Space Engineering International Course
Syllabus 2024

English ＸＡ (英語ＸＡ)

【Course code】 26009663 **[Instructor] WATANABE Hiroaki [Credits] 1**
【Semester】 spring
【Class Time】 Mon 5 period

Course Description

To teach students how to write technical abstracts, and full research papers that meet global standards. Students will bring in content that is related to their thesis, and will learn to build up their academic writing ability. They will learn more technical terminology, and various aspects of how to best structure their academic paper and thesis. They will learn to summarize academic papers.
They will be exposed to spoken English (videos of lectures etc.) related to their research field.

Classes will be conducted with Moodle.

Course and Curriculum linkage

Intended for students of the Space Engineering International Course (SEIC).

Course Calendar/Class Topic

1
Course overview, summary and paraphrasing and avoiding plagiarism. Step-by-step introduction to characteristics of a good abstract.
2
Review of summarizing and paraphrasing; introduction to self- and peer-evaluation techniques; Abstract introduction and method. Homework as directed by the instructor: Summary of research.
3 Abstract discussion and conclusion. Turn in your study’s summary.
4 Introduction to common errors
5 Presenting your research (1) (practice); Self-evaluation and goal setting; Editing.
6 Presenting your research (2); Peer-reviewing (structure, format and language conventions review).
7 Summarizing academic papers (1) Choosing an appropriate topic
8 Summarizing academic papers (2); Homework as directed by the instructor
9
Writing research introduction; Researching the topic background; Describing aims and writing good research questions; Write a summary about your study’s introduction, literature, problem and research questions; Homework as directed by the instructor
10 Writing research method; Poster Session writing: Turn in summary of study’s introduction.
11
Writing research results; Poster Session writing; Turn in summary of research method. Homework as directed by the instructor
12
Write the discussion and significance of your research results. How to present results; Poster writing, facts, details and delivery. Turn in summary of research results. Homework as directed by the instructor.
13
Writing research references and citations . Presenting your research (practice), as well as on student self-evaluation, goal setting, along with reviewing the fundamentals of abstract and academic writing. Turn in completed summary; Homework as directed by the instructor.
14
Presenting your research (1); Peer-editing (structure, format and language conventions review). Homework as directed by the instructor.
15 Peer-editing; Turn-in Final Paper
16 Final Exam and student survey

General Course Policies

All class sessions are conducted in English. This class has informal conversation, peer-assisted learning and writing practice.
Class assignments will be conducted with Moodle.

Course Objectives

By the end of this course, students should:

1. Understand the basic conventions of an abstract
2.
Understand how to concisely state research objectives, explain the research background, describe the research design and present results
3. Understand how to use appropriate register and tone for the specific genre of writing
4. Be able to write grammatically accurate sentences using appropriate vocabulary
5. Be able to write academic papers in English

Evaluation Methods and Grading Criteria

20% Summary of Student’s Study
20% Research Drafts
20% Teacher Discretion
40% Final Exam

Assignment Instructions

Active participation is expected in class activities. Students are expected to prepare for class warm-up each week and assist each other.
Students are expected to set aside 0.5 hours a week as time for class preparation.

Keywords

Descriptive writing, evaluation, cooperative / autonomous learning, creative process: brainstorming, organizing, drafting, reviewing, revising, publishing

Required Textbooks

Writing Research Papers 4 (published by Macmillan)

References/Recommended Reading

Any English-English dictionary from a reputable publisher (eg. Cambridge, Oxford, Collins etc.) is recommended.

Notes

Create a free online account at https://www.grammarly.com/ (This helps you correct grammatical errors.)
dictionary.com online is useful.

Email

watanabe_hiro_kyutechST*runbox.com （Replace * with @）

Japanese for Beginners (日本語入門)

【Course code】 42000809
【Semester】 autumn
【Class Time】 Wed 2 period

[Instructor] YAMAJI Naoko [Credits] 1

Course Description

This course aims to provide an introduction to spoken Japanese to the international students who have little or no experience in learning Japanese. They will learn simple phrases and useful expressions for their daily life.

