The University of Texas at TYLER
COLLEGE OF ENGINEERING

Department of Mechanical Engineering
Phone: +1.903.566.7003
Fax: +1.903.566.7148
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# MENG 3210 – Experimental Measurements and Techniques

## Course Syllabus

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| Semester / Year | Fall 2021 |
| Catalog Description | The course serves as an introduction to the fundamental principles of instrumentation and measurement, along with statistics, and integrates and applies what the student has learned in the math, physics, and mechanical and electrical engineering courses. The course includes a 3-hour-per-week laboratory where a student applies the material learned in the lecture. Predict, analyze, and test the performance of sensors of various kinds, using measurement equipment. Statistical analysis is integrated into the course, especially in the hands-on laboratories. Student teams will design, analyze, and document an experimental procedure. All procedures will result in a professional quality laboratory report. |
| Prerequisites | Grade C or better in:<br>- EENG 3308 Programming Language for Design<br>- ENGR 2302 Dynamics<br>- ENGR 1200 Engineering Methods or completion of a technical writing course<br>- MENG 2201 Mechanical Engineering II<br>- PHYS 2126 University Physics II Laboratory<br>- PHYS 2326 University Physics II. |
| Section number | **Lecture**: 030, 031<br>**Lab**: 031L, 032L, 033L |
| Instructor name | Ola Al-Shalash |
| Contact info | **Office:** Houston Engineering Center: **A212**<br>**E-mail:** oalshalash@uttyler.edu |
| Class Type / Location | **030**: Face-to-face / HEC B210<br>**031**: Face-to-face / HEC B210<br>**031L**: Face-to-face / HEC B222<br>**032L**: Face-to-face / HEC B222<br>**033L**: Face-to-face / HEC B222 |
| Class Time | Attend the following lecture based on myuttyler enrollment:<br>**030**: Monday 11:15 AM - 12:10 PM<br>**031**: Wednesday 11:15 AM - 12:10 PM<br><br>Attend the required lab meeting based on myuttyler enrollment: |

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| | **031L**: Thursday 2:00 PM - 4:45 PM<br>**032L**: Friday 9:05 AM - 11:50 AM<br>**033L**: Friday 2:00 AM - 4:45 PM |
| Office Hours | **Monday**: 12:30 PM – 2:15 PM<br>**Friday**: 12:30 PM – 1:45 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. |
| Optional References | 1. **Measurement and Instrumentation -Theory and Application**, Second Edition, by Alan S. Morris and Reza Langari.<br>2. **Theory and Design for Mechanical Measurements**, Fifth Edition, by Richard S. Figliola and Donald E. Beasley.<br>3. **Measurement and Instrumentation Principles**, Third Edition, by Alan S Morris. |
| Additional requirements | Handouts and manuals posted on Canvas. Software available through virtual desktop – one.uttyler.edu and IT support. |
| Evaluation Method | Grading:<br>Mid-term Exam **20** %<br>Quizzes **15** %<br>Assignments **20** %<br>Laboratory Reports **20** %<br>Project **20** %<br>Class Participation and Attendance **5** % |
| Grading Policy / Scale | Letter grades<br>Scale: **A** = > 90 – 100<br>**B** = > 80 – 89<br>**C** = > 70 – 79<br>**D** = > 60 – 69<br>**F** < 60<br><br>**Grade appeal**<br>Grades can be appealed by sending an email then meeting the instructor during office hours, but no later than three days after the grade has been posted. Moreover, students may appeal any grade reduction to the instructor if valid excuse with documentation is provided. |

