

# Exercises in Aerospace Engineering1

Syllabus Number

2F302

Basic Major Subjects

Requisites 1 credit

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## 1. Course Description

Classes will be exercise-based. We shall study chemistry and thermodynamics and solve basic problems related to the theory of aerospace propulsion, orbital dynamics, and flight dynamics. Students will also practice listening comprehension in technical English, using an English text related to aerospace engineering.

## 2. Course Objectives

Our objective is to turn the knowledge of the students who have already learned into knowledge they can use. We will teach the basics, including chemistry as it relates to basic engineering, thermodynamics from the four dynamics that form the basis of aerospace engineering, and then how to solve problems related to orbital dynamics and flight dynamics. Ability in English is also of steadily increasing importance for life after graduation; therefore, the student will receive practice in listening comprehension for technical English related to aeronautical engineering.

## 3. Grading Policy

Each exercise will be graded and evaluation of grades by comprehensively summarizing those results. Basically it is necessary to take more than a passing score (60 points) each time. Your score will be "0" if you are absent.

In this exercise, there are five field exercises. Regarding exercises that are missed or failed and require retesting, the instructor in charge will give feedback and conduct a retest in a report format.

## 4. Textbook and Reference

### Textbook

Please follow the timetable. Do bring your textbooks, reference books, English-Japanese dictionary, notes, handouts etc. However, note that you cannot lend and borrow during exercise hours in principle. Exercise assignment paper and answer sheet. (For designated papers, it may be changed by instruction of teacher). Prepare and review using LMS.

## 5. Requirements(Assignments)

Open lecture notes, textbooks and LMS lecture materials that you have been taught about chemistry, aerodynamics, thermodynamics, Newtonian mechanics and aircraft dynamics, check if you understand basic laws and physical concepts and compile them in a notebook.

Also, solve the practice issues found at the end of the textbook chapter and write it in the notebook and see what kind of questions are being questioned.

More than 36 hours in that period are necessary for the review of this subject.

## 6. Note

We will distribute the schedule for the first exercise.

From 8th to 10th lesson, we will conduct interviews with English technical documents. Be punctual.

## 7. Schedule

Satoshi Yamada is in charge of the first to third times.

Chemistry fundamental exercise 1 (substance quantity, chemical reaction formula).

Chemistry fundamental exercise 2 (binding energy and reaction heat, concentration).

Chemistry fundamental exercise 3 (substance quantity · chemical reaction formula · summary of binding energy and reaction heat · concentration, examination).

Keizo Hashimoto is in charge of the fourth to seventh times.

Basic thermodynamics exercise 1 (state quantity of thermodynamics, Carnot cycle).

Basic thermodynamics exercise 2 (Otto cycle and diesel cycle).

Basic thermodynamics exercise 3 (Sabbath cycle and Brayton cycle).

Basic thermodynamics exercise 4 (reverse cycle of Stirling cycle, polytropic change).

Yoshihiro Koshioka is in charge from the 8th to the 10th.

Hearing 1 of aerospace engineering English textbook (Pitot tube principle, incompressible flow around the wing).

Hearing 2 of aerospace engineering English textbook (flow around the cylinder and Reynolds number)

Hearing 3 of aerospace engineering English textbook (lift characteristics of wing, induced drag)

Yoshihiro Tsuruda is in charge of the 11th to the 12th.

Basic exercise of spacecraft orbital dynamics 1 (Changes in orbit due to various factors)

Basic exercise of spacecraft orbital dynamics 2 (Observation of orbit from ground)

Hiroshi Yoneda is in charge of the 13th to the 15th.

Basic exercise of flight dynamics 1 (longitudinal stability)

Basic exercise of flight dynamics 2 (Flight Performance)

Basic exercise of flight dynamics 3 (lateral and directional stability)