructor, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

i. "Cheating" includes, but is not limited to:

- copying from another student's test paper;
- using, during a test, materials not authorized by the person giving the test;
- failure to comply with instructions given by the person administering the test;
- possession during a test of materials, or devices and instruments allowing access to materials, which are not authorized by the person giving the test, such as class notes or specifically designed

“crib notes” as well as cell phones, to name a few. The presence of textbooks constitutes a violation if they have been specifically prohibited by the person administering the test;

- using, buying, stealing, transporting, or soliciting in whole or part the contents of an unadministered test, test key, homework solution, or computer program;
 - collaborating with or seeking aid from another student or person during a test or other assignment without explicit authorization;
 - discussing the contents of an examination with another student who will take the examination;
 - divulging the contents of an examination, for the purpose of preserving questions for use by another, or removing material from the exam location, when the instructors has designated that the examination is not to be removed from the examination room or not to be returned or to be kept by the student;
 - substituting for another person, or permitting another person to substitute for oneself to take a course, a test, or any course-related assignment;
 - paying or offering money or other valuable thing to, or coercing another person to obtain an unadministered test, test key, homework solution, or computer program or information about an unadministered test, test key, home solution or computer program;
 - falsifying research data, laboratory reports, and/or other academic work offered for credit;
 - taking, keeping, misplacing, or damaging the property of The University of Texas at Tyler, or of another, if the student knows or reasonably should know that an unfair academic advantage would be gained by such conduct; and
 - misrepresenting facts, including providing false grades or resumes, for the purpose of obtaining an academic or financial benefit or injuring another student academically or financially.
- ii. “Plagiarism” includes, but is not limited to, the appropriation, buying, receiving as a gift, or obtaining by any means another’s work and the submission of it as one’s own academic work offered for credit.
- iii. “Collusion” includes, but is not limited to, the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any section of the rules on scholastic dishonesty.
- iv. All written work that is submitted will be subject to review by plagiarism software.
- v. Penalty for any related infractions will be decided at the discretion of the instructor including, but not limited to, granting of a failing grade in part or the course or in the entire course.

4. Students Rights and Responsibilities

To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please follow this link: <http://www.uttyler.edu/wellness/rightsresponsibilities.php>

5. Important Covid-19 Information for Classrooms and Laboratories

Students are required to wear face masks covering their nose and mouth, and follow social distancing guidelines, at all times in public settings (including classrooms and laboratories), as specified by [Procedures for Fall 2020 Return to Normal Operations](#). The UT Tyler community of Patriots views adoption of these practices consistent with its [Honor Code](#) and a sign of good citizenship and respectful care of fellow classmates, faculty, and staff.

Students who are feeling ill or experiencing symptoms such as sneezing, coughing, or a higher than normal temperature will be excused from class and should stay at home and may join the class remotely. Students who have difficulty adhering to the Covid-19 safety policies for health reasons are also encouraged to join the class remotely. Students needing additional accommodations may contact the Office of Student Accessibility and Resources at University Center 3150, or call (903) 566-7079 or email saroffice@uttyler.edu.

6. Recording of Class Sessions

Class sessions may be recorded by the instructor for use by students enrolled in this course. Recordings that contain personally identifiable information or other information subject to FERPA shall not be shared with individuals not enrolled in this course unless appropriate consent is obtained from all relevant students. Class recordings are reserved only for the use of students enrolled in the course and only for educational purposes. Course recordings should not be shared outside of the course in any form without express permission.

7. Campus Carry

We respect the right and privacy of students 21 and over who are duly licensed to carry concealed weapons in this class. License holders are expected to behave responsibly and keep a handgun secure and concealed. More information is available at <http://www.uttyler.edu/about/campus-carry/index.php>

8. UT Tyler a Tobacco-Free University

All forms of tobacco will not be permitted on the UT Tyler main campus, branch campuses, and any property owned by UT Tyler. This applies to all members of the University community, including students, faculty, staff, University affiliates, contractors, and visitors.

Forms of tobacco not permitted include cigarettes, cigars, pipes, water pipes (hookah), bidis, kreteks, electronic cigarettes, smokeless tobacco, snuff, chewing tobacco, and all other tobacco products.

There are several cessation programs available to students looking to quit smoking, including counseling, quitlines, and group support.

For more information on cessation programs please visit www.uttyler.edu/tobacco-free.

9. Grade Replacement/Forgiveness and Census Date Policies

Students repeating a course for grade forgiveness (grade replacement) must file a Grade Replacement Contract with the Enrollment Services Center (ADM 230) on or before the Census Date of the semester in which the course will be repeated. Grade Replacement Contracts are available in the Enrollment Services Center or at <http://www.uttyler.edu/registrar>. Each semester's Census Date can be found on the Contract itself, on the Academic Calendar, or in the information pamphlets published each semester by the Office of the Registrar.

