COURSE	Thermodynamics I
COURSE NUMBER	MCEN 3012
CREDITS	3 credits
INSTRUCTOR	Dr. Nathan McNeill AEC 206 nmcneill@colorado.edu (970) 248-1623
OFFICE HOURS	M T W Th 10:30 AM – 12:00 PM; 1:00 – 5:00 PM
MEETING TIMES	M W 9:00 – 10:15 AM
LOCATION	AEC 204
PREREQUISITES	MATH 253
TEXTBOOK	Thermodynamics: An Engineering Approach (8th Edition) by Çengel and Boles (ISBN: 9780077366742)
WEBSITE	https://learn.colorado.edu

GRADING

Assignments	55 %
Concept inventories	5 %
Final exam	10 %
Project	15 %
Quizzes	15 %

Letter grades will be assigned as follows:

A	92.00 – 100 %
A-	90.00 – 91.99 %
B+	87.00 – 89.99 %
B	82.00 – 86.99 %
B-	80.00 – 81.99 %
C+	77.00 – 79.99 %
C	72.00 – 76.99 %
C-	70.00 – 71.99 %
D+	67.00 – 69.99 %
D	62.00 – 66.99 %
D-	60.00 – 61.99 %
F	< 60.00 %

COURSE DESCRIPTION

Thermodynamics is about the transformation of energy from one form to another. In many cases thermodynamics is about transforming thermal energy into work, such as in an automobile engine or at a power plant. In this first course on thermodynamics we will focus on the analysis of energy systems and the application of these systems to real world contexts. This requires an understanding of the broader context of engineering work, such as considering the environmental, societal, and economic impacts of engineering solutions.

This course will require significant reading of the textbook with in-class assessments and activities based on the readings occurring about once a week. The reading schedule can be found on the calendar on the following page with readings to be completed by the date on which they are listed. Assignments are due at the beginning of class on the dates indicated and late assignments will not be accepted. In this course, you can expect to spend up to three hours working outside of class for every hour that you spend in class.

LEARNING OBJECTIVES

1. Basic Competencies

   You will be able to apply thermodynamic property data as well as concepts of energy, heat, work, power, process, state to the solution of thermodynamics problems.

2. First Law Analysis

   You will be able to perform a First Law analysis on arbitrary steady flow systems as well as selected time-dependent open and closed systems.

3. Second Law and Entropy Concepts

   You will be able to apply Second Law and entropy concepts to thermodynamic systems such as gas and vapor power cycles.

4. Property Data Tables and Modern Computational Tools

   To solve thermodynamics problems, you will be able to use both traditional property data tables as well as modern computational tools

5. Contemporary Issues

   You will be able to demonstrate an awareness of the impact of thermodynamics on contemporary issues such as air pollution, power generation, and automobile design.

SCHEDULE

Date	Topic	Reading	Due
Week 1			
Aug 22	Thermodynamics Concept Inventory (Pre-test)		
Aug 24	Chapter 1 – Basics	1–1 to 1–9	
Week 2			
Aug 29	Chapter 1 – Basics		Quiz 1
Aug 31	Chapter 2 – Energy	2–1 to 2–5	Assignment 1
Week 3			
Sep 5	Chapter 2 – Energy	2–6 to 2–7	Quiz 2
Sep 7	Project		Assignment 2
Week 4			
Sep 12	Chapter 3 – Properties	3–1 to 3–4	
Sep 14	Chapter 3 – Properties	3–5	Project initial
Week 5			
Sep 19	Chapter 3 – Properties	3–6 to 3–7	Quiz 3
Sep 21	Chapter 4 – Closed systems	4–1 to 4–2	Assignment 3
Week 6			
Sep 26	Chapter 4 – Closed systems	4–3 to 4–5	Quiz 4
Sep 28	Chapter 5 – Control volumes	5–1 to 5–3	Assignment 4
Week 7			
Oct 3	Chapter 5 – Control volumes	5–4	
Oct 5	Chapter 5 – Control volumes	5–4	Quiz 5
Week 8			
Oct 10	Chapter 5 – Control volumes	5–5	
Oct 12	Chapter 6 – Second Law	6–1 to 6–8	Assignment 5
Week 9			
Oct 17	Chapter 6 – Second Law	6–9 to 6–11	Quiz 6
Oct 19	Chapter 7 – Entropy	7–1 to 7–6	Assignment 6
Week 10			
Oct 24	Chapter 7 – Entropy	7–7 to 7–9	
Oct 26	Chapter 7 – Entropy	7–10 to 7–11	Quiz 7