Course and Curriculum linkage

This class is only for the international students

Course Calendar/Class Topic

1 Introduction / Pronunciation / Greetings
2 Getting to know each other
3 Talking about food (in case you have to avoid religious prohibited food)
4 Making small talk (1)
5 Asking for things you need
6 Placing orders at shops and restaurants
7 Placing orders at shops and restaurants :Asking/ telling the prices
8 Review (1)
9 Making small talk (2)
10 Asking how to get a place with public transportation
11 Asking for consent or permission before doing something
12 Talking about physical conditions
13 Talking about physical conditions :Asking/telling the business hours
14 Being nice and friendly after absence
15 Review
16 Test

General Course Policies

We will use a romanized Japanese textbook and concentrate on developing the basic hearing and speaking abilities required in daily life.

Course Objectives

1. To get used to Japanese phoneme system
2. To be able to catch learned words and phrases
3. To be able to interact with others by using simple Japanese expressions

Evaluation Methods and Grading Criteria

Class participation, assignments, the final test.

Assignment Instructions

Students are expected to set aside 30 minutes a week as time for class preparation.

Keywords

Elementary Japanese

Required Textbooks

Learning materials will be provided in class.

References/Recommended Reading

To be announced as needed

Notes

None

Email

yamaji@dhs.kyutech.ac.jp

Space Environment Testing Workshop (宇宙環境試験ワークショップ)

【Course code】 26000813 **[Instructor] CHO Mengu [Credits] 1**
【Semester】 2nd quarter
【Class Time】 Fri 4 period, Fri 5 period

Course Description

A satellite is exposed to extreme environments such as vacuum, radiation and plasma. It is also exposed to severe vibration and shock onboard a rocket. Satellites have to operate maintenance-free and need to be tested thoroughly before the launch. The purpose of this subject is to learn the actual tests through hands-on laboratory workshop.

Course and Curriculum linkage

Space Environment Testing Workshop is a subject for the Space Engineering International Course (SEIC).

Course Calendar/Class Topic

1 Vibration - overview
2 Vibration - preparation
3 Vibration test
4 Vibration - analysis
5 Shock - overview
6 Shock - preparation
7 Shock test
8 Shock - analysis
9 Thermal vacuum - overview
10 Thermal vacuum - preparation
11 Thermal vacuum test
12 Thermal vacuum - analysis
13 Thermal cycle overview and preparation
14 Thermal cycle test
15 Thermal cycle - analysis

General Course Policies

The classes will be laboratory workshops

Course Objectives

1. Obtain hands-on experience of spacecraft testing
2. Understand the testing principle

Evaluation Methods and Grading Criteria

Report

Assignment Instructions

Download and read the lecture material before each lecture.

Keywords

Spacecraft Environment, Testing

Required Textbooks

None

References/Recommended Reading

HARRIS' SHOCK AND VIBRATION HANDBOOK, Allan G. Piersol, Thomas L Paez, Macgrawhill, Spacecraft Thermal Control Handbook, David G. Gilmore, Aerospace Press
JAXA-JERG-2-130「宇宙機一般試験標準」
SMC-S-016 "TEST REQUIREMENTS FOR LAUNCH, UPPER-STAGE AND SPACE VEHICLES"
ISO-15864 " Space systems — General test methods for space craft, subsystems and units"
ECSS-ST-10-03 "Space Engineering – Testing"

Notes

This workshop is for students who register the Space Engineering International Course only. Students are supposed to finish Space Environment Testing.

Email

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Space Systems PBL I (宇宙システムＰＢＬI)

【Course code】 26990824
【Semester】 3rd quarter
【Class Time】

[Instructor] CHO Mengu [Credits] 1

Course Description

Space system spans a wide range of fields such as mechanical, electrical, material and other engineerings and consists of a huge number of parts and numerous softwares, It is also required to function maintenance-free for a long time in the extreme environment in space. A satellite flies over any countries regardless the border. Therefore, its usage requires a global point of view. It is not sufficient to learn via textbooks and lectures, in order to learn how to design the system elements, combine them, test and operate to bring the satellite value to the users. Students carry out a project in a group made of a few numbers to develop hypothetical space system or real nano-satellite, rocket, spacecraft and others. Students organize the user requirements and perform system conceptual design by incorporating them into the system requirements and the design requirements. This PBL will be conducted in English as a subject of Space Engineering International Course.

