

MEEN 3240 | Mechanical and Energy Engineering Laboratory I**Course Syllabus**

Fall 2026 • Full Term: August 17 - December 11, 2026

Course at a Glance

Instructor: Chakra Chand	Office: NTDP F180 Office Hours: By Appointment
Email: chakra.chand@unt.edu	Lecture Section: MEEN 3240-002 (5785)
Lecture: Friday 9:40 AM - 10:30 AM NTDP K110	Lab TA: Emme Arnold Emme.Arnold@unt.edu

Laboratory Sessions • NTDP F158

Section	Day	Time	Location
MEEN 3240-304 (2423)	Thursday	3:30 PM - 6:20 PM	NTDP F158
MEEN 3240-306 (5786)	Tuesday	10:40 AM - 1:30 PM	NTDP F158
MEEN 3240-307 (5787)	Friday	3:30 PM - 6:20 PM	NTDP F158

*Note: Laboratory attendance is mandatory. The detailed weekly schedule is provided on the final page.***Required Course Material & Reference****Required course material:** Lab Manual, required lab report template, experiment-specific instructions, sample lab reports, and PPT slides posted to Canvas as the course progresses.**Reference textbook:** J. P. Holman, Experimental Methods for Engineers, 8th ed. (or 7th ed.), ISBN 978-0-07-352930-1.**Course Description**

This course is tailored for third-year Mechanical and Energy Engineering students to develop fundamental experimental skills in thermal-fluid sciences. It provides hands-on training in engineering measurements, data acquisition, system analysis, uncertainty, safety, and technical reporting.

- Measurement techniques and uncertainty analysis
- Thermodynamic and heat transfer systems
- Fluid mechanics and viscosity measurements
- Instrumentation and data acquisition
- Calorimetry and refrigeration cycles
- HVAC system performance analysis
- Student-designed experimental projects

Pre-requisites: MEEN 2210 - Thermodynamics I; MATH 3410 - Differential Equations I; MEEN 2110 - Engineering Data Analysis

Course Learning Outcomes & ABET EAC Student Outcomes

MEEN 3240 Course Learning Outcomes	ABET EAC Student Outcomes						
Outcome	1	2	3	4	5	6	7
Demonstrate ability to perform statistical error analysis of experimental data.	X					X	
Demonstrate understanding measurements of transport properties.	X					X	
Demonstrate understanding of temperature measurements.	X					X	
Demonstrate understanding basic electrical measurement.	X					X	
Demonstrate ability to design and conduct mechanical engineering experiments.	X					X	
Demonstrate understanding of concepts of the First Law of Thermodynamics.	X					X	
Demonstrate understanding fundamentals of energy and power estimation for both solar and wind.	X					X	
Demonstrate ability to present and report scientific data.	X		X	X	X	X	
Demonstrate ability to control thermal science experiments.						X	

Note: ABET EAC Student Outcomes 1-7 correspond to the student outcomes adopted by the program. An "X" indicates the ABET outcome(s) supported by each MEEN 3240 course learning outcome.

Grading

Assessment Weights

Assessment	Weight
Lab Reports (9)	45%
Lecture Attendance	10%
Midterm (Lectures 1-4 and Experiments 1-4)	20%
Final Exam (Lectures 5-9 and Experiments 5-9)	20%
Lab 10 - Student-Designed Experiment	5%
Total	100%

Course Grade Scale

Letter Grade	Range
A	≥ 90%
B	80 - 89.9%
C	70 - 79.9%
D	60 - 69.9%
F	< 60%

Lab Report Submission & Individual Work Policy

Most experiments are performed in groups, although some activities may be completed individually. Regardless of how the experiment is performed, each student must submit an individual PDF lab report through Canvas. The report must represent the student's own technical writing, calculations, analysis, figures/tables, post-lab responses, and conclusions.

- Group members may use common raw data collected together, but each submitted report must be independently prepared.
- The required report template must be followed for every submission. A sample lab report may be posted for each laboratory as a reference for expected organization and quality; sample reports are guidance only and must not be copied.
- Reports are normally due about one week after the laboratory session at the deadline shown in Canvas. Late reports are not accepted except for approved accommodation or authorized/excused absences.
- For an authorized/excused laboratory absence, the instructor will determine the appropriate make-up arrangement based on the circumstances, laboratory schedule, and availability. When feasible, the student will be required to attend another MEEN 3240 laboratory section performing the same experiment. If attending another section is not feasible, the instructor may provide an approved raw-data set so the student can complete the required analysis and individual lab report. When instructor-provided data are used, they satisfy the signed raw-data requirement for that excused absence. Students should contact the instructor as soon as possible regarding the absence and make-up arrangement.

