This syllabus is provided as a general informational guide. Some of the information may vary depending on the specific course section and instructor. Different sections of the same course may require different textbooks. Verify the section specific textbook information in the CUNY's Academic Course Schedule Web Page. Modifications of the grading system presented here will be communicated by the instructors of the sections when they meet the class.

BOROUGH OF MANHATTAN COMMUNITY COLLEGE
City University of New York

Department of Science

Title of Course THERMODYNAMICS I
ESC 211 Section _____
FALL 2017
Credits 3

Class hours 4
Lab hours (if applicable)
Instructor Information
Name:
Office:
Room:
Email:

Course Description
This course covers introductory concepts and definitions that include Absolute Temperature, Work, Heat, First Law and applications, Second Law, Carnot Theorem, Entropy, Thermodynamic state variable and functions, Reversibility, irreversibility, Power and Refrigeration cycles, Ideal Gas Mixtures, Mixtures of vapor and gas, Humidity calculations.

Prerequisites/Co-requisites
Prerequisite: CHE 201, Chemistry I
Pre or co-requisities: PHY 225, University Physics II, MAT 303 Calculus III

Student Learning Outcomes

Course Student Learning Outcomes (Students will have…)	**Measurements (means of assessment for student learning outcomes listed in first column)**
Knowledge of thermodynamic laws and an ability to formulate mass, energy and entropy balances for systems and control volumes.	1. In class exam.
An ability to apply thermodynamic principles to the analysis of modern electromechanical devices.	2. In class exam.
Knowledge of thermodynamic power and refrigeration cycles.	3. In class exam.
Knowledge of ideal gas mixtures, gas-vapor mixtures, and the psychrometric chart.	4. In class exam.
Knowledge of statistical thermodynamics, including statistical models, microscopic interpretation of heat and work, and statistical concept of entropy.	5. In class exam.
An ability to use thermodynamic charts and software to calculate thermodynamic properties and analyze systems.	5. In class exam.

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Required Text & Readings
Title: Thermodynamics, an Engineering Approach 8th Edition
Author: Cengel, Y. and Boles, M.

Other Resources

Evaluation & Requirements of Students
Three examinations, comprehensive final examination, homework and project assignments.

Below are the college's general education learning outcomes, the outcomes that are checked in the left-hand column indicate goals that will be covered and assessed in this course. (Check at least one.)

	General Education Learning Outcomes	**Measurements (means of assessment for general education goals listed in first column)**
☐	**Communication Skills-** Students will be able to write, read, listen and speak critically and effectively.	
■	**Quantitative Reasoning-** Students will be able to use quantitative skills and the concepts and methods of mathematics to solve problems.	Graded homeworks and exams will measure how students apply mathematics to solve thermodynamics problems.
☐	**Scientific Reasoning-** Students will be able to apply the concepts and methods of the natural sciences.	
☐	**Social and Behavioral Sciences-** Students will be able to apply the concepts and methods of the social sciences.	
☐	**Arts & Humanities-** Students will be able to develop knowledge and understanding of the arts and literature through critiques of works of art, music, theatre or literature.	
☐	**Information & Technology Literacy-** Students will be able to collect, evaluate and interpret information and effectively use information technologies.	
☐	**Values-** Students will be able to make informed choices based on an understanding of personal values, human diversity, multicultural awareness and social responsibility.	

Outline of Topics
LECTURE SYLLABUS

WEEK **TOPIC**

1 Introduction, definition & terminology temperature scales and the Zeroth law of thermodynamics.

2, 3 Properties of pure substance, phase diagrams, tables of thermodynamics properties and the ideal gas equation of state.

4 Work and Heat.

5, 6	Energy balance for closed system, internal energy, enthalpy, specific heats, energy relation for ideal gases. Control volume, conservation of mass and energy for open system, Steady State Steady Flow process, Uniform State Uniform Flow process.
7	Heat engine and refrigerators, second law of thermodynamics, reversibility Carnot cycle, Carnot theorems and consequences.
8, 9	Clausius inequality, entropy, irreversibility, principle of increase of entropy, entropy change of ideal gases, polytropic and isentropic processes, second law for a control volume, isentropic efficiency
10	Irreversibility and Availability. Available energy, reversible work and irreversibility, availability and second - law efficiency
11	Mixture of ideal gases, gas vapor mixture, humidity calculation.
12	Introduction to power and refrigeration cycles. Rankin cycles, Otto and Diesel cycles, vapor compression refrigeration cycles
13, 14	Introduction to Statistical Thermodynamics. Review of permutations, combinations and probability. Quantum - mechanical considerations. Bose - Einstein, Fermi - Dirac, and Maxwell -Boltzmann models for statistical thermodynamics. Microscopic interpretation of heat and work. Statistical concept of entropy.

College Attendance Policy
At BMCC, the maximum number of absences is limited to one more hour than the number of hours a class meets in one week. For example, you may be enrolled in a three-hour class. In that class, you would be allowed 4 hours of absence (not 4 days). In the case of excessive absences, the instructor has the option to lower the grade or assign an F or WU grade.

Academic Adjustments for Students with Disabilities
Students with disabilities who require reasonable accommodations or academic adjustments for this course must contact the Office of Services for Students with Disabilities. BMCC is committed to providing equal access to all programs and curricula to all students.

BMCC Policy on Plagiarism and Academic Integrity Statement
Plagiarism is the presentation of someone else's ideas, words or artistic, scientific, or technical work as one's own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism.

Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC's web side, www.bmcc.cuny.edu. For further information on integrity and behavior, please consult the college bulletin (also available online).