ME3057 Syllabus

Experimental Methodology, 3 Credits, Fall 2026

Instructor Information

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Course Description

This course provides a hands-on introduction to experimental methods in mechanical emphasizing experimentation, data analysis, engineering judgment, and technical communication. Students investigate the fundamental components and principles of mechanical measurement systems through a series of laboratory experiments. Topics include instruments, sensors, transducers, signal conditioning, electrical circuits, actuators, feedback control systems, and data acquisition. Measurement techniques address temperature, strain, force, pressure, position, velocity, acceleration, fluid flow, acoustics, and vibration.

Students develop practical skills in workplace safety, experimental procedures, calibration, measurement uncertainty, error propagation, design of experiments, sampling, data acquisition, data analysis, and technical communication. First-order uncertainty analysis is used to evaluate experimental results, and empirical findings are compared with established engineering principles and theoretical predictions.

Laboratory activities are organized into a series of experimental test stands, or “blocks,” that students complete in small groups during weekly laboratory sessions. Each block provides an opportunity to plan and conduct experiments, acquire and analyze data, evaluate measurement uncertainty, and communicate results through a written laboratory report. Through this iterative, hands-on experience, students develop the experimental skills and engineering judgment needed to design, conduct, and interpret mechanical engineering experiments.

Pre- &/or Co-Requisites

Prereq: ME2016, ME2110, MATH2551, COE3001(co-req)

Course Learning Outcomes

Upon successful completion of this course, students should be able to:

1. Conduct engineering experiments safely and effectively using standard experimental methods and procedures.
2. Configure and use engineering measurement and data acquisition systems, including sensors, instruments, electrical circuits, and sampling systems.
3. Analyze experimental data using appropriate statistical methods and evaluate measurement error, uncertainty, and dynamic response.
4. Design and execute an engineering test plan, including selection of appropriate equipment, development of test procedures, collection and analysis of data, and evaluation of test results.
5. Communicate experimental methods, analysis, results, and conclusions effectively through technical reports and other engineering documentation.
6. Work effectively in teams to plan and conduct experiments, analyze results, and address engineering problems while considering relevant economic, environmental, and social impacts.

Webb Communication Instructor

Jill Noel Fennell, Ph.D. (Communications Co-Instructor)
Frank K. Webb Academic Professional Chair in Communication Skills,
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ME3057 is part of the Webb Communication Program which provides communication training & support at all educational levels within the Woodruff School. The Program aligns with the Woodruff School's mission by equipping engineers to effectively communicate solutions and their social implications, driving action, and change to address society's most pressing challenges. A tenet of the program is, "The technical communicator's job is to transfer information to their audience with the smallest cognitive load while still being trustworthy and actionable." The program's mission is to equip engineers with the ability to: 1) determine trustworthiness and actionability of information, 2) balance cognitive load with content clarity, 3) discern usable information from extraneous data, and 4) leverage genre expectations to tailor communication.

Labs Sequence (3057 & 3058) Communication Learning Objectives

By the end of this two-course lab sequence, students will be able to:

1. **Communicate Experimental Rationale and Methodology**
   1.1. Justify experimental design decisions, including selection of methods, instrumentation, and procedures.
   1.2. Critique and articulate how procedural choices shape data quality and relevance.
2. **Curate and Present Results for Decision-Making**
   2.1. Prioritize and distill decision-relevant findings from raw and intermediate data while balancing quantitative and qualitative framing tailored to the client's needs.
   2.2. Discern the ideal visual for data presentation, including knowing how to leverage tables and different kinds of figures.
3. **Integrate Technical Validity with Usable Communication**
   3.1. Synthesize and frame findings in ways that establish **trustworthiness** (through rigor, error analysis, and limitations) while also emphasizing **usability** (clear visuals, decisive claims, actionable conclusions).
4. **Translate Experimental Findings into Engineering Judgment**
   4.1. Show how results inform engineering decision options, trade-offs, or next steps, rather than treating communication as a passive report.
   4.2. Evaluate and qualify recommendations considering uncertainty and error propagation.
5. **Adapt Communication to Stakeholders and Genres**
   5.1. Analyze and anticipate audience needs, specifically for the professional role of an engineering product owner and forecast how the users of the report will want to be able to use the new information.
   5.2. Analyze engineering genres for decision-making information, specifically emails, memos, statements of work, product manuals, and test procedure specifications and evaluate how these genres reflect different needs at different moments in the work-process timeline.
   5.3. Apply and adapt conventions of professional engineering genres, including executive summaries and proposals.
6. **Collaborate on Team-Based Communication**
   6.1. Contribute, coordinate, and integrate to team-authored reports through planning, drafting, and editing processes.
   6.2. Evaluate peers' work and propose actionable, future-oriented recommendations for success.

