

# Basic Thermodynamics

Syllabus Number

2A103

Basic Major Subjects

Elective Requisites 2  
credit

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## 1. Course Description

Lectures will address the following topics, and students will then solve problems related to these topics in order to deepen their understanding of them.

1. Temperature, thermal expansion and ideal gases
2. Heat and the first law of thermodynamics
3. Kinetic theory of gases
4. Heat engines, entropy and the second law of thermodynamics

## 2. Course Objectives

Heat-related phenomena are not always intuitively obvious. Therefore, students will gain an abstract understanding of thermodynamics by examining examples that are as familiar as possible. In these classes, we will cover the contents listed below in the outline, with the goal of gaining an understanding of the basic concepts and an overview of the science of thermodynamics.

## 3. Grading Policy

Evaluation is based on the results of the mid-term exam (rating rate 30%) and the final exam (rating rate 70%).

For the feedback of the mid-term exam, we will explain the problem after the mid-term exam.

In addition, latter part of the classes, sample problems are given and then through these practices, students can ensure the understanding of the thermodynamics.

## 4. Textbook and Reference

Textbook

R. A. Serway, translated by Hiroyuki Matsumura, "Physics for scientists and engineers - II, Thermodynamics", ISBN978-4-87361-072-6  
Gakujutsu Toshō Co., Ltd.

## 5. Requirements(Assignments)

In the textbook, important points and questions and sample problems are listed at the end of each chapter, and through checking these points, practicing the sample problems, the understanding of the lectures will be promoted.

## 6. Note

Even during the lecture, be sure to bring a scientific calculator, as it will be calculated as a simple practice.

## 7. Schedule

- [1] Temperature, Thermal Expansion and Ideal Gas (1)  
Temperature and Zeroth Law of Thermodynamics, Thermometer and Temperature Scale
- [2] Temperature, Thermal Expansion and Ideal gas (2)  
Constant Volume Gas Thermometer, Kelvin's Temperature Scale
- [3] Temperature, Thermal Expansion and Ideal gas (3)  
Thermal Expansion of Solid and Liquid, Macroscopic Behavior of Ideal Gas
- [4] Heat and Thermal Energy, Mechanical Equivalent of Heat, Heat Capacity and Specific Heat, Latent Heat
- [5] Work and Heat in Thermodynamic Processes
- [6] The First Law of Thermodynamics
- [7] Application of The First Law of Thermodynamics, Heat Transfer and Thermal Insulation
- [8] Mid-term Examination, Explanation of Problems
- [9] Kinetic Theory of Gases, Molecular Model of Ideal Gas, Molecular Interpretation of Temperature
- [10] Specific Heat of Ideal Gas, Adiabatic Process of Ideal Gas
- [11] Sound Velocity of Gas, Equal Distribution of Energy
- [12] Velocity Distribution of Molecules, Mean Free Path
- [13] Van der Waals' Equation of State
- [14] Heat Engine, Second Law of Thermodynamics, Efficiency of Heat Engine
- [15] Reversible Process and Irreversible Process, Carnot Engine, Entropy