Course and Curriculum linkage

Space Systems PBL I is a subject for the Space Engineering International Course (SEIC).

Course Calendar/Class Topic

To be announced by the project supervisors.

General Course Policies

To be announced by the project supervisors.

Course Objectives

1. Obtain experience of space system design
2. Obtain experience of inter-cultural communication

Evaluation Methods and Grading Criteria

To be announced for each project.

Assignment Instructions

To be announced for each project.

Keywords

To be announced for each project.

Required Textbooks

To be announced for each project.

References/Recommended Reading

To be announced for each project.

Notes

None

Email

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Space Systems PBL II (宇宙システムＰＢＬⅡ)

【Course code】 26990825
【Semester】 4th quarter
【Class Time】

[Instructor] CHO Mengu [Credits] 1

Course Description

Space system spans a wide range of fields such as mechanical, electrical, material and other engineerings and consists of a huge number of parts and numerous softwares, It is also required to function maintenance-free for a long time in the extreme environment in space. A satellite flies over any countries regardless the border. Therefore, its usage requires a global point of view. It is not sufficient to learn via textbooks and lectures, in order to learn how to design the system elements, combine them, test and operate to bring the satellite value to the users. Students carry out a project in a group made of a few numbers to develop hypothetical space system or real nano-satellite, rocket, spacecraft and others. Students organize the user requirements and perform system conceptual design by incorporating them into the system requirements and the design requirements. This PBL will be conducted in English as a subject of Space Engineering International Course.

Course and Curriculum linkage

Space Systems PBL II is a subject for the Space Engineering International Course (SEIC).

Course Calendar/Class Topic

To be announced by the project supervisors.

General Course Policies

To be announced by the project supervisors.

Course Objectives

1. Obtain experience of space system design
2. Obtain experience of inter-cultural communication

Evaluation Methods and Grading Criteria

To be announced for each project.

Assignment Instructions

To be announced for each project.

Keywords

To be announced for each project.

Required Textbooks

To be announced for each project.

References/Recommended Reading

To be announced for each project.

Notes

To be announced for each project.

Email

To be announced for each project.

Advanced Embedded Systems (組み込みシステム特論)

【Course code】 26100001 **[Instructor] ASAMI Kenichi [Credits] 2**
【Semester】 2nd quarter
【Class Time】 Thu 5 period, Thu 6 period

Course Description

This lecture provides design methodology, working principles, and organization of embedded systems.
Fundamentals of computer architecture, digital circuits, and systems modeling languages will be introduced.

Course and Curriculum linkage

Intended for students of the Space Engineering International Course (SEIC).

Course Calendar/Class Topic

1 Embedded systems
2 Logic circuits (1)
3 Logic circuits (2)
4 Verilog HDL (1)
5 Verilog HDL (2)
6 FPGA (1)
7 FPGA (2)
8 ARM microprocessor (1)
9 ARM microprocessor (2)
10 UML/SysML (1)
11 UML/SysML (2)
12 SystemC (1)
13 SystemC (2)
14 Presentation (1)
15 Presentation (2)

General Course Policies

Mini-tests are imposed for the understanding of each topic.

Course Objectives

Students understand embedded systems design process.

1. Students expand understanding of embedded systems design.
2. Students enhance understanding of digital systems development.
3. Students utilize understanding of systems modeling languages.

Evaluation Methods and Grading Criteria

The grade is evaluated by mini-tests, presentation, and final report.

Assignment Instructions

Students are required to review the lecture slides.
Students are expected to set aside 4 hours a week as time for class preparation.

Keywords

Embedded systems, FPGAs, ARM microprocessor, UML/SysML, SystemC

Required Textbooks

The lecture slides will be provided on Moodle.

References/Recommended Reading

[1] Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design 2nd Edition, Morgan Kaufmann, 2008.
[2] Sarah Harris, David Harris, Digital Design and Computer Architecture ARM Edition, Morgan Kaufmann, 2015.
[3] Clive Maxfield, The Design Warrior's Guide to FPGAs, Newnes, 2004.

Notes

Nothing special.

Email

Provided on Moodle.

