Engineering Thermodynamics- EGR 271
Block 1, 2018-19

Professor: Niloofar Kamran
Email: nkamran@cornellcollege.edu
Office Phone: 319-895-4360
Office: 019 West Science
Office hours: M, T, W, Th: 3-4 pm, and whenever I am in my office

Textbook: *Fundamentals of Engineering Thermodynamics,* Eighth Edition, by Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Publisher: Wiley, Print ISBN: 9781118412930, 1118412931

Prerequisite: PHY 161 - General Physics I

Daily Schedule: We start the day at 9 am by discussing the homework assignments that you already worked on and there is a quiz from the homework or the materials from the day before just before 10 am. From 10 to 11 am, we work on the new materials, and in the afternoon we solve examples and deepen our understanding of the subject of the day.

Course Description: This is a four semester credit, selected elective class. Thermodynamics is the study of energy and its conversion to other forms, notably work and heat. Topics include internal energy, enthalpy, entropy and temperature; the first and second laws of thermodynamics; combustion, cyclic processes, engines, efficiency and refrigeration; heat transfer. Practical applications of thermodynamics are also discussed, including power generation, pollution and waste control, materials science and chemical engineering.

Course Objectives: This course supports the Educational Priorities and Outcomes of Cornell College with emphases on knowledge, inquiry, reasoning, and communication. Upon completion of this course, students will have a good understanding of the following concepts:

1- Closed systems, control volume, specific volume, temperature units, and problem-solving techniques.
2- Mechanical concepts of energy, definition of work, energy transfer, energy balance and First Law of thermodynamics, power cycle, refrigeration and heat pump cycles.
3- Evaluating the properties of materials, enthalpy, phase changes, specific heats, ideal gas model, polytropic processes.
4- Conservation of mass and energy for a control volume, forms of mass balance rate, nozzles and diffusers, turbines, compressors and pumps.
5- Second law of thermodynamics, irreversible and reversible processes, Kelvin-Planck statement, maximum performance measures for cycles operating between two reservoirs, Carnot cycle, Clausius inequality.
6- Entropy, Tds equations, entropy change of an ideal gas, entropy change in internally reversible processes of closed systems, entropy balance for closed systems, directionality of processes, entropy rate balance for control volumes at steady state, isentropic processes, isentropic efficiencies of turbines, compressors and pumps, heat transfer and work in internally reversible steady-state flow processes.
7- Vapor power systems, Rankine cycle.
8- Gas power systems, internal combustion engines, gas turbine power plants.

This course supports the students outcomes in Criterion 3 of ABET for baccalaureate level programs including: 1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics, 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Assignments:

Homework:

There are homework assignments for every day. You are expected to work on them and reach an understanding of the problem and have a good idea on how they are being solved, and the best is when you solve a problem to the end. We discuss the problems the day after (you need to come to class ready and bring your questions regarding the problems, I don't solve and explain the problems from scratch). There is a quiz on one of the problems in class, you are allowed to consult your notes and solutions as long as you understood the problem.

List of homework problems	
Chapter 1	22, 23, 26, 31, 41, 47, 56
Chapter 2	19, 25, 35, 60, 82, 86, 90, 95
Chapter 3	12, 17, 27, 43: a, c, e, 46, 54, 65, 77, 86, 105, 111: ignore the signs in the picture, 122, 135, 142
Chapter 4	4, 20, 24, 32, 48, 53, 58, 65, 79, 85, 95, 103
Chapter 5	10, 18, 24, 39, 46, 52, 64, 78, 79, 80, 84
Chapter 6	10, 16, 21, 32, 37, 54, 59, 69, 95, 112, 133, 162, 170
Chapter 8	2, 13, 21, 35
Chapter 9	12, 24, 36

Project:

In this project you can work in a group or individually. Your task is to pick one or two concepts of thermodynamics and explain it in a way that it is understandable for general public who know nothing about thermodynamics. In this project you are encouraged (you don't have to) to use some form of art to express your selected concept such as sculpture, music, animation, poetry etc. however the main points of the project (up to 90%) is given to the quality of the delivery of the concept and how understandable and interesting it is for our selected audience and less to the artistic merit (10%). Timeline of the project:

First Thursday	Finalizing the teams
Afternoon of first exam	Brainstorming on the possible ideas
Afternoon of second exam	Follow up meeting on how each team is doing
Third Friday afternoon	I'll meet with each group and double check the presentations
Fourth Tuesday afternoon	Presentations

You are encouraged to be in contact with me anytime you feel need help and do not wait for the assigned timeline.

Grades:

Daily Quizzes	100	First exam (second Monday)	100
Project	50	Second exam (third Tuesday)	100
Bonus points	20	Final exam (Cumulative)	150

Total grade out of 500.

Bonus points: for brief written reports, up to two, on events/talks/discussions on campus or off campus which contribute to your liberal arts education.

A	93-100		C	74-76
A-	90-92		C-	70-73
B+	87-89		D+	67-69
B	84-86		D	64-66
B-	80-83		D-	60-63
C+	77-79		F	<60

Students with disabilities: Cornell College makes reasonable accommodations for persons with disabilities. Students should notify the Coordinator of Academic Support and Advising and their course instructor of any disability related accommodations within the first three days of the term for which the accommodations are required, due to the fast pace of the block format. For more information on the documentation required to establish the need for accommodations and the process of requesting the accommodations, see http://www.cornellcollege.edu/academic-support-and-advising/disabilities/index.shtml.

Academic Honesty: Cornell College expects all members of the Cornell community to act with academic integrity. An important aspect of academic integrity is respecting the work of others. A student is expected to explicitly acknowledge ideas, claims, observations, or data of others, unless generally known. When a piece of work is submitted for credit, a student is asserting that the submission is her or his work unless there is a citation of a specific source. If there is no appropriate acknowledgement of sources, whether intended or not, this may constitute a violation of the College's requirement for honesty in academic work and may be treated as a case of academic dishonesty. The procedures regarding how the College deals with cases of academic dishonesty appear in The Compass, our student handbook, under the heading "Academic Policies – Honesty in Academic Work."