Date	Topic	Reading	Due
Week 11			
Oct 31	Chapter 7 – Entropy	7–12	
Nov 2	Chapter 7 – Entropy		Quiz 8
Week 12			
Nov 7	Chapter 9 – Gas Power Cycles	9–1 to 9–3, 9–8, 9–9	Assignment 7
Nov 9	Chapter 9 – Gas Power Cycles	9–10	Quiz 9
Week 13			
Nov 14	Chapter 10 – Vapor Power Cycle	10–1 to 10–2	Assignment 8
Nov 16	Chapter 10 – Vapor Power Cycle	10–3	Quiz 10
Week 14			
Nov 21	**No Class – Thanksgiving Break**		
Nov 23	**No Class – Thanksgiving Break**		
Week 15			
Nov 28	Project		Assignment 9
Nov 30	Project		
Week 16			
Dec 5	Final exam review		Project final
Dec 7	Thermodynamics Concept Inventory (Post-test)		
Finals Week			
Dec 12 – 15	Final exam date and time to be determined		

COUNSELING SERVICES

A variety of services are available to help you if you are struggling academically, feeling discouraged, overwhelmed, depressed, stressed, anxious, or, if you are struggling with relationships, family problems, grief, health problems, disabilities, hunger, or finances. If you are having suicidal thoughts you can call the Colorado West Mental Health Suicide Hotline at 970-241-6022, the National Suicide Hotline at 1-800-784-2433, or Behavioral Clinical Services any time at 970-241-6500.

The Student Services Office, in Lowell Heiny Hall, Room 107, has mentors who can help you with many academic, financial, and personal concerns. You can stop by during normal business hours or call 970-248-1366. If they are unable to help you, they can refer you to services that can provide help. (http://www.coloradomesa.edu/studentservices/index.html)

Counseling services are provided by Behavioral Clinical Services located at 1005 North 12th St. #105, phone number 970-241-6500 (answered 24/7). All students paying student fees are eligible for $5 co-pay counseling sessions. You may contact Behavioral Clinical Services directly at 970-241-6500 to set up an appointment. All sessions are confidential and students dealing with personal matters affecting their academic life are encouraged to speak with a professional counselor.

COURSE POLICIES: UNIVERSITY OF COLORADO--BOULDER

A primary objective of the Mechanical Engineering Department is to prepare each of our students for careers in the engineering profession. As professionals, engineers must meet high standards of technical competence as well as ethical behavior. According to the Accreditation Board of Engineering and Technology (ABET) code of ethics, engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

1. *Using their knowledge and skill for the enhancement of human welfare;*
2. *Being honest and impartial, and serving with fidelity the public, their employers, and clients;*
3. *Striving to increase the competence and prestige of the engineering profession.*

The Department of Mechanical Engineering (ME) believes that it is essential for you to learn the professional behavior that will prepare you for your career after college. Therefore, in each mechanical engineering course you will be required to practice the professional behavior that will be expected by your future employers. This syllabus clearly outlines the ME policy regarding academic integrity and academic climate. These policies will be upheld in each of your courses throughout the mechanical engineering curriculum. However, we also expect that this culture of professionalism will pervade all of your University of Colorado experiences.

I. ACADEMIC INTEGRITY

You may be asked to complete individual homework assignments in this course. Though you may work in groups to discuss and solve problems, it is expected that you will abide by the University of Colorado at Boulder honor code at all times. Therefore, **you may not plagiarize a problem set or allow another student to plagiarize your answers to a problem set.** Examples of plagiarism include: copying from a solution manual, copying from Internet sites, copying from previous academic year homework sets, and copying directly from classmates. If you have any doubt that you are using sanctioned materials to assist with your homework solution, please ask your current instructor/professor. On assignments that require you to use supplemental materials, it is also essential that you properly document the sources of information you use.

Any instances of dishonesty on homework or tests will result in a minimum sanction for your first violation of the honor code of a zero score and an entry in your department file. Additional sanctions will be imposed by the ME Department for subsequent violations, possibly including expulsion from the ME program. You may contest any accusation according to the campus honor code policy.