Lab Report Requirements - Required for Every Submission

Requirement	Expectation
Figures & Apparatus	Use clear, readable, properly sized images. Do not stretch images. Include all major apparatus/materials used and provide a caption for every figure.
Signed Raw Data	Include a photograph or scan of the raw data recorded during the experiment. The raw data must be signed by the TA/TF during or immediately after the lab session.
Sample Calculations	Show at least one complete sample calculation for each distinct type of analysis so the calculation process can be verified.
Post-Lab Questions	Include every post-lab question from the lab manual. Write each question first and place the answer directly below it, in the same order as the manual.
Results	Present analyzed results clearly using appropriate tables and/or graphs. Figures and tables must be readable and properly labeled.
Conclusion	State the experiment objective, key results/trends, whether the results support the relevant theory, and important errors/sources of uncertainty and their effect on the results.
Participation Photo	Include a selfie/participation photo of yourself with the experimental apparatus used for that laboratory clearly visible in the background. This is required for participation verification.
Quality Standard	Grading is based on quality, correctness, completeness, organization, and technical clarity - not simply report length.

Lab Report Grading Rubric - 100 Points

Rubric Criterion	Points
Formatting - labeling of tables, figures, and equations	3
Formatting - consistency throughout report	2
Apparatus - all apparatus used are presented	5
Raw data - clearly presented and signed by TA/TF	10
Sample calculations - steps shown; at least one for each distinct analysis	15
Post-lab questions - all answered/discussed properly	35
Results - analysis presented clearly using tables and/or graphs	15
Conclusion - major outcomes and results discussed; Conclusion appropriately drawn from results	10
Lab attendance/participation photo with apparatus	5

Lab 10 - Student-Designed Experiment

Lab 10 is worth 5% of the total course grade. Students will design and execute a simple, safe engineering experiment and collect, analyze, and interpret their own data.

- Work may be completed individually or in a group of up to three students; each student must submit an individual report reflecting their own analysis, calculations, and conclusions.
- Only equipment and materials previously used in the course may be used. Outside equipment or new materials are not permitted. Proposed experiments must be safe, feasible, and approved.
- Before the lab, decide on group members (if any), identify a simple experimental objective/question, and identify measurable variables.
- If no experiment idea is proposed, the default activity will be fabrication, calibration, testing, and validation of a thermocouple sensor calibration equation.
- The report must include a cover page, introduction/question or hypothesis, methodology with equipment pictures and procedure, raw data and calculations, results, conclusion, and participation photo.

- The Lab 10 report will be graded using the same 100-point Lab Report Grading Rubric shown in this syllabus. The resulting Lab 10 score contributes 5% of the final course grade.

Laboratory Safety & Emergency Procedures

- Safety and feasibility take priority in all laboratory activities. Follow the instructor/TA directions, posted laboratory rules, lab manuals, and experiment-specific safety instructions at all times.
- Do not operate equipment, modify a setup, or energize a system unless you have been instructed and authorized to do so. Immediately report damaged equipment, leaks, spills, injuries, or unsafe conditions to the instructor/TA.
- Use required personal protective equipment and safety controls identified for the specific experiment. If you are uncertain about a procedure, stop and ask before proceeding.
- UNT uses Eagle Alert for critical emergency notifications. In an emergency or university closure, follow official UNT instructions and check Canvas for course-specific updates.

Attendance & Authorized Absences

Lecture attendance: Attendance is required and constitutes 10% of the final course grade. **Each scheduled lecture carries equal weight** within that 10%. Attendance will be recorded in Canvas. Attendance may be taken at the **beginning, middle, or end** of the lecture. Students are expected to attend the **full lecture period**.

Laboratory attendance: Lab attendance is mandatory. Students may not attend another laboratory section without prior instructor approval. A student who misses a laboratory session without an authorized/excused absence will receive a zero for the associated lab report. For an authorized/excused absence, the make-up arrangement will follow the procedure described in the Lab Report Submission & Individual Work Policy: the student may be required to attend another section performing the same experiment, or the instructor may provide approved raw data when a section make-up is not feasible.

Attendance verification: Students must sign the attendance sheet individually and include the required selfie/participation photo in the lab report, with the apparatus used for that laboratory clearly visible in the background.

Exam Policy

- All exams are closed book and closed notes unless otherwise announced in writing.
- A standardized formula sheet will be provided with the exam. It will contain selected equations, relationships, property information, and constants needed for the covered material; students may not use a personal formula sheet unless specifically authorized.
- The midterm and final exam will be administered during the regular Friday lecture class on the dates listed in the Schedule Overview.
- Exam format: Each exam is designed for the 50-minute lecture period and is graded out of 100 points. The format follows the course exam model provided in Canvas: conceptual or multiple-choice questions, and quantitative engineering calculations based on lecture and laboratory material. Students must show the required calculation steps and supporting work to receive full credit.
- No make-up exam will be given except when an authorized absence, approved accommodation, or applicable UNT policy requires an alternate arrangement.

