



**COURSE OBJECTIVES AND SCOPE:** To develop proficiency in applying principles of thermal and fluid analysis to situations commonly found in industry. Areas of application include piping systems, heat exchangers, turbomachinery, power cycles, and external flows around wings and bodies.

**CLASS MEETING INFO:**

Section	Day	Start Time	End Time	Room
Lecture	Tuesday Thursday	6:10PM	7:30PM	Pandora 146
Lab	Thursday	7:40AM	9:00PM	Pandora 116 and others

**INSTRUCTOR:**

T. Sean Tavares, PhD.

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Pandora Rm. 103

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**OFFICE HOURS:** Monday 10:40AM – 11:40AM, Tuesday 4:30PM – 5:30PM, and by appointment.

**REQUIRED RESOURCES:** There is one required textbook:

*Fundamentals Thermal-Fluid Sciences, 6<sup>th</sup> Ed.* by Cengel, Cimbala, and Ghajar. ISBN 13: 9781260716979

**BOOKS ON LIBRARY RESERVE:** The following supplemental materials have been placed on reserve in the library. You do not need to purchase them.

1. *Introduction to Thermal and Fluids Engineering*, Kaminski & Jensen (text formerly used in ET 645)
2. *Experimental Methods for Engineers*, J.P. Holman; useful reference for labs
3. *Engines, Energy, and Entropy*, J.B. Fenn; supplemental reference for power cycles

**COURSE CREDITS & FORMAT:** This is 4 credit course. Classes will consist of lectures and labs. The labs involve the application of concepts taught in lecture and also some new material related to thermal and fluid sciences. The modality will be in person unless unforeseen circumstances require a change to remote format.

**COURSE MANAGEMENT:** The course is administered using the Canvas (myCourses) learning management system. <https://mycourses.unh.edu>



**COURSE GRADE:** The course grade will be determined using the following weighting of assignment groups:

Homework	32%	Tests (2 planned)	30%
Lab Projects	17%	Final Exam	15%
Practice Problems	6%		

**CALCULATION OF LETTER GRADES:** Letter grades for the course correspond to the following percentage points in the Canvas gradebook:

Letter Grade	Range
A	100% to 94%
A-	< 94% to 90%
B+	< 90% to 87%
B	< 87% to 84%
B-	< 84% to 80%
C+	< 80% to 77%
C	< 77% to 74%
C-	< 74% to 70%
D+	< 70% to 67%
D	< 67% to 64%
D-	< 64% to 61%
F	< 61% to 0%

**ASSIGNMENTS AND COURSE SPECIFIC POLICIES:** The following is a brief description of the graded assignments for the course along with some course specific policies:

**Lectures:** Students are responsible for all material covered in class and in reading assignments. Regular attendance at lectures and participation in discussions is strongly encouraged.

**Homework:** Homework assignments make up a substantial component of the course grade. Submissions will be files uploaded to Canvas (unless instructed otherwise). There will be an assignment Due Date followed by a short Grace Period. Assignments received after the Due Date but before the end of the Grace Period will be subject to a 10% penalty. No credit will be given for an assignment after the end of the Grace Period.



**Labs:** Labs will involve a combination of individual work and working in groups. The lab component will involve various combinations of making measurements, relating data to physical concepts, and developing analytical skills relevant to experimental work. Closed Toe Shoes and use of appropriate Personal Protective Equipment (safety glasses, etc.) are required in the lab. It is the student's responsibility to make up any missed lab work.

**Practice Problems:** These are short problems and conceptual questions designed to reinforce course material in a timely manner. Practice problems will be assigned, completed, and discussed during class time with rare exceptions. You can think of the Practice Problem component of the grade as points for class participation.

**Tests & Final Exam:** Tests will typically be given during scheduled lecture time and/or lab periods. (Part or all of one or more tests may be given in take-home format.) If a student needs to miss a test for any reason, the instructor must be notified prior to the session in which it is given. If an exam is missed without prior notification the student will receive a grade of zero. In extreme circumstances and if no prior notification is possible, the student must contact the instructor within 24 hours of the missed test or exam and submit in writing the reason that the scheduled test period was missed. See the section on Accommodations if you have circumstances that may require modified testing.

**REQUIREMENTS FOR ASSIGNMENTS:** For homework assignments, lab reports, practice problems/quizzes, tests, and final exam:

- (1) Show your problem-solving process. Briefly describe Define variables clearly and use sketches or graphs where appropriate.
- (2) the concepts, assumptions, and other resources you are using.
- (3) Clearly identify your final answers.
- (4) Submit your work in the format requested for the assignment.
- (5) Submit assignments as a **single coherent file** unless requested to do otherwise.
- (6) You are responsible for the **content and legibility** of all submitted assignments. Check to make sure the file you have uploaded corresponds to the given assignment and is **easily readable when printed**. Illegible content will not be considered for grading.
- (7) Tests and Final Exam are required to be **individual efforts**. No collaboration!
- (8) Collaboration on Homework, Labs, and Practice Problems is permitted.

