

Identification	Subject	ENGR 311 Engineering Thermodynamics 6 ECTS		
	Department	Chemistry and Chemical Engineering		
	Program	Undergraduate		
	Term	Fall 2026		
	Instructor	Babak Rustamzade		
	E-mail:	babakrustamzade@gmail.com		
	Phone			
	Classroom/hours			
	Office hours			
Prerequisites				
Language	English			
Compulsory/Elective	Compulsory			
Required textbooks and course materials	▪ Yan, C. Y. (2022, September 1). Introduction to Engineering Thermodynamics. BCcampus. [1] ▪ Moran, M. J., & Shapiro, H. N. (2004). Fundamentals of engineering thermodynamics (5th ed., SI Units). John Wiley & Sons. [2] ▪ Çengel, Y. A., Boles, M. A., & Kanoğlu, M. (2021). Thermodynamics: An engineering approach (9th ed.). McGraw-Hill Education. [3] ▪ Koretsky, M. D. (2012). Engineering and Chemical Thermodynamics (2nd ed.) [4] ▪ Elementary Principles of Chemical Processes (3rd edition) written by Richard M. Felder and Ronald W. Rousseau in pdf published in 2005 [5]			
Website of course	This course is based on traditional face-to-face classes.			
Teaching methods	Lecture	X		
	Group discussion	X		
	Practical tasks	X		
Evaluation	Methods	Date/deadlines		Percentage (%)
	Activity			5
	Quiz	4 th and 11 th week		20
	Midterm Exam	TBA		25
	Case study	13 th week		10
	Final Exam	TBA		40
	Total			100
Course outline	This course introduces the fundamental concepts of classical thermodynamics and their application to solve problems encountered in chemical engineering processes. It emphasizes the first and second laws of thermodynamics, property relationships, and their use in various calculations. Students will also get a chance to work on some real-life cases. Using different property tables and charts will be key for the course.			

Course objectives	The objective of this course is to provide students with a comprehensive understanding of the fundamental principles of classical thermodynamics and their application to engineering systems. Students will study thermodynamic systems, properties, processes, state functions, and the behavior of pure substances, ideal gases, and real fluids. The course develops the ability to apply the First and Second Laws of Thermodynamics to analyze energy transformations in both closed and open systems and to evaluate thermodynamic properties using tables, diagrams, and equations of state. Students will also learn to analyze major thermodynamic cycles, including Carnot, Rankine, Brayton, Otto, Diesel, and refrigeration cycles, in order to assess the performance and efficiency of power generation, internal combustion, and refrigeration systems. Particular attention will be given to entropy, irreversibility, energy balances, and exergy analysis for determining process feasibility and system efficiency. In addition, the course aims to strengthen students' problem-solving and engineering judgment by applying thermodynamic principles to practical systems such as power plants, engines, refrigeration equipment, and renewable energy technologies. Teamwork, technical communication, and analytical skills will also be developed through problem-solving activities, discussions, and case-study presentations.
Learning outcomes	Here is some common learning outcomes associated with thermodynamics courses: • Apply the first and second laws of thermodynamics to analyze chemical processes. • Understand and utilize key thermodynamic properties like enthalpy, entropy, and internal energy. • Employ equations of state for ideal and real gases. • Perform thermodynamic cycles analysis. • Solve problems related to work, heat transfer, and energy balance. • Critically evaluate the limitations of various thermodynamic models. • Utilize thermodynamic data and property tables to solve engineering problems.
Policy	• Activity For a variety of reasons, participation in a classroom context is essential. It is essential to the learning process, promotes teamwork, and aids in the general success of both the individual students and the class. The main point will be the level of student interaction during classes • Case Study/Report Students will be presented with an opportunity to work on a real-life case in an oil and gas plant. They must use their critical analysis and engineering knowledge to understand the case and try to solve it by applying what they learnt during the thermodynamics course. They must present a report that consists of 8-12 pages to explain their results, findings, and reasonings. • Quiz A consistent method of gauging your understanding of the content covered in class is through quizzes. They assist you and your teacher in evaluating your comprehension of important ideas and identifying any areas that can benefit from more explanation. Each quiz will be marked based on 10 points. There will be two quizzes. • Withdrawal (pass/fail) The School Science and Engineering grading guidelines are carefully adhered to throughout this course. To pass, a student must typically receive a mark of at least 60%. Failure to achieve this benchmark will result in the student failing the course.

	• Cheating/plagiarism Any form of plagiarism or cheating on a test, quiz, or project will result in the cancellation of the assignment. In this scenario, the student will receive a score of zero (zero) without any further consideration. • Illness A student with an illness may miss a quiz or presentation. This might be because the student needs to go to the hospital, recover at home, or attend regular medical appointments. In this case, the student must inform the instructor in advance about the illness and must present a document from their doctor. After considering the situation, the instructor may set a new date for the quiz or project presentation. Only one opportunity will be given to the student. The students who don't inform the instructor in advance will not be given a chance to retake the quiz or give a presentation. • Professional behavior guidelines During class hours, students are expected to conduct themselves in a way that fosters a positive academic and professional atmosphere. Discussions without permission and unethical conduct are absolutely forbidden. • Ethics In class, students must not be late. During class, mobile phones must be put away and turned off.
Use of Artificial Intelligence Tools	The use of Generative Artificial Intelligence (GAI) tools within this course is permitted solely for educational, research, and individual learning purposes and must remain consistent with the University's principles of academic integrity. GAI tools may be used as supplementary resources to support learning and research; however, all submitted work must reflect the student's own understanding, critical thinking, and academic contribution. Any use of GAI must be appropriately disclosed in the relevant assignment, project, presentation, or other academic material. Students are fully responsible for evaluating and verifying the accuracy, reliability, and appropriateness of all AI-generated content included in their work.

Tentative Schedule		
Weeks	Topics	Reference books
1	Introduction to Thermodynamics	[2] Pages 25-39
2	Thermodynamic properties of pure substances	[1] Pages 21-65
3	Ideal and Real Gases, Energy and First Law of Thermodynamic	[1] Pages 84-138
4-5	Equations of State, Second Law of Thermodynamics	[1] Pages 140-162
6	Power cycles, Refrigeration cycle	[3] Pages 226-289
7	Midterm exam	
8	Properties of Mixtures, Phase Equilibrium	[4] Pages 130-171
9	Reaction Equilibrium	[4] Pages 130-171
10	Applications of Reaction Equilibrium	[4] Pages 130-171
11	Thermodynamic Relations	[2] Pages 320-356
12	Applications in Flow Systems	[2] Pages 320-356
13	Reacting Mixtures and Combustion	[2] Pages 432-516
14	Applications of Thermodynamics in Energy Systems	[5] Pages 124-145
15	Introduction to Property Tables and Charts	[2] Pages 434 - 448
Final Exam		