Identification	**Subject**	ENGR 311 Engineering Thermodynamics, 6 ECTS	
	Department	Chemistry and Chemical Engineering	
	Program	Undergraduate	
	Term	Fall 2025	
	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	4th and 11th week	20
	Midterm Exam	TBA	25
	Case study	13th 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 following are common course objectives that are typically associated with Thermodynamics • Understand fundamental principles of classical thermodynamics, including systems, properties, processes, and state functions. • Apply the First and Second Laws of Thermodynamics to analyze energy transformations in closed and open systems. • Evaluate thermodynamic properties of pure substances, ideal gases, and real fluids using tables, charts, and equations of state. • Analyze thermodynamic cycles (e.g., Carnot, Rankine, Brayton, Otto, Diesel, and refrigeration cycles) to assess the performance of power generation and refrigeration systems. • Apply entropy concepts to determine process feasibility and evaluate irreversibility in engineering systems. • Integrate energy balance and exergy analysis for efficiency evaluation of engineering systems. • Develop problem-solving skills for modeling and analyzing real-world engineering systems involving energy conversion. • Strengthen engineering judgment by relating thermodynamic principles to practical applications in power plants, internal combustion engines, refrigeration, and renewable energy systems. • Enhance teamwork and communication skills through problem-solving sessions, group discussions, and presentations on thermodynamic case studies.
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 50 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.

Tentative Schedule

Weeks	Topics	Reference books
1	Introduction to Thermodynamics	[2] Chapter 1
2	Thermodynamic properties of pure substances	[1] Chapter 1
3	Ideal and Real Gases, Energy and First Law of Thermodynamic	[1] Chapter 2
4-5	Equations of State, Second Law of Thermodynamics	[1] Chapter 6
6	Power cycles, Refrigeration cycle	[3] Chapter 9
7	**Midterm exam**	
8	Properties of Mixtures, Phase Equilibrium	[4] Chapter 6
9	Reaction Equilibrium	[4] Chapter 6
10	Applications of Reaction Equilibrium	[4] Chapter 6
11	Thermodynamic Relations	[2] Chapter 11
12	Applications in Flow Systems	[2] Chapter 11
13	Reacting Mixtures and Combustion	[2] Chapter 13

14	Applications of Thermodynamics in Energy Systems	[5] Chapter 7
15	Introduction to Property Tables and Charts	[2] Appendix B
Final Exam		