

Thermodynamics

Syllabus Number 1C201
Basic Major Subjects
Requisites 2 credit
SHINOTAKE, Akihiko

1. Course Description

In this series of lectures, students learn the basic items, objectives and targets of thermodynamics, units, heat energy and work, entropy, the first and second laws of thermodynamics, enthalpy, thermodynamic process of ideal gas, cycles and efficiency of heat engines, and combustion of fuel.

2. Course Objectives

Thermodynamics is the study about the energy transform and transfer and is the one of the basic sciences for the investigation of the natural phenomena.

The objective of this course is to understand the basic principles, the law of thermodynamics and thermal efficiency and the heat cycle of each type of thermal engine.

3. Grading Policy

Students will be evaluated based on periodic test (90%) and report assignment (10%). It is necessary to attend more than 2/3 in order to qualify for regular examination. The submitted reports will be corrected and returned.

4. Textbook and Reference

Textbook

Takanori Saito, Kazuhiro Hamaguchi, Koichi Hirata, The thermodynamics to be learned for the first time Ohmsha

5. Requirements(Assignments)

We assume that you understand physics, chemistry and mathematics of high school and university first year. Always read the textbook of the next lesson described in the first part of the class contents, note down the part which you don't understand (about 1.5 hours), and attend class. After class, review the points you learned, organize your notes and solve the exercises as suggested (about 1 - 2 hours). Please submit the assignment as a report at the beginning of the next lesson. The contents of the assignment will also be posted on LMS.

6. Note

Please bring a scientific calculator because you may be doing exercises during class. Depending on the degree of comprehension, the progress may go back and forth. So, we will specifically suggest you the review subject and the next preparatory range at each lesson.

7. Schedule

- [1] Thermal equipment and thermodynamics
[Preparation] Read through the first chapter of the textbook (p. 1-12), clarify the points that can not be understood and come to class.
[Review] Solving exercises 1.1 to 1.4 on p.12 and submitting it as a report at the start of the next lesson.
- [2] Thermal energy utilization technology (1) (thermal energy source, heat transfer)
- [3] Thermal energy utilization technology (2) (chemical reaction of combustion)
- [4] Thermal energy utilization technology (3) (combustion calculation)
- [5] Thermal Energy and Work (1) (pressure change and work)
- [6] Thermal Energy and Work (2) (temperature and entropy)
- [7] Status and change of energy (1) (state and change of substance)
- [8] State and change of energy (2) (law of thermodynamics)
- [9] State and change of energy (3) (change and flow of energy)
- [10] State change of ideal gas (1) (state equation, internal energy)
- [11] State change of ideal gas (2) (enthalpy, entropy)
- [12] Engine cycle (1) (engine type)
- [13] Engine cycle (2) (Carnot cycle, car cycle)
- [14] Engine cycle (3) (gas turbine, other cycles)
- [15] Summary and Review
[Practice] We ask the representatives to write the answers for several problems on the blackboard separately, and explain.