Course Information

Course Materials

- Canvas course website includes relevant course instructional materials
- Recommended Textbook: Theory & Design for Mechanical Measurements, Figliola & Beasley, 7th ed, Wiley (e-text ISBN 9781119475651 or ISBN: 9781119723455)
- Recommended Notebook: SCNO Laboratory Notebook 9.25×11.25×0.75

Grading Policy

The grading process and scoring methods will be clearly stated, allowing students to reasonably understand expectations, assessment criteria, and progress towards final grades throughout the semester. Grading rubrics based on stated assessment criteria will be used and written feedback will be provided with graded material. Requests may be made within 1 week of grading to review feedback with instructors.

Graded Breakdown

Attendance, Participation & Peer Evaluation		10%
Homework Assignments		10%
Lab Reports: Blocks 1-5		70%
Test Engineering Project		10%
	Total:	**100%**

Grading Scale

A=90-100; B=80-89.95; C=70-79.95; D=60-69.95; F<59.5

General Grading Criteria

Technical writing grading criteria:

1. Criteria 1 – follows the Burdell Inc. Style Guide
2. Criteria 2 – writing uses appropriate voice and point of view
3. Criteria 3 - includes appropriate abstract, summary or introduction
4. Criteria 4 - clearly states objectives
5. Criteria 5 - includes relevant background
6. Criteria 6 - emphasizes test methods, procedures, and approaches
7. Criteria 7 - discusses results in appropriate detail
8. Criteria 8 - documents test and environment conditions

9. Criteria 9 - emphasizes quality of results, error, and uncertainty
10. Criteria 10 - includes relevant data in the form of tables and graphs
11. Criteria 11 – includes appropriate tables and graphs w/ labels and formatting
12. Criteria 12 - tables and graphs cited and discussed in text
13. Criteria 13 - emphasizes conclusions
14. Criteria 14 - includes references for cited prior works and outside data sources
15. Criteria 15 - includes professionally formatted equations
16. Criteria 16 - uses appropriate significant figures

Critical thinking and analysis intellectual standard grading criteria:

17. Criteria 17 - Clarity - Understandable, the meaning can be grasped
18. Criteria 18 - Accuracy - True, Free from errors or distortions
19. Criteria 19 - Precision - Exact to the necessary level of detail
20. Criteria 20 - Relevance - Relating to the matter at hand
21. Criteria 21 - Depth - Containing complexities and multiple interrelationships
22. Criteria 22 - Breadth - Encompassing multiple viewpoints
23. Criteria 23 - Logic - The parts make sense together, no contradictions
24. Criteria 24 - Significance - Focusing on the important, not trivial
25. Criteria 25 - Fairness - Justifiable, not self-serving or one-sided

Overall communication assessment grading criteria:

26. Criteria 26 – Trustworthiness – Can this audience evaluate and believe your work?
27. Criteria 27 – Actionability – Can this audience use this information for its intended purpose?
28. Criteria 28 – Intuitiveness – Can the audience understand and use it without unnecessary effort?
29. Criteria 29 - Genre Use – Does the deliverable work the way the audience expects this kind of communication to work?