Vision and Image Recognition (視覚画像認識特論)

【Course code】 26500911 **[Instructor] HANAZAWA Akitoshi [Credits] 2**
【Semester】 3rd quarter
【Class Time】 Wed 3 period, Fri 2 period

Course Description

With the progress of image recognition algorithms, image recognition technologies are utilized in many fields, e.g. robotics, vision assistance, security, car safety system, etc. To understand image reconition systems, students studies about the characteristics of digital images, feature detection, reognition methods, machin learning algorithms. In the class, for the experience of practical image recognition systems, each student uses computer tools related to image processing and machine learning, which is, OpenCV, Processing, Maxima, R. By doing assignments using these tools, students learn techniques applicable for their research activities.

Course and Curriculum linkage

In this class, students will experience image feature detection and machine learning by running their own programs using image processing and machine learning tools such as Python, OpenCV, and Processing. In addition, by performing assignments using these tools, students will deepen their understanding of the content and learn techniques that can be used in graduate school research activities.

Course Calendar/Class Topic

1 Basic Knowledge
2 Linear Regression 1
3 Linear Regression 2
4 Non-Linear Neural Network
5 Multi-Layer Neural Network
6 Tensorflow
7 Pattern Recognition by CNN
8 Image Recognition by CNN 1
9 Image Recognition by CNN 2
10 Object Detection 1
11 Object Detection 2
12 Transfer Learning & Fine Tuning
13 Group Work 1
14 Group Work 2
15 Image Caption

General Course Policies

Moodle is used for the distribution of lecture materials, task submission and examination. For doing the tasks using C langulage, Processing, Maxima, etc. and thir submission, students must bring their own PC. (Let the teacher know if it is impossible before the class starts.)

Course Objectives

1. Understand basics of digital image processing.
2. Understand statistical characteristics of digital image components.
3. Understand image recognition by machine learning.

Evaluation Methods and Grading Criteria

Task submission 60% and final exam 40%,

Assignment Instructions

Students are expected to set aside 4 hours a week as time for class preparation.

Keywords

Image Recognition, Machine Learning

Required Textbooks

Use online (moodle) materials.

References/Recommended Reading

Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow 2, 3rd Edition, Packt Publishing, ISBN-13 ： 978-1789955750

Notes

It is recommended to review Python language.

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Advanced Mechanics of Materials (材料力学特論)

【Course code】 26450810 **[Instructor] YAMAGUCHI Eiki [Credits] 2**
【Semester】 1st quarter
【Class Time】 Mon 2 period, Mon 5 period

Course Description

For a good prediction of structural behavior, the modeling of material behavior (stress-strain relationship) is very important. To this end, plasticity-based modeling of material behavior is studied in this course.

Course and Curriculum linkage

Prerequisite: structural mechanics
Without a good understanding of structural mechanics, no one could pass this course in the past.

Course Calendar/Class Topic

1 Plasticity-Based Modeling of 1D
2 Plasticity-Based Modeling of 1D
3 Example Problem
4 Essentials of Stress
5 Essentials of Stress
6 Essentials of Strain
7 Essentials of Stress-Strain Relationship
8 Plasticity Theory in Multi-Dimension
9 Plasticity Theory in Multi-Dimension
10 Plasticity Theory in Multi-Dimension
11 Stress-Strain Relationship
12 Stress-Strain Relationship
13 Example Problem
14 Example Problem
15 Example Problem

General Course Policies

Plasticity-based constitutive model is studied. From the one-dimensional model, the fundamental of the plasticity theory is discussed first. The plasticity theory for multi-axial stress state is then explained. To be specific, the constitutive relationship for von Mises material is given in detail.

Course Objectives

The goal of this course is to acquire a good knowledge of the plasticity theory. It is important to evaluate the ultimate strength of a structure and required for the seismic design of a structure.

Evaluation Methods and Grading Criteria

The mid-term exam and the final exam would be given, based on which the grade would be determined.

Assignment Instructions

Students are expected to study for 4 hours a week in addition to the lecture.

Keywords

stress, strain

Required Textbooks

None

References/Recommended Reading

Plasticity for Structural Engineers, Wai-Fah Chen and Da-Jian Han
J. Ross Publishing

Notes

This lecture is given in English.

Email

Given in the lecture.