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| Important events/ dates | **Census date:** September 3<br>**Last day to withdraw:** November 1<br>**Med-term Exam:** Week of October 18 |
| Attendance/ Makeup policy/<br>other rules | • Attendance is expected per university policy. Regular attendance is highly recommended. It is imperative if you want to do well in this course.<br>• Lab attendance is required. Failure in attending a lab will result in a zero grade in the corresponding lab report.<br>• Attendance will be taken and regularly checked using Canvas. Students who come to class after attendance is taken will be considered absent.<br>• In case you have to miss a class, it is your responsibility to keep up with the class work and be informed of all announcements made in the class.<br>• Students will not be permitted to leave the classroom during lectures/labs except for extreme emergencies.<br>• No email submission of assignments, HomeWorks, etc. All assignments MUST be submitted to Canvas for grading.<br>• No makeups unless students provide a university accepted excused absence with proper documentation at the discretion of the instructor.<br>• Student with SAR status should contact the UT Tyler Office of Student Accessibility and Resources for exam arrangements.<br>• Any minor violation of the Student Behavior (see below) or the Lab Safety form (see Canvas) by a student as deemed by the instructor will result in a full letter grade reduction for each incident while any major violation(s), such as cheating and plagiarism, by a student as deemed by the instructor will result in automatic failing grade in the course. |
| Course Learning Objectives / ABET & PEOs relation | **Expected Learning Outcomes**<br><br>By the end of this course, students will be able to:<br><br>1. Select and use sensors and instrumentation to report engineering measurements and to perform calculations using the corresponding governing equations. (SO1)<br>2. Interpret and analyze data, obtained from Engineering Experimentation, using statistical methods and uncertainty analysis. (SO6) |

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| | 3. Design, perform, and report results of a mechanical engineering experiment. (SO1)<br>4. Use software for data acquisition. (SO1)<br>5. Write professional quality laboratory reports. (SO6) |
| Tentative Topics | • Basic Measurements and Uncertainty<br>• Statistical Analysis<br>• Signal Conditioning<br>• Temperature<br>• Displacement<br>• Strain<br>• Self-directed laboratory investigation |
| Other | • Tentative course schedule can be found at the end of this document.<br>• Evaluation activities, Student Behavior, and other notes are listed below: |

**Evaluation activities:**

- **Exams**: there will be one exam during the semester. Late or no submission for the exam results in automatic grade of zero.

- **Quizzes**: quizzes will be pop quizzes that are assigned/ applied according to the topics covered in lectures and lab activities.

- **Assignments**: Assignment include but not limited to pre-lab draft reports, in-class activities, LabVIEW assignments and MATLAB homework. Most assignments need to be completed before each lab, in which the content may be covered. Solution to assignments might not be provided. However, students can work on the right solution by checking their work with the instructor. Student questions will be answered if the student proves that he has tried to come up with the answer. A student missing a laboratory activity by 10 minute or more (e.g. arrive at 2:10:01 pm instead of at 2:00:00 pm) will have zero in the laboratory assignment. A pre-lab draft report is required to be submitted as part of the assignments before the beginning of the intended laboratory class.

- **Class Participation and Attendance**: Attendance is expected to lecture and laboratory classes, including taking notes and participating in discussions and class activities are required while in class.

- **Lab Reports**: For each laboratory activity, a report must be submitted before the beginning of the following laboratory class for grading on Canvas, total of about 7 lab

activities. Instructions on lab report format/style and grading rubric will be given separately. In addition, each lab report should include an appendix section that shows list that shows which team member worked on what parts of the lab and how many hours spent (this apply to the project report as well). Peer Evaluation will have to be completed for couple selected lab reports if not all.

- **Project Report**: Each student, part of a group, will work on one lab project of a topic approved by the instructor. The default project will be given separately. Students working in groups must propose the concept, demonstrate the experiment, and show the results of the project and finally discuss them. Each student must also fill out a Peer Evaluation form for each report. Peer Evaluation will be used to help calculate the Peer/Instruction Evaluation grade that is added to the overall project grade and different from the group project report grade in case a concern is raised from one of the team members. Same method is used for lab report peer evaluation.

**NOTE:** Instructions on the written and oral report format/style, grading rubric and peer evaluation forms will be given separately on Canvas. Late submissions of assignments, lab 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 **20 % deduction per day** from the graded score.

**Student Behavior:**

- Academic dishonesty, in the form of cheating, fabrication, falsification, multiple submissions, plagiarism, and complicity, will not be tolerated. Regulations about academic dishonesty are contained in *A Student Guide to Conduct and Discipline at UT Tyler*, which may be obtained from the Office of Student Affairs.
- The Student Conduct and Lab Safety Form available electronically should be used to follow guidelines and will be used to assess part of Assignment grade.
- Any violation of the Student Behavior (see below) will result in grade reduction for each incident. Students may appeal the grade reduction to the instructor if valid excuse or reason can be given.
- The use of cellular phones during the class and lab **is prohibited**.
- **No food or drink** is allowed in the classroom or laboratories.
- **Student attitude:**
  - Given this is a professional, educational setting you are expected to dress and behave appropriately including wearing full pants and closed-toed shoes. A positive, mature attitude/behavior is expected from the students in all classes (lectures and laboratories). Students disturbing directly or indirectly the class or other students will be asked to leave the classroom or laboratory with the consequences associated to an absence.
  - Students are encouraged to utilize any tutoring services available if needed and come prepared to each week's class and lab. Each student is expected to work with

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the group in a professional manner. It is important to communicate clearly and professionally of any concerns or issues to the instructor or lab assistant, who will relay to the instructor if they cannot be resolved independently.

- Canvas should be the primary mode of contacting the instructor so check the Canvas announcements and discussion board to check for information about the course. In addition, university provided patriots email should be the official communication method and you should check your email regularly. Use the above email address or Canvas messaging if you want to email the instructor. Please use **MENG 3210- your section, your question or concern title** in the email subject line. Please allow the instructor at least one to two business days to respond to your email. Emails with improper language will not be answered. Emails with same concerns or questions from multiple students will be answered/covered during class time.

➢ **NOTE:** The syllabus is subject to change during the semester as deemed necessary. Students will be notified for any major changes.

**Important Covid-19 Information for Classrooms and Laboratories**

Students are expected to wear face masks covering their nose and mouth in public settings (including classrooms and laboratories). 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, digestive issues (e.g. nausea, diarrhea), or a higher than normal temperature should stay at home and are encouraged to use the UT Tyler COVID-19 Information and Procedures website to review protocols, check symptoms, and report possible exposure. 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.

**Recording of Class Sessions if applies**

If, for any reasons, class sessions are going to be recorded by the instructor, then the recording will be 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.

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## University Policies:

### 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.

### 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.

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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.

**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

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**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

**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.

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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.

**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

**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.

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**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.

**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.

**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.

**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.

**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.

**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)

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**Tentative course schedule:**

| # | Week of | Lecture Activity | Lab Activity |
|---|---|---|---|
| 1 | Aug. 23 | Course Introduction/ Syllabus/ Significant Digits | **Lab A** - MATLAB Tutorial Course |
| 2 | Aug. 30 | Measurement Systems | **Lab B** - Lab Safety |
| 3 | Sep. 6 | Monday, Sep. 6: Labor Day holiday - No Classes<br>Statistical Analysis I | **Lab C** - Report Rewrite |
| 4 | Sep. 13 | Statistical Analysis II | **Lab D** - LabVIEW |
| 5 | Sep. 20 | Uncertainty Analysis | **Lab E** - LabVIEW |
| 6 | Sep. 27 | Instrument Types | **Lab F** - LabVIEW |
| 7 | Oct. 4 | Data analysis | **Lab 1**- How to use a Digital Multimeter |
| 8 | Oct. 11 | Review for Exam | Project expectations and instructions |
| 9 | Oct. 18 | **Mid-Term Exam** | **Lab 2** - Uncertainty in Measurements |
| 10 | Oct. 25 | Dynamic Behavior of Measurement Systems | **Lab 3** - Data Analysis |
| 11 | Nov. 1 | Signal Conditioning | **Lab 4** - Signal Conditioning |
| 12 | Nov. 8 | Measuring temperature | **Lab 5** - Temperature Measurements |
| 13 | Nov. 15 | Measuring Displacement | **Lab 6** - Displacement Measurements |
| 14 | Nov. 22 | **Thanksgiving holidays – No Classes** | |
| 15 | Nov. 29 | Measuring strain | Work on Assignment/ Project |
| 16 | Dec. 6 | **Final Exam Week – Project Due** | |