

Introduction to Space Engineering

Syllabus Number

2B105

Basic Major Subjects

Elective Requisites 2
credit

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1. Course Description

This course provides fundamentals of space engineering (e.g., space transportation systems like rockets, reentry vehicles, spacecraft systems like satellites, interplanetary probes, space environment, and space utilization). Students can comprehend overviews of aerospace systems if they will attend this class after learning the "Introduction to Aeronautical Engineering" at a first-year undergraduate. This subject is related to the clause 2 of the diploma policy of the Department of Aerospace Engineering. This course consists lecture and interactive discussion which related to lecture topics.

2. Course Objectives

- Scope and overview of space engineering
- Fundamentals of space environment
- Objectives and motivations of space utilization
- History and current trends of space transportation system (rockets, reentry vehicles)
- History and current trends of spacecraft (satellites, interplanetary probes)
- Fundamentals of orbital dynamics (parameters, equations)
- Safety and reliability of space engineering through the example accidents

3. Grading Policy

- Attendance: more than 2/3 (Requirements to take End-term exam.)
- Homework: 20%
- Mid-term exam: 40%
- End-term exam: 40%

Detail solutions of homework will be shown in LMS and be given feedback at lecture.

4. Textbook and Reference

Textbook

Lecture materials will be provided from LMS. (If needed, printed materials will be distributed at lecture).

Reference

鈴木弘一 『はじめての宇宙工学』 森北出版、2007、ISBN-13: 978-4627690714

岩崎信夫 『図説 宇宙工学』 宇宙航空研究開発機構監修、日経印刷、2010、ISBN-13: 978-4904260715

5. Requirements(Assignments)

Preparation (1.5 hours): Students must read through the lecture materials and check in advance for any questions summarize them in a notebook.

Review (1.5 hours): Student must recheck the lecture materials, make reports or homework for better understanding.

6. Note

- Students will give presentations on homework assignments in the classes.
- Lecture contents may change depending on progress.
- Recommended items to bring to lecture: Devices to access Internet (like note PC, tablet PC, and smartphone, etc.)
- Open education tool : Todai TV (The University of Tokyo Online Video Program)
https://todai.tv/contents-list/2017FY/onishi_mission/04

7. Schedule

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| [1] | Introduction, history of space development |
| [2] | What is "space"? |
| [3] | Rocket, space shuttle |
| [4] | Satellite, planetary probe |
| [5] | Space infrastructures, space agencies in the world, civilian space developments |
| [6] | Summary of the former part, mid-term exam. |
| [7] | Fundamentals of orbital dynamics: overviews |
| [8] | Fundamentals of orbital dynamics: equations |
| [9] | Fundamentals of orbital dynamics: orbit transfer |
| [10] | Fundamentals of orbital dynamics: observation from ground station |
| [11] | Satellite utilization: GPS/GNSS |
| [12] | Satellite utilization: Earth observation |
| [13] | Satellite utilization: ISS and space environment |
| [14] | Failures, hazards, safety and reliability |
| [15] | Summary, end-term exam. |