> **University of Colorado at Boulder Honor Code Policy:**
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> All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-725-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and nonacademic sanctions (including but not limited to university probation, suspension, or expulsion).
>
> Additional information on the Honor Code can be found at:
>
> http://www.colorado.edu/policies/honor.html
>
> **Helpful interactions between students are encouraged.**
> ***The key difference between helping and cheating is that helping each other means communicating concepts; cheating means using/copying another's work as your own.***

II. ACADEMIC CLIMATE

In Class Expectations:
It is our expectation that each of you will be respectful to classmates and instructors at all times. In an effort to create a professional atmosphere within the classroom, it is requested that you:

- Arrive to class on time
- Turn off your cell phone during class
- Limit use of your laptop computer to class purposes
- Put away newspapers and magazines
- Refrain from having disruptive conversations during class
- Remain for the whole class, or if you must leave early do so without disrupting others
- Display professional courtesy and respect in all interactions related to this class

Compliance with these expectations will assist us with the creation of a learning community and a high quality educational experience. The University of Colorado Classroom behavior policy will complement the outlined classroom expectations.

University of Colorado Classroom Behavior Policy:

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See polices at:

http://www.colorado.edu/policies/classbehavior.html

and

http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code

Discrimination and Harassment:
Discriminatory and harassing behavior will not be tolerated in the Department of Mechanical Engineering. A safe and inclusive environment will be created and maintained by students and instructing faculty member. Students with concerns about discrimination or harassment actions should immediately contact the instructor, the Department Chair or their academic advisor, or contact the Office of Discrimination and Harassment (see below).

Examples that may be considered harassment include:

- A teaching assistant or instructor asking a student for a date.
- Displaying sexually explicit material in an academic setting (including laptop wallpaper).
- Persisting in asking a classmate for a date after being turned down.
- Using degrading terminology in referring to others, including peers.

University of Colorado Discrimination and Harassment Policy:

The University of Colorado at Boulder policy on Discrimination and Harassment, the University of Colorado policy on Sexual Harassment and the University of Colorado policy on Amorous Relationships apply to all students, staff and faculty. Any student, staff or faculty member who believes s/he has been the subject of discrimination or harassment based upon race, color, national origin, sex, age, disability, religion, sexual orientation, or veteran status should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Judicial Affairs at 303-492-5550. Information about the ODH, the above referenced policies and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at:

http://www.colorado.edu/odh

Out of Class Expectations:
Though many of the above stated policies address academic climate within the classroom, these policies should also be upheld outside of the classroom. As a member of the ME community you are expected to consistently demonstrate integrity and honor through your everyday actions. Furthermore, faculty and staff members are very willing to assist with your academic and personal needs. However, multiple professional obligations make it necessary for us to schedule our availability. Suggestions specific to interactions with faculty and staff include:

- Respect posted office hours. Plan your weekly schedule to align with scheduled office hours
- Avoid disrupting ongoing meetings within faculty and staff offices. Please wait until the meeting concludes before seeking assistance. Respect faculty and staff policies regarding use of email and note that staff and faculty are not expected to respond to email outside of business hours. Send emails to faculty and staff using a professional format. Tips for a professional email include:
    - Always fill in the subject line with a topic that indicates the reason for your email to your reader.
    - Respectfully address the individual to whom you are sending the email.
    - Avoid email, chat room or text message abbreviations.
    - Be brief and polite.
    - Add a signature block with appropriate contact information.
    - Reply to emails with the previously sent message. This will allow your reader to quickly recall the questions and previous conversation.

Accommodation of Disabilities or Religious Commitments:
In coordination with Educational Access Services, reasonable accommodations will be provided for qualified students with disabilities. Please meet with me during the first week of class to make arrangements. Dana VandeBurgt, the Coordinator of Educational Access Services, can also be contacted at 248-1801, or in person in Houston Hall, Suite 108.

If you have a temporary medical condition or injury, see guidelines at
http://www.colorado.edu/disabilityservices/go.cgi?select=temporary.html

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance.

> **If students have conflicts with scheduled exams, assignments, experiments, etc. they should contact the instructor(s) at least two weeks in advance to determine appropriate steps to take.**