Lab Schedule

Lab Week	Date	Topic		Lab Week	Date	Topic
No Lab	Monday, August 24, 2026	No Lab		Lab 7	Monday, October 19, 2026	Block 4: Analytical Models - Vibrations 1
	Tuesday, August 25, 2026	No Lab			Tuesday, October 20, 2026	Block 4: Analytical Models - Vibrations 1
	Wednesday, August 26, 2026	No Lab			Wednesday, October 21, 2026	Block 4: Analytical Models - Vibrations 1
	Thursday, August 27, 2026	No Lab			Thursday, October 22, 2026	Block 4: Analytical Models - Vibrations 1
	Friday, August 28, 2026	No Lab			Friday, October 23, 2026	Block 4: Analytical Models - Vibrations 1
Lab 1	Monday, August 31, 2026	Lab Block Demos & Workplace Safety		Lab 8	Monday, October 26, 2026	Block 4: Analytical Models - Vibrations 2
	Tuesday, September 1, 2026	Lab Block Demos & Workplace Safety			Tuesday, October 27, 2026	Block 4: Analytical Models - Vibrations 2
	Wednesday, September 2, 2026	Lab Block Demos & Workplace Safety			Wednesday, October 28, 2026	Block 4: Analytical Models - Vibrations 2
	Thursday, September 3, 2026	Lab Block Demos & Workplace Safety			Thursday, October 29, 2026	Block 4: Analytical Models - Vibrations 2
	Friday, September 4, 2026	Lab Block Demos & Workplace Safety			Friday, October 30, 2026	Block 4: Analytical Models - Vibrations 2
	Monday, September 7, 2026	Labor Day		Lab 9	Monday, November 2, 2026	Block 5: Sys Analysis - MassSpringDamper 1
Lab 2	Tuesday, September 8, 2026	Open Lab: Test Plans & Risk Assessment			Tuesday, November 3, 2026	Block 5: Sys Analysis - MassSpringDamper 1
	Wednesday, September 9, 2026	Open Lab: Test Plans & Risk Assessment			Wednesday, November 4, 2026	Block 5: Sys Analysis - MassSpringDamper 1
	Thursday, September 10, 2026	Open Lab: Test Plans & Risk Assessment			Thursday, November 5, 2026	Block 5: Sys Analysis - MassSpringDamper 1
	Friday, September 11, 2026	Open Lab: Test Plans & Risk Assessment			Friday, November 6, 2026	Block 5: Sys Analysis - MassSpringDamper 1
Lab 3	Monday, September 14, 2026	Block 1: Signals & DAQ Lab / Elvis III		Lab 10	Monday, November 9, 2026	Block 5: Sys Analysis - MassSpringDamper 2
	Tuesday, September 15, 2026	Block 1: Signals & DAQ Lab / Elvis III			Tuesday, November 10, 2026	Block 5: Sys Analysis - MassSpringDamper 2
	Wednesday, September 16, 2026	Block 1: Signals & DAQ Lab / Elvis III			Wednesday, November 11, 2026	Block 5: Sys Analysis - MassSpringDamper 2
	Thursday, September 17, 2026	Block 1: Signals & DAQ Lab / Elvis III			Thursday, November 12, 2026	Block 5: Sys Analysis - MassSpringDamper 2
	Friday, September 18, 2026	Block 1: Signals & DAQ Lab / Elvis III			Friday, November 13, 2026	Block 5: Sys Analysis - MassSpringDamper 2
Lab 4	Monday, September 21, 2026	Block 2: Acoustics or Temperature		Lab 11	Monday, November 16, 2026	Block 6: Test Engineering Project 1
	Tuesday, September 22, 2026	Block 2: Acoustics or Temperature			Tuesday, November 17, 2026	Block 6: Test Engineering Project 1
	Wednesday, September 23, 2026	Block 2: Acoustics or Temperature			Wednesday, November 18, 2026	Block 6: Test Engineering Project 1
	Thursday, September 24, 2026	Block 2: Acoustics or Temperature			Thursday, November 19, 2026	Block 6: Test Engineering Project 1
	Friday, September 25, 2026	Block 2: Acoustics or Temperature			Friday, November 20, 2026	Block 6: Test Engineering Project 1
Lab 5	Monday, September 28, 2026	Block 3: Cal/Uncertainty-Tensile Test 1		No Lab	Monday, November 23, 2026	No Lab
	Tuesday, September 29, 2026	Block 3: Cal/Uncertainty-Tensile Test 1			Tuesday, November 24, 2026	No Lab
	Wednesday, September 30, 2026	Block 3: Cal/Uncertainty-Tensile Test 1			Wednesday, November 25, 2026	No Lab
	Thursday, October 1, 2026	Block 3: Cal/Uncertainty-Tensile Test 1			Thursday, November 26, 2026	Thanksgiving Day
	Friday, October 2, 2026	Block 3: Cal/Uncertainty-Tensile Test 1			Friday, November 27, 2026	No Lab
No Lab	Monday, October 5, 2026	Ga Tech Fall Break		Lab 12	Monday, November 30, 2026	Block 6: Test Engineering Project 2
	Tuesday, October 6, 2026	Ga Tech Fall Break			Tuesday, December 1, 2026	Block 6: Test Engineering Project 2
	Wednesday, October 7, 2026	No Labs			Wednesday, December 2, 2026	Block 6: Test Engineering Project 2
	Thursday, October 8, 2026	No Labs			Thursday, December 3, 2026	Block 6: Test Engineering Project 2
	Friday, October 9, 2026	No Labs			Friday, December 4, 2026	Block 6: Test Engineering Project 2
Lab 6	Monday, October 12, 2026	Block 3: Calibr./Uncertainty - Tensile Test 2		No Lab	Monday, December 7, 2026	Final Instruction Day
	Tuesday, October 13, 2026	Block 3: Calibr./Uncertainty - Tensile Test 2			Tuesday, December 8, 2026	Reading Days
	Wednesday, October 14, 2026	Block 3: Calibr./Uncertainty - Tensile Test 2			Wednesday, December 9, 2026	
	Thursday, October 15, 2026	Block 3: Calibr./Uncertainty - Tensile Test 2			Thursday, December 10, 2026	
	Friday, October 16, 2026	Block 3: Calibr./Uncertainty - Tensile Test 2			Friday, December 11, 2026	
					Monday, December 14, 2026	Final Project Due