Calculator Policy

Calculators are allowed for homework and quizzes. For course exams, only calculator models currently permitted by NCEES for the FE/PE examinations will be accepted. The approved families used in this course are listed below.

Manufacturer	Approved Models
Casio	All fx-115 and fx-991 models (model name must include fx-115 or fx-991).
Hewlett Packard	HP 33s and HP 35s models only.
Texas Instruments	All TI-30X and TI-36X models (model name must include TI-30X or TI-36X).

Disability Accommodations

The University of North Texas provides reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Access (ODA) to verify eligibility and request an accommodation letter. After the instructor receives the ODA letter, the student and instructor should communicate privately and promptly about implementing the approved accommodations in this course.

Academic Integrity, AI Use & Independent Work

Academic misconduct will be handled in accordance with UNT Policy 06.003 and applicable university procedures. Unauthorized copying, fabrication or alteration of data, use of another student's analysis, or submission of work that is not your own may result in academic penalties and referral through the university process.

- For lab reports, group data collection does not make the written report a group assignment. Each student must independently prepare the report.
- Sample lab reports are provided only to demonstrate expected organization and quality. Copying wording, calculations, plots, analysis, or answers from a sample or another student is not permitted.
- Generative AI may be used for limited **spelling, grammar, and clarity assistance** unless you authorize something else.
- AI cannot generate or replace **calculations, data analysis, graphs/plots, post-lab answers, conclusions, or other technical content** submitted for credit.
- Students are responsible for everything they submit and must be able to explain their work.

Canvas & Course Communication

- The syllabus, lecture materials, lab manuals/templates, sample lab reports, announcements, and course updates will be posted in Canvas. Sample reports are provided only as references for format, organization, and expected quality.
- Course announcements and grades will be maintained in the Lecture Class area/module on Canvas.
- Students should check Canvas regularly for laboratory instructions, due dates, schedule changes, grades, and other updates.

Week	Dates	Lecture Topics	Lab Session / Activity	Reports Due
W1	Aug. 17-21	Overview of Syllabus and Safety Rules	NO Lab Sessions	—
W2	Aug. 24-28	Lecture 1: Measurement & Uncertainty	NO Lab Sessions	—
W3	Aug. 31-Sep. 4	Lecture 2: Measurement of Air Viscosity and Liquid Viscosity	Experiment #1: Measuring Density of THREE Different Objects	—
W4	Sep. 7-11	Lecture 3: Measurement of Liquid Viscosity	Experiment #2: Measurement of Air Viscosity	Exp. #1
W5	Sep. 14-18	Lecture 4: Thermocouple Construction and Calibration	Experiment #3: Measurement of Liquid Viscosity Using Different Viscometers	Exp. #2
W6	Sep. 21-25	Review Lecture: Midterm Exam Review	Experiment #4: Thermocouple Construction and Calibration	Exp. #3
W7	Sep. 28-Oct. 2	Midterm Exam (Lectures 1-4 and Experiments 1-4)	NO Lab Sessions	—
W8	Oct. 5-9	Lecture 5: Measurement of the Specific Heat of Different Metals	NO Lab Sessions	—
W9	Oct. 12-16	Lecture 6: Measurement of the Latent Heat of Ice	Experiment #5: Measurement of the Specific Heat of Different Metals	Exp. #4
W10	Oct. 19-23	Lecture 7: Rankine Cycle	Experiment #6: Measurement of the Latent Heat of Ice	Exp. #5
W11	Oct. 26-30	Lecture 8: Refrigeration Cycle	Experiment #7: Rankine Cycle	Exp. #6
W12	Nov. 2-6	Lecture 9: HVAC System	Experiment #8: Refrigeration Cycle	Exp. #7
W13	Nov. 9-13	Final Exam Review / Course Review	Experiment #9: HVAC System	Exp. #8
W14	Nov. 16-20	Final Exam (Lectures 5-9 and Experiments 5-9)	NO Lab Sessions	—
W15	Nov. 23-27	Thanksgiving Break - UNT Closed	NO Lab Sessions	—
W16	Nov. 30-Dec. 4	No Friday lecture (Reading Day: Dec. 4)	Experiment #10: Student-Designed Experiment	Exp. #9
W17	Dec. 7-11	No lecture	NO Lab Sessions	Exp. #10

Schedule note: The schedule above is subject to change. Any revisions will be announced through Canvas.