Failure to file a Grade Replacement Contract will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates are eligible to exercise grade replacement for only three course repeats during their career at UT Tyler; graduates are eligible for two grade replacements. Full policy details are printed on each Grade Replacement Contract.

The Census Date is the deadline for many forms and enrollment actions of which students need to be aware. These include:

- Submitting Grade Replacement Contracts, Transient Forms , requests to withhold directory information, approvals for taking courses as Audit, Pass/Fail or Credit/No Credit.
- Receiving 100% refunds for partial withdrawals. (There is no refund for these after the Census Date)
- Schedule adjustments (section changes, adding a new class, dropping without a “W” grade)
- Being reinstated or re-enrolled in classes after being dropped for non-payment
- Completing the process for tuition exemptions or waivers through Financial Aid

10. State-Mandated Course Drop Policy

Texas law prohibits a student who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2-year or 4-year Texas public college or university. For purposes of this rule, a dropped course is any course that is dropped after the census date (See Academic Calendar for the specific date).

Exceptions to the 6-drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Enrollment Services Center and must be accompanied by documentation of the extenuating circumstance. Please contact the Enrollment Services Center if you have any questions.

11. Disability/Accessibility Services

In accordance with Section 504 of the Rehabilitation Act, Americans with Disabilities Act (ADA) and the ADA Amendments Act (ADAAA) the University of Texas at Tyler offers accommodations to students with learning, physical and/or psychological disabilities. If you have a disability, including a non-visible diagnosis such as a learning disorder, chronic illness, TBI, PTSD, ADHD, or you have a history of modifications or accommodations in a previous educational environment, you are encouraged to visit <https://hood.accessiblelearning.com/UTTyler> and fill out the New Student application. The Student Accessibility and Resources (SAR) office will contact you when your application has been submitted and an appointment with Cynthia Lowery, Assistant Director of Student Services/ADA Coordinator. For more information, including filling out an application for services, please visit the SAR webpage at <http://www.uttyler.edu/disabilityservices>, the SAR office located in the University Center, # 3150 or call 903.566.7079.

The University of Texas at Tyler has a continuing commitment to providing reasonable accommodations for students with documented disabilities. Like so many things this Fall, the need for accommodations and the process for arranging them may be altered by the COVID-19 changes we are experiencing and the safety protocols currently in place. Students with disabilities who may need accommodation(s) in order to fully participate in this class are urged to contact the Student Accessibility and Resources Office (SAR) as soon as possible, to explore what arrangements need to be made to ensure access. During the Fall 2020 semester, SAR will be conducting all appointments via ZOOM. If you have a disability, you are encouraged to visit <https://hood.accessiblelearning.com/UTTyler> and fill out the New Student Application. For more information, please visit the SAR webpage at <http://www.uttyler.edu/disabilityservices> or call 903.566.7079.

Student Absence due to Religious Observance

Students who anticipate being absent from class due to a religious observance are requested to inform the instructor of such absences by the second class meeting of the semester.

12. Student Absence for University-Sponsored Events and Activities

If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least two weeks prior to the date of the planned absence. At that time the instructor will set a date and time when make-up assignments will be completed.

13. Social Security and FERPA Statement

It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically.

14. Emergency Exits and Evacuation

Everyone is required to exit the building when a fire alarm goes off. Follow your instructor's directions regarding the appropriate exit. If you require assistance during an evacuation, inform your instructor in the first week of class. Do not re-enter the building unless given permission by University Police, Fire department, or Fire Prevention Services.

15. UT Tyler Resources for Students

- UT Tyler Writing Center (903.565.5995), writingcenter@uttyler.edu
- UT Tyler Tutoring Center (903.565.5964), tutoring@uttyler.edu
- The Mathematics Learning Center, RBN 4021, this is the open access computer lab for math students, with tutors on duty to assist students who are enrolled in early-career courses.
- UT Tyler Counseling Center (903.566.7254)

15. Calculator Policy

You can only use one of the calculators allowed for the FE Exam (see example list below, for up to date official list see <https://ncees.org/exams/calculator/>). No other calculator will be allowed for the final exam. You are not allowed to store any class material in the calculator during the exams.

Casio: All fx-115 models. Any Casio calculator must contain fx-115 in its model name. Examples of acceptable Casio fx-115 models include (but are not limited to):

- fx-115 MS
- fx-115 MS Plus • fx-115 MS SR • fx-115 ES
- fx-115 ES Plus

Hewlett Packard:

The HP 33s and HP 35s models, but no others.

Texas Instruments:

All TI-30X and TI-36X models. Any Texas Instruments calculator must contain either TI-30X or TI-36X in its model name. Examples of acceptable TI-30X and TI-36X models include (but are not limited to):

- TI-30Xa
- TI-30Xa SOLAR
- TI-30Xa SE
- TI-30XS Multiview
- TI-30X IIB
- TI-30X IIS
- TI-36X II, SOLAR, Pro