The official course schedule posted in Canvas. The schedule is subject to change with reasonable notice and class consensus.

Course Policies

Safety Policy

Safety is the top priority in this hands-on laboratory course. Students must abide by Georgia Tech laboratory safety rules and procedures. Unsafe behavior may result in dismissal from the lab and loss of credit for work missed. Students should complete a brief risk assessment for each lab activity following the CDC hierarchy of controls and RAMP method -- Recognize risks, Assess hazards, Minimize/mitigate risks, Prepare for emergencies. Students should always wear safety glasses and wear closed toe shoes in

the laboratory. Injuries and safety incidents must be reported. Further safety rules will be communicated in the lab or by Canvas announcement.

> *This course emphasizes the principles of the NIOSH "Safety Matters" workplace safety educational program. We acknowledge that all workers can be injured, become sick, or even be killed on the job. We further recognize that work-related injuries and illnesses are predictable and can be prevented. Workers should know how to identify hazards at work and predict how workers can be injured or made sick. Workers should also know how to prevent injury and illness, how to identify emergencies at work, and decide on the best ways to address them. We acknowledge that workers have the right to a safe and healthy workplace and that employers are responsible for safe and healthy work. Workers must know how to find resources that help keep all workers safe and healthy on the job. Workers should know how they can communicate with others—including people in authority—when they feel unsafe or threatened.*

Attendance Policy

Attendance and participation are mandatory for all labs during the officially scheduled period. Lab deliverables will not be accepted without participation in the lab. Attendance may be mandatory for certain workshop lecture periods, and highly recommended for general lectures. Students should arrive at least 5 minutes early for scheduled lab sessions. All lab documents should be read before the scheduled lab period. Teaching Assistants will be in the laboratory during lab sections to help answer questions.

Requests to reschedule lab sessions due to official institute excused absences must be arranged with the Professor at least one week in advance of the absence. Rescheduling will require notification/verification from the Office of the Registrar. Students who miss a lab due to illness or family emergency must arrange to reschedule with the Professor. Notices must be given as soon as possible. Verification from the Office of the Dean of Students will be required to get credit. The same applies if an assignment extension is needed. Do not send doctors notes to Instructors or TAs; these should be provided to the Dean of Students Office. The Georgia Tech course attendance policy and process for requesting excused absences may be found here:
https://studentlife.gatech.edu/resources/class-attendance

Group Work

Groups are assigned by the instructor and may change during the semester. All team members must contribute. If you experience undue difficulty with team members, notify the instructor well in advance of a deliverable due date. Poor group dynamics can result in

requiring individual reports from certain members, the entire team, or elevation of the issue beyond course leadership. Individuals who fail to contribute to the lab work, to the post-lab analysis, or to the deliverables may be penalized, and in some circumstances may receive a zero for an assignment to which they failed to contribute. Lab reports are group assignments, though each group member must submit the report separately via Canvas with the completed honor code agreement as a cover page. Generally, homework assignments (including Outlines) are individual assignments unless otherwise directed.

Peer Evaluations

Each group member is required to submit a Peer Evaluation for each group report. These are typically due 24-48 hours after the associated assignment. They should sufficiently convey the contribution of each team member in all aspects of the lab and report preparation in a paragraph. Peer evaluations are graded according to the quality of the evaluation provided for each team member. The contents of peer evaluations written about a student are referenced when determining the student's participation grade and may be used for grade arbitration and/or to justify a reduced assignment grade for a student who has failed to contribute sufficiently to the group's work. A student who consistently receives poor peer evaluation scores/participation may be asked to complete lab deliverables individually.