**ET MINIMUM GRADE REQUIREMENT:** Starting with students entering the ET program in the fall of 2022, the following minimum grade requirement applies:

*Each course required in the major must be completed with a minimum grade of C-. Students must attain a minimum GPA in the major of 2.0.*

More information about University Requirements for Graduation can be found at:

<https://catalog.unh.edu/srrr/academic-policies/requirements-graduation/>



**RELEVANCE TO ET PROGRAM ACCREDITATION:** The UNH Engineering Technology Program is accredited by the Accreditation Board for Engineering and Technology (ABET). Learning objectives for ET courses are aligned with the ABET Outcomes for baccalaureate degree programs in Engineering Technology.

This course is designed to address the following specific MET Program Criteria for Baccalaureate Level Programs described in the section entitled *II. Program Criteria*.

- c. Perform selection, set-up, and calibration of measurement tools/instrumentation;
- d. Elements of differential and integral calculus;
- i. Thermal sciences (such as thermodynamics, fluid mechanics, heat transfer, etc.);
- l. Technical communications typically used in preparation of engineering proposals, reports, and specifications.



**SELECTED UNIVERSITY POLICIES:** The handbook of *Student Rights, Rules, and Responsibilities* is now incorporated in the Academic Catalog. See: <https://catalog.unh.edu/srrr/>  
Brief descriptions of a few specific policies are given below, along with links to more complete information.

**ACADEMIC INTEGRITY:** Academic integrity is a core value at the University of New Hampshire. The members of its academic community both require and expect one another to conduct themselves with integrity. This means that each member will adhere to the principles and rules of the University and pursue academic work in a straightforward and truthful manner, free from deception or fraud. The policy can be found in the annual publication of the [Student Rights, Rules, and Responsibilities](#).

**ATTENDANCE:** Class attendance is important for your learning. You are responsible for all course assignments and meeting all deadlines unless exceptions are agreed upon with the instructor ahead of time. If you need to miss a class for a planned activity, let the instructor know ahead of time. See the [Attendance and Class Requirements](#) policy in the undergraduate catalog.

**CREDIT HOUR POLICY:** This syllabus reflects the federal definition of a credit hour, which entails a minimum 3 hours of engaged time per week per credit over a 15-week semester. Examples of engaged time include class time, assignments, examinations, laboratories, participation in course-related experiences (attending a talk or performance, speakers and events, fieldwork, etc.), conferences, and office hours. Student work reflects intended learning outcomes and is verified through evidence of student achievement. For more information, please see: [Pp111 Policy On Credits-And-Degrees.pdf \(neche.org\)](#)

**EXTENDED ABSENCES:** If you are dealing with an unexpected, extenuating circumstance that will keep you out of class or affect your performance for more than a day or two, reach out to Lisa Enright, Assistant Dean of Student Success, at [lisa.enright@unh.edu](mailto:lisa.enright@unh.edu) to request a letter be sent to all your faculty.

**STUDENT ACCESSIBILITY SERVICES:** According to the Americans with Disabilities Act (as amended, 2008), each student with a disability has the right to request services from UNH to accommodate his/her/their disability. If you are a student with a documented disability or believe you may have a disability that requires accommodations, please contact Student Accessibility Services (SAS) located on the Manchester campus in room 417 or [sas.office@unh.edu](mailto:sas.office@unh.edu).

Accommodation letters are created by SAS with the student. Please follow up with your instructor as soon as possible to ensure timely implementation of the identified accommodations in the letter. Faculty have an obligation to respond once they receive official notice of accommodations from SAS but are under no obligation to provide retroactive accommodations.

For more information refer to [www.unh.edu/sas](http://www.unh.edu/sas) or contact SAS at 603.862.2607, 711 (Relay NH) or [sas.office@unh.edu](mailto:sas.office@unh.edu).



**CONFIDENTIALITY AND MANDATORY REPORTING OF SEXUAL VIOLENCE OR**

**HARRASSMENT:** The University of New Hampshire and its faculty are committed to assuring a safe and productive educational environment for all students and for the university as a whole. To this end, the university requires faculty members to report to the university's [Title IX Coordinator](#) (Bo Zarycky, [Bo.Zarycky@unh.edu](mailto:Bo.Zarycky@unh.edu), 603-862-2930/1527 TTY). Faculty, staff or students on the Manchester campus can also contact Lisa Enright, Deputy Title IX Coordinator ([lisa.enright@unh.edu](mailto:lisa.enright@unh.edu); 603-641-4336; Room 439) to report any incidents of sexual violence and harassment shared by students.