Advanced Analysis of Structures (構造解析特論)

【Course code】 26600001 **[Instructor] CHEN Pei-Shan [Credits] 2**
【Semester】 4th quarter
【Class Time】 Tue 3 period, Tue 4 period

Course Description

This course will introduce you to the study of nonlinear behavior of structures, including the basic theories on buckling analysis of space frames, analysis of cable structures, and Elasto-Plastic analysis of rigid frames. Furthermore, this course will equip you with the knowledge to anchor your understanding of structural design of space structures, high-rise buildings and mechanical structures.
This is also a course of Space Engineering, and the lectures will be given in English.

Course and Curriculum linkage

It is desirable that the attendees have the basic knowledge of Structural Mechanics.

Course Calendar/Class Topic

1 Introduction, Nonlinear analysis (Part 1)
Nonlinear Analysis of a 2-Bar system

2 Nonlinear analysis (Part 2)
Principle of stationary potential energy

3 Nonlinear analysis (Part 3)
Iteration and incremental analysis (Geometric stiffness)

4 Nonlinear analysis (Part 4)
Coordinate transformation and nonlinear element stiffness matrices

5 Nonlinear analysis (Part 5)
Nonlinear stiffness matrices by principle of virtual work

6 Nonlinear analysis (Part 6)
Incremental analysis and convergence

7 Nonlinear analysis (Part 7)
Nonlinear buckling analysis and bifurcation of space frames (Imperfections sensitivity)

8 Nonlinear analysis (Part 8)
Linear buckling analysis

9 Cable structure (Part 1)
Introduction; Suspension cables (parabolic profile)

10 Cable structure (Part 2)
Suspension cables (catenary profile), Influence of boundary condition

11 Cable structure (Part 3)
Prestressing analysis of tensegric structures

12 Cable structure (Part 4)
Linear and nonlinear analysis of tensegric Structures

13 Elasto-plastic analysis (Part 1)
Introduction, Homogeneous Beams

14 Elasto-plastic analysis (Part 2)
Combined Bending and axial force

15 Elasto-plastic analysis (Part 3)
Elasto-plastic analysis of structures

General Course Policies

Students may be asked to explain and/or solve questions during lesson. After the lesson, every student should complete his/her homework and review the lecture contends simultaneously for more deep understanding.

Course Objectives

1. Knowledge of nonlinear analysis of space frames and mechanical structures.
2. Knowledge of analysis of cable structures.
3. Elasto-plastic analysis of building and mechanical structures.

Evaluation Methods and Grading Criteria

The overall grade will be decided based on short reports and the attendance.

Assignment Instructions

Attendees should prepare to explain and/or solve questions in turn during lectures.

Keywords

Nonlinear analysis, Buckling analysis, Spatial Structures, Space frames, Cable structure, Elasto-plastic analysis,
非線形力学解析，座屈解析，スペースフレーム，ケーブル構造，弾塑性解析

Required Textbooks

No textbook. Reference books may be introduced during the lecture.

References/Recommended Reading

No textbook. Reference books may be introduced during the lecture.

Notes

It is desirable that the attendees have the basic knowledge of Structural Mechanics.

Email

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Computational Fluid Dynamics (数値流体力学特論)

【Course code】 26440902 **[Instructor] TSUBOI Nobuyuki [Credits] 2**
【Semester】 1st quarter
【Class Time】 Tue 2 period, Fri 2 period

Course Description

Recent numerical methods to solve fluid dynamics have been improved remarkably. Many engineering companies use some commercial codes to design some products; however, basic knowledge must be required to use such the commercial codes. This course presents recent numerical simulation methods for compressible fluid in order to understand some basic solver and recent numerical techniques.

Course and Curriculum linkage

Basic knowledge of thermal and fluid dynamics-related subjects, especially compressible fluid dynamics, is mandatory. This course is the basis for understanding numerical methods for compressible fluids.

Course Calendar/Class Topic

1 Introduction
2 Numerical method for scalar equation
(a)Finite difference method

3
(b)Higher-order upwind difference method

4 Numerical method for system equation
(a)Finite difference method

5
(b)Solution method for system equation

6
(c)Approximate Riemann solver

7
(d)Various numerical fluxes

8
(e) Recent numerical fluxes

9 Transfer on general coordinate and grid generation