Assignment Preparation and Submission

All deliverables (reports, outlines, homework, etc.) must be typed and turned in via Canvas as PDF files. Figures are recommended to be produced using Matlab or Excel. Code and data may be submitted as a .zip file separate from the PDF file (2 files per assignment submission). Data sets may be submitted as a .mat file and scripts/functions as .m files (within the zip) which can be executed directly to display your results/figures. Include a "readme.txt" if guidance is recommended to know which files to execute. Generally, it is not recommended to include code or data sets in the final executive report, but students may use discretion with inclusion of relevant information.

Late Policy

Assignment due dates are based on official enrollment sections. Late work is penalized by 10 points per day, for up to 5 days. Assignments more than 5 days late will not be accepted. Late status starts immediately after the due date & time (5 minutes late = 1 day late = 10 point penalty). Late submissions are not allowed for the final project. Missing work due to illness or excused absence should promptly be coordinated with the professor. Heavy academic workload, focusing on other classes and generally being too busy are not valid excuses for late work.

Communications Policy

Email is the primary method of communicating with the professor. Students are responsible for all announcements and communications whether sent via Canvas, MS Teams, or E-Mail. It is recommended keeping notifications enabled for both Canvas Announcements and MS Teams Channel Mentions. Course materials including, but not limited to, laboratory manuals, laboratory resources, homework, lecture notes, and lecture videos are copyrighted by the Georgia Institute of Technology (GT) and are for GT student instructional use only. They may not be distributed outside of normal course usage.

Course Success

In order to succeed in this course, students should: follow safety guidelines, attend lab and lecture as scheduled, participate in all lab activities, read the textbook, attend office hours when needed, communicate with the TA/instructors, stay on schedule, take notes in a laboratory notebook, complete assignments on time, use tools and test equipment, obtain equipment specifications, think critically, and be familiar with the Canvas site.

Instructional Authority

Final responsibility and authority for grading and policy interpretation resides with the primary faculty professor. The communication co-instructor provides support and guidance for communication. Graduate Teaching Assistants instruct and grade, but do not have the authority to change course policy without primary instructor approval.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

In this course, it is an academic integrity violation to use data for an experiment that a student did not fully participate in. Students may not copy data from other groups. In extreme cases, instructors may make exceptions to this policy by special request. Sources of all data and information should be acknowledged.

Responsible AI Use Policy

This course encourages responsible use of AI tools to enhance innovation and problem-solving while maintaining academic integrity, critical thinking, and ethical practices. AI should support—not replace—individual effort and understanding. Since this is a communication-focused course, all reports, writing and analysis must ultimately be self-authored and cannot be AI-generated. Copy-pasting AI output is discouraged.

Permitted Uses of AI

AI tools may assist with:

- Brainstorming problems and solutions
- Interpreting assignments to help plan work
- Research & planning tests, safety protocols, and risk assessments
- Coding: Writing, debugging, and optimizing code
- Design: Creating models, simulations, and diagrams
- Documentation: Formatting and organizing reports, proofreading work

Critical Thinking & AI

Students must critically evaluate AI-generated content by:

- Reflecting on how AI was used and its contribution
- Identifying and addressing AI limitations
- Justifying the acceptance or modification of AI outputs

AI Transparency

Students must declare AI use with citations:

- State how AI was used (e.g., "I used [AI Tool] to assist with [specific task]").
- Cite AI tools used including the name and version (e.g. ChatGPT v4.0)

AI Academic Integrity

Violations include failing to declare AI use, submitting unacknowledged AI-generated content, and using AI as a sole source without personal input. Penalties will follow university integrity policies, including grade reductions or resubmissions.

AI Collaboration

Students are encouraged to seek peer and instructor review to evaluate AI-assisted work and ensure appropriate and ethical AI use. This policy reflects ethical engineering standards and prepares students for AI use in their careers.

Institute Policies

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Undergraduate Student Academic Success Resources:

A list of resources for undergraduate students' academic success and information about advising can be found at Success at Tech. Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit success.gatech.edu/tutoring, email tutoring@gatech.edu, or visit Clough Undergraduate Learning Commons, Suite 283.

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being (student-resource-guide (gatech.edu)