宇宙ミッション入門

Syllabus Number 2B310

Special Subjects
Elective 2 credit

TSURUTA YOSHIHIRO

1. Course Description

This course provides advanced topics 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 applications of space systems if they will attend this class after learning the "Introduction to Space Engineering" at a second-year undergraduate. This subject is related to the clause 2 and 3 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

- Advanced knowledge of space environment
- Analysis and discussion for future space utilization
- Design of space transportation system (rockets, reentry vehicles)
- Design of spacecraft system (satellites, interplanetary probes)
- Advanced topics of orbital dynamics (unique orbits, perturbation)
- Specific design flow of space mission and spacecraft

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

岩崎信夫、的川泰宣著 『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

宮崎康行 『人工衛星をつくるー設計から打ち上げまでー』 オーム社、2011、ISBN-13: 978-4274503719

茂原正道、烏山芳夫 『衛星設計入門』 培風館、2002、ISBN-13: 978-4563067212

木田隆、小松敬治、川口淳一郎 『人工衛星と宇宙探査機』 コロナ社、2001、ISBN-13: 978-4339012231

James Richard Wertz 『Space Mission Engineering: The New Smad』 Microcosm Press、2011、ISBN-13: 978-1881883159

5. Requirements(Assignments)

Pre-condition: Students must understand the fundamental topics of space engineering though the previous lecture "Introduction to Space Engineering" at a second-year undergraduate.

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.
- Necessary items to bring to lecture: function calculator or note PC, tablet PC, smartphone.
- 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/komaba-fes2017/05

7. Schedule

[1]	Introduction, review of “Introduction of Space Engineering”
[2]	Advanced space environment: environmental factors which causes barriers for spacecraft and manned space exploration
[3]	Advanced Space Transportation: rockets, reentry vehicles.
[4]	Advanced orbital dynamics (1): Perturbation
[5]	Advanced orbital dynamics (2): Equations considering perturbation
[6]	Advanced orbital dynamics (3): Comparison of perturbation forces
[7]	Advanced orbital dynamics (4): Trajectory to moon, planets, swing-by
[8]	Summary of the former part, mid-term exam.
[9]	Space mission and spacecraft design (1): mission definition, requirement analysis
[10]	Space mission and spacecraft design (2): system architecture design
[11]	Space mission and spacecraft design (3): subsystem design, components selection and design
[12]	Space mission and spacecraft design (4): sizing ~ solar panel, battery, antenna, memory, etc.
[13]	Space mission and spacecraft design (5): on-ground verification and validation

[14] Space mission and spacecraft design (6): operation, procedure of mission termination

[15] Summary, end-term exam.