If you wish to speak to a confidential support service provider who does not have this reporting responsibility because their discussions with clients are subject to legal privilege, you can contact the [SHARPP Center for Interpersonal Violence Awareness, Prevention, and Advocacy](#) at (603) 862-7233/TTY (800) 735-2964, as well as, Caroline Young, SHARRP Center Advocacy Expanded Services Coordinator for UNH Manchester ([caroline.young1@unh.edu](mailto:caroline.young1@unh.edu); room 417; Available in person Mondays 9 am to 4-pm and available by appointment (in person and virtually) by emailing [caroline.young1@unh.edu](mailto:caroline.young1@unh.edu)). Individuals can also access Reach Crisis Services NH 603-668-2299 (24 hours), 77 Sundial Ave., Suite 306W, Manchester, NH.

For more information about what happens when you report, how the university treats your information once a report is made to the Title IX Coordinator, your rights and reporting options at UNH (including anonymous reporting options) please visit [student reporting options](#) . [The uSafeUS app](#) is also available for students to keep reporting options and resources easily accessible on their phones.

Help us improve our campus and community climate. If you have observed or experienced an incident of bias, discrimination or harassment, please report the incident by contacting the Civil Rights & Equity Office at [UNH.civilrights@unh.edu](mailto:UNH.civilrights@unh.edu) or TEL # (603) 862-2930 voice/ (603) 862-1527 TTY / 7-1-1 Relay NH, or visit the CREO website. Anonymous reports may be submitted.





Course Outline for Spring 2025

Semester Week	Date - Day	Tentative Agenda
Week 1	Jan 21 – T Jan 23 – R	Lecture – Course Introduction & Internal Flows, Ch. 14 Lecture – Internal Flows, Ch. 14 Lab Period – <b>NO LAB MEETING</b>
Week 2	Jan 28 – T Jan 30 – R	Lecture – Internal Flows, Ch. 14 Lecture – Internal Flows, Ch. 14 Lab Period – <b>Lab Session</b>
Week 3	Feb 4 – T Feb 6 – R	Lecture – Properties of Pure Substances, Ch. 4 Lecture – Properties of Pure Substances, Ch. 4 Lab Period – <b>Lab Session</b>
Week 4	Feb 11 – T Feb 13 – R	Lecture – Properties of Pure Substances, Ch. 4 Lecture – Properties of Pure Substances, Ch. 4 Lab Period – <b>Lab Session</b>
Week 5	Feb 18 – T Feb 20 – R	Lecture – Properties of Pure Substances, Ch. 4 Lecture – Energy Analysis of Steady Flow Devices, Ch. 6 Lab Period – <b>Lab Session</b>
Week 6	Feb 25 – T Feb 27 – R	Lecture – Energy Analysis of Steady Flow Devices, Ch. 6 Lecture – Energy Analysis of Steady Flow Devices, Ch. 6 Lab Period – <b>Lab Session</b>
Week 7	Mar 4 – T Mar 6 – R	Lecture – Energy Analysis of Steady Flow Devices, Ch. 6 Lecture & Lab Periods – <b>TEST #1</b>
Week 8	Mar 11 – T Mar 13 – R	Lecture – Energy Analysis of Steady Flow Devices, Ch. 6 Lecture – Energy Analysis of Steady Flow Devices, Ch. 6 Lab Period – <b>Lab Session</b>
Week 9	March 17-21	<b>SPRING BREAK – NO CLASSES</b>
Week 10	Mar 25 – T Mar 27 – R	Lecture – Power and Refrigeration Cycles, Ch. 9 Lecture – Power and Refrigeration Cycles, Ch. 9 Lab Period – <b>Lab Session</b>
Week 11	Apr 1 – T Apr 3 – R	Lecture – Power and Refrigeration Cycles, Ch. 9 Lecture – Power and Refrigeration Cycles, Ch. 9 Lab Period – <b>Lab Session</b>
Week 12	Apr 8 – T Apr 10 – R	Lecture – Power and Refrigeration Cycles, Ch. 9 Lecture – Power and Refrigeration Cycles, Ch. 9 Lab Period – <b>Lab Session</b>
Week 13	Apr 15 – T Apr 17 – R	Lecture – External Flow: Drag and Lift, Ch. 15 Lecture & Lab Periods – <b>TEST #2</b>
Week 14	Apr 22 – T Apr 24 – R	Lecture – External Flow: Drag and Lift, Ch. 15 Lecture – External Flow: Drag and Lift, Ch. 15 Lab Period – <b>Lab Session</b>
Week 15	Apr 29 – T May 1 – R	Lecture – External Flow: Drag and Lift, Ch. 15 Lecture – Course Wrap-Up and Review for Final
Week 16	May 6 – T May 8 – R	READING DAY – <b>NO CLASSES</b> Lecture Period – <b>FINAL EXAM</b>
Week 17	May 13 – T	Lecture Period – <b>Contingency Day for Final</b>