

Heat and Heat Engine

Syllabus Number

1C202

Basic Major Subjects

Elective Requisites 2
credit

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1. Course Description

The lectures are taught on the following topics:

- 1) Nozzle Flow.
- 2) 3 phase state diagram of water.
- 3) Steam Table of water.
- 4) Steam Cycle and Steam engine.
- 5) Rankine cycle.
- 6) Reheating and regenerative cycle.
- 7) Combined cycle.
- 8) Refrigerator and heat pump.
- 9) Steam adsorbed refrigerated cycle and gas refrigerated cycle.
- 10) Others.

2. Course Objectives

The objective of this course is to learn and understand the basic knowledge related to the transformation from heat energy to kinetic energy, the thermodynamic process of steam, steam cycles, cycles of refrigerators and heat pumps and so on.

Prerequisites for this course are an understanding of the first and second laws of thermodynamics, thermodynamics processes of ideal gas, constant volume and constant pressure cycles and so on.

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 of the attendance in order to qualify for regular examination. The submitted reports will be corrected and returned.

4. Textbook and Reference

Textbook

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

5. Requirements(Assignments)

We assume that you understand the thermodynamics first law, the second law, the state change of the ideal gas, and constant volume and constant pressure cycle, which are the basis of thermodynamics. Always read the textbook before the next lesson which described in the 1st and 2nd class of the lesson contents, take note of the part that you don't understand (about 1.5 hours), and bring to class. After class, review the points you learned, organize your notes and solve the exercises given to you (about 1 - 2 hours). Please submit the assignment as a report at the beginning of the next lesson.

6. Note

Chapters 7 to 12 of the same textbook as "thermodynamics" correspond.

Please bring a scientific calculator as you may need to practice during lesson. 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

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| [1] | Review of "thermodynamics", conversion of thermal energy to kinetic energy (1) (flow of gas)
[Preparation] Check chapter 1-6 of the textbook ("The range of study of" Thermodynamics "),
read through Chapter 7 p.109-112, clarify the points that can not be understood and go to class.
[Review] Reviewing what you learned in the lesson and organizing your notes. |
| [2] | Conversion of thermal energy to kinetic energy (2) (nozzle flow)
[preparation] Read Chapter 7 (p.113-119), clarify the points that can not be understood and go to class.
[Review] Solving exercises 7.1 to 7.4 on p.120 and submitting it as a report at the start of the next lesson. |
| [3] | State change of steam (1) (phase change, phase rule) |
| [4] | State change of steam (2) (property of water, degree of dryness) |
| [5] | Status change of steam (3) (steam chart, hs chart) |
| [6] | Steam cycle (1) (work of steam turbine) |
| [7] | Steam cycle (2) (Rankine cycle) |
| [8] | Steam cycle (3) (reheat / regeneration cycle) |
| [9] | Refrigeration and heat pump cycle (1) (refrigerator and heat pump) |
| [10] | Refrigeration and heat pump cycle (2) (various refrigeration cycles) |
| [11] | Air conditioning (1) (temperature and humidity) |
| [12] | Air conditioning (2) (wet air diagram) |
| [13] | Energy and Environment (1) (air pollution, global warming) |
| [14] | Energy and Environment (2) (environmental issues and countermeasures) |

[15]

Summary and Review

[Practice] We ask the representatives to write the answers for several problems on the blackboard separately, and explain.