

LaGuardia Community College
City University of New York
Mathematics, Engineering & Comp. Sc. Department – Engineering

MAE 219 THERMODYNAMICS I

Number of credits: 3 credits, 3 Lecture hrs

Course description: Introduction to the concept of energy and the laws governing the transfers and transformations of energy. Emphasis on thermodynamic properties and the first and second law analysis of systems and control volumes. Integration of these concepts into the analysis of basic power cycles is introduced.

Prerequisites: SCP232, MAT203, SCC201

Lecturer:

Office:

Email:

CAPSTONE

A capstone course is a summary, integrative course that ties together the key learning objectives met in a particular subject area, along with a student's lived personal experience while at LaGuardia. Theoretical skills acquired through different classes over the years and individual responses to real world applications will join in the synthesis. Students will have the opportunity to demonstrate their critical thinking and analytical skills and their ability to combine these in new and unanticipated ways. In the capstone, students will revisit many of the topics discussed/learned in other engineering courses in their particular majors (electrical, mechanical or civil) and relate these topics anew to real world applications. Upon transfer to a four-year college as a junior, students will begin working on the required senior design project. Ideally, the LaGuardia capstone experience will provide them with a smooth transition to this senior design project and also serve to prepare the launch of their careers as professional engineers.

Course Objectives: The students will be asked to demonstrate their knowledge of the material covered in Thermodynamics I through their mastery of the following course objectives:

1. Introduce basic physical concepts and applications of thermodynamics, and their consequences for engineering processes and operations
2. Familiarize students with the properties of pure substances along with basic principles governing transformations of energy
3. Emphasize the first and second law of thermodynamics
4. Provide an elementary introduction to cycles
5. Introduce the behavior of gas mixtures

Through the study of Thermodynamics I the student will be able to:

1. Describe the basic physical concepts and their applications in thermodynamics

2. Determine properties of pure substances, such as steam and refrigerant 134-a, and ideal gases from either tabular data or equations of state.
3. Analyze processes involving ideal gases and real substances as working fluids in both closed systems and open systems or control volumes to determine process diagrams, apply the first law of thermodynamics to perform energy balances, and determine heat and work transfers. Analyze systems and control volumes through the application of the second law.
4. Analyze the basic Carnot, Otto, refrigeration and Rankine cycles
5. Analyze and solve problems related to behavior of gas mixtures

Text: *Thermodynamics, An Engineering Approach*, Cengel, Y.A. and Boles, M.A. McGraw-Hill, New York, 7th ed.

Grading

Final Exam (30%), Midterm (30%), Research Paper (15%), Quizzes & Homework (15%), EPortfolio (10%)

<u>WEEK</u>	<u>CHAPTER</u>	<u>TOPICS</u>
1	1	INTRODUCTION AND CONCEPTS The thermodynamics system and the control volume, macroscopic vs. microscopic viewpoint, properties and state of a substance, processes and cycles, systems of units, the zeroth law of thermodynamics, temperature scales.
2	2	ENERGY & ENERGY TRANSFER Forms of Energy, Energy Transfer, Mechanical Work, First Law of Thermodynamics
3	3	PROPERTIES OF A PURE SUBSTANCE Phase equilibrium in a pure substance, equations of state, tables of thermodynamic properties, thermodynamic surfaces, Compressibility Factor.
4	4	ENERGY ANALYSIS OF CLOSED SYSTEMS Polytropic Process, Energy Balance for Closed Systems, Specific Heats, Internal Energy, Enthalpy, Specific Heats of Ideal Gases and Solids and Liquids.
5	5	MASS AND ENERGY ANALYSIS OF CONTROL VOLUMES Conservation of Mass, Mass & Volume flow rate, Mass

