S14049: Thermodynamics with Applications

Instructors:

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Course Description:

Thermodynamics: the most dreaded class that you have to take before obtaining that coveted engineering degree. OR! Thermodynamics: one of the coolest subjects that explains just about everything (kind of), from how molecules interact with one another to how we can stop climate change.

This is a moderately spicy yet exciting class that will discuss the fundamental understanding of energy that AP Chemistry sadly does not teach you. We will build from a molecular description of gases to statistical mechanics (not as scary as it sounds!), derive the Ideal Gas Law, see that the Ideal Gas Law sadly does not always work and learn about non-ideality, and then apply those concepts to chemical and biological engineering.

Learn about the First, Second, and Third Laws of Thermodynamics, mass and energy balances, power cycles, entropy, equations of state, vapor-liquid equilibrium and more!

This class is not meant to be easy. On the contrary: this class is meant to give you a rigorous foundation of thermodynamics so that you have a thorough understanding of energy. Please don't feel bad if you don't understand something! We will be more than happy to answer any questions you may have.

Prerequisites: AP Calculus, knowledge of AP Chemistry preferred

This course is modeled after my Chemical-Biological Engineering Thermodynamics course. As such, it assumes previous knowledge of physics, chemistry, and multivariable calculus. I aim to teach most of the necessary concepts from these classes, but a review of AP Chemistry (if you've taken it) would be very useful. I do, however, assume you've taken single variable calculus (i.e. AP Calculus AB/BC).

I will make some review lecture notes that will be very helpful to look at before we start the course.

Homework and Exams:

I will post weekly problem sets after each lecture on the class website. Additionally, I will post a midterm and final exam. These are completely optional. I will not be collecting them nor grading them. They are only meant to give you additional practice applying the concepts that we learn in lecture. That being said, I highly suggest you take a look at them and give them a try, as they will hopefully help solidify the material. Solution keys will also be posted on the class website.

Kahoot Tournament!

I plan to have a quick game of Kahoot around halfway through each lecture in order to review some of the material covered. We will keep track of your total overall score throughout the course and award prizes to the top competitors in the last lecture! If you are unable to make a lecture we will excuse this from your score.

Zoom Logistics

This will be updated as I get more information and we get closer to our first lecture.

Lecture Schedule with Topics

Note: Lecture topics are subject to change (in particular, lectures 4-6).

Lecture	Date	Topics
1	7/11/20	Introduction to Statistical Thermodynamics
2	7/18/20	Entropy and The Second Law of Thermodynamics, The Partition Function
3	7/25/20	Phase Diagrams, Phase Equilibrium and Equations of State
4	8/1/20	First Law of Thermodynamics, Thermodynamic Processes of Closed Systems
5	8/8/20	Mass and Energy Balances for Open Systems
6	8/15/20	Power Cycles and Applications