

**The University of Texas at San Antonio  
Department of Mechanical Engineering  
ME 6113 Experimental Techniques in Engineering  
Syllabus**

**Course Description:**

(2-3) 3 Credit Hours.

Laboratory-based course focused on experimental testing, accounting for sources of errors, and analysis including uncertainty, graphing, and curve fitting. Modern transducers and measurement and data acquisition techniques will be discussed and utilized in the context of engineering laboratories and a course project.

**Prerequisites:**

Graduate standing and consent of instructor.

**Instructors:**

Christopher Combs, Ph.D.

Office: EB 3.04.26

E-mail: [ccombs@utsa.edu](mailto:ccombs@utsa.edu)

Office Hours: Tuesday & Thursday 9-11 AM or by appointment

Jacob M. Delimont, Ph.D.

Senior Research Engineer, Southwest Research Institute

E-mail: [jacob.delimont@swri.org](mailto:jacob.delimont@swri.org)

**Time:**

Lecture & Lab: Tuesday & Thursday 11:30 AM – 12:45 PM (CRN: 31292)

**Location:**

Lecture: UTSA – EB 3.04.66; SwRI – TBD

Labs: TBD

**Recommended textbook:**

Holman, J. P., Experimental Methods for Engineers, 8th Edition, McGraw-Hill

**Major prerequisites by topic:**

1. Differential and Integral Calculus
2. Statistics
3. Basic Instrumentation Techniques

**Topics covered:**

1. Fundamental measurement instruments and laboratory equipment
2. Basic statistics for measurements and instrumentation
3. Data presentation in charts and tables
4. Probability distributions in measurements
5. Sampling and confidence intervals
6. Regression analysis
7. Uncertainty analysis
8. Experimental measurement techniques
9. Data acquisition
10. Design of experiments
11. Advanced measurement techniques and optical diagnostics

**Grading:**

The grading will be calculated as follows:

Homework 1	4%
Homework 2	5%
Midterm Exam	15%
Lab 1	12%
Lab 2	12%
Lab 3	12%
Final Project	40%
<b>Total</b>	<b>100%</b>

A standard decade scale ( $A \geq 90\%$ ,  $B+ = 88-89.9$ ,  $B = 80-87.9\%$ ,  $C+ = 78-79.9\%$ ,  $C = 70-77.9\%$ ,  $D = 60-69.9\%$ ,  $F < 60\%$ ) will be used to assign final grades in this course. The instructors reserve the right to curve grades in a manner that will benefit students.

**Lab Assignments:**

The lab assignments are due within 10 minutes of the start of class per the dates in the schedule below. Turning in a lab assignment late will result in an immediate 20% reduction in grade. For any lab assignment turned in late, there will be a 20% penalty for each day the assignment is late, up until all possible points have been lost after one class week.

**Lab Attendance:**

Lab attendance is mandatory and failure to attend a lab without an official excused absence will result in a 10% reduction in the score for the associated assignment. Missed labs should be made up as soon as possible. Arriving more than 10 minutes late to a lab will constitute a missed lab.

**Exam Policy:**

Per the UTSA Mechanical Engineering Department's exam policy, there will be no bathroom breaks during an exam (unless a student provides a medical note). There will also be no electronic devices (phone, smart watch, camera, electronic glasses, computer, unapproved calculator, etc.) on student body (in pockets, boots, clothing, etc.) or within reach (under seat, on adjacent seat, etc.) during exams. Having an unapproved electronic device accessible during an exam will be considered cheating and handled as a case of academic dishonesty.

**Approved Calculators for Exams:**

The FE exam calculator policy ([www.ncees.org](http://www.ncees.org)) will be used for exams. Only the models listed below may be used during exams:

- Hewlett Packard – all HP 33s and HP 35s (~\$60) models
- Casio - all fx-115 (~\$17) and fx-991 (~\$18) models
- Texas Instruments - all TI-30X (~\$10) and TI-36X (~\$19) models

**Excused Absences:**

Excused absences include personal illnesses, deaths in the family, religious holidays, and UTSA sponsored activities. For illnesses, you must provide documentation (physician's statement/note, etc.) within 3 class meetings in order to be excused. Absences in observance of religious holidays are authorized only if you notify your instructor in writing (email or physical note) at least one

week in advance. UTSA sponsored events require an original signed letter on UTSA letterhead from the faculty or staff sponsor.

**Make-up Exams:**

Make-up exams will not be allowed unless previously approved by the instructor.

**Late Work:**

Late work will only be accepted if a student has an excused absence on the day an assignment is due. Students missing class on the due date of an assignment owing to a planned excused absence (religious holiday or UTSA sponsored activity) should arrange with the instructor an appropriate time to submit the assignment. If an assignment is not submitted, the grade will always be a 0.

**Lecture Attendance:**

While attendance in the lecture portion of the class is not mandatory, the student will be responsible for learning all of the material covered in the lectures.

**Extra Credit**

Any potential extra credit opportunities will be offered by the instructor to the class as a whole and will never be offered exclusively to individual students hoping to improve their grade. Solicitations by students for extra credit opportunities will not be provided with a response, given that this action would violate UTSA policy by promoting differential treatment between students.

**Scholastic Dishonesty:**

Scholastic dishonesty is a serious offense that includes, but is not limited to, copying homework, cheating on a test, plagiarism, or collusion. The Office of Student Life (458-4720) should be contacted if a student has questions about what constitutes scholastic dishonesty/  
[http://utsa.edu/studentlife/conduct/scholastic\\_dishonesty.html](http://utsa.edu/studentlife/conduct/scholastic_dishonesty.html)

While it is acceptable to look at other students' reports for the purpose of seeing the format and style, it is a violation of University policy to plagiarize (copy) text from other students' work without proper citation. Figures must also be original.

Cases of suspected scholastic dishonesty related to exams and written reports will be prosecuted through the UTSA Office of Student Life, with the recommended penalty that the student receive an "F" grade for the class.

**Blackboard:**

Some of the documents you need for this course will be posted in Blackboard. It is your responsibility to check Blackboard on a regular basis throughout the semester. I may post important messages regarding assignments, schedules, and any changes to the syllabus through in Blackboard. These messages may require a response from you. Some assignments and quizzes will be posted to Blackboard as well.

To learn how to navigate Blackboard, you can view these tutorials:

<https://www.youtube.com/playlist?list=PLontYaReEU1seUE3ACG3sEc3zR7Br7URU>

**Electronic Devices:**

Laptops and/or tablets are encouraged in class. I will show you step-by-step how to complete various assignments and we will also have activities where your electronic devices will be very useful to you. (Remember, you can borrow a laptop from the library: <https://lib.utsa.edu/services/technology-lending>).

Phones must be on silent or vibrate during class time. If you are using your device in a way that is distracting or not related to class, you may be asked to either put away the device or to leave class. Also, please do not sit in class with headphones or earbuds in your ears. This can be distracting and is considered to be unprofessional.

**Audio/Video Recording:**

Feel free to record any lectures or presentations in my class for your own personal use at UTSA. However, these recordings may not be duplicated, shared, or disseminated without the express written consent of the instructor. When at SwRI, please consult with a staff member on-site before recording any content or taking photographs.

**Course Evaluation:**

I use the feedback provided by my students in course evaluations to improve my teaching. Additionally, course evaluations are a strategy used by the university as one factor in evaluating an instructor's effectiveness. As a faculty member, I encourage you to complete the course evaluation during the availability period near the end of the semester so that I can make improvements for my next group of students.

**University Policies:**

Required university policy link: <http://teaching.utsa.edu/wp-content/uploads/2018/07/Required-University-Policies.pdf>

Roadrunner's Creed: <https://www.utsa.edu/studentlife/creed.html>

**Student Support Services:**

<http://teaching.utsa.edu/wp-content/uploads/2018/07/UTSA-Student-Support-Services.pdf>

**Responsible Employee Notice:**

The University has an obligation to maintain an environment free of sexual harassment and sexual violence, thus many University employees, including the instructor, have mandatory reporting and response obligations and may not be able to honor a complainant's request for confidentiality. Complainants who want to discuss a complaint in strict confidence may use the resources outlined in HOP Section IX.A.5, "Confidential Support and Resources" at the following link: <http://www.utsa.edu/hop/chapter9/9-24.html>

**Disclaimer:**

This syllabus is provided for informational purposes regarding anticipated course content and schedule of courses. It is based on the most recent information available on the date of its issuance and is as accurate and complete as possible. I reserve the right to make any changes necessary and/or appropriate and will make every effort to communicate any changes in a timely manner in class. Students are responsible for staying up to date on any changes to the syllabus that may occur during the term of this course.

**The University of Texas at San Antonio**  
**Department of Mechanical Engineering**  
**ME 6113 Experimental Techniques in Engineering**  
**Spring 2019 | T/R 11:30am-12:45pm**  
**Course Schedule**

*(all dates tentative, changes will be announced in class)*

<b>Class</b>	<b>Date</b>	<b>Lecture Topic</b>	<b>Location &amp; Instructor(s)</b>	<b>Assignment/ Notes</b>
1	15-Jan	Course Overview and Introduction	UTSA - Combs, Delimont	Organize Carpools
2	17-Jan	Statistics, Graphing, and Curve Fitting	UTSA - Combs	
3	22-Jan	Security Badges, SwRI Overview	SwRI - Delimont	
4	24-Jan	Errors and Uncertainty Analysis	SwRI - Delimont	
5	29-Jan	Design of Experiments	SwRI - Delimont	
6	31-Jan	Spectral Analysis	UTSA - Combs	
7	5-Feb	SwRI Lab Tours	SwRI - Delimont	
8	7-Feb	Intro. to Data Acq. & Meas. Techniques	SwRI - Delimont	Homework 1 Due
9	12-Feb	Force, Torque, Strain, Disp., & Vibration Meas.	UTSA - Combs	
10	14-Feb	Interferometric Techniques	UTSA - Combs	
11	19-Feb	Schlieren Lab #1 - Part 1	UTSA (EB 1.04.26) - Combs	
12	21-Feb	Schlieren Lab #1 - Part 2	UTSA (EB 1.04.26) - Combs	
<b>13</b>	<b>26-Feb</b>	<b>Midterm Exam</b>	<b>UTSA - Combs</b>	
14	28-Feb	Laser Diagnostics	UTSA - Combs	Homework 2 Due
15	5-Mar	Materials Testing Lab #2 - Part 1	UTSA - Combs	Lab #1 Report Due
16	7-Mar	Materials Testing Lab #2 - Part 2	UTSA - Combs	Team Project Proposal Due
17	12-Mar	<i>Spring Break</i>	<i>No Class</i>	
20	14-Mar	<i>Spring Break</i>	<i>No Class</i>	
21	19-Mar	Modal Analysis Lab #3 - Part 1	SwRI - Delimont	
22	21-Mar	Modal Analysis Lab #3 - Part 2	SwRI - Delimont	Lab #2 Report Due
23	26-Mar	<i>Team Project</i>	<i>No Class</i>	
24	28-Mar	<i>Team Project</i>	<i>No Class</i>	
25	2-Apr	<i>Team Project</i>	<i>No Class</i>	
<b>26</b>	<b>4-Apr</b>	<b>Team Project Update Presentations</b>	<b>SwRI - Combs, Delimont</b>	Lab #3 Report Due
27	9-Apr	<i>Team Project</i>	<i>No Class</i>	
28	11-Apr	<i>Team Project</i>	<i>No Class</i>	
29	16-Apr	<i>Team Project</i>	<i>No Class</i>	
30	18-Apr	<i>Team Project</i>	<i>No Class</i>	
31	23-Apr	<i>Team Project</i>	<i>No Class</i>	
32	25-Apr	<i>Team Project</i>	<i>No Class</i>	
<b>33</b>	<b>30-Apr</b>	<b>Team Final Presentations</b>	<b>UTSA - Combs, Delimont</b>	
<b>34</b>	<b>2-May</b>	<b>Team Final Presentations</b>	<b>UTSA - Combs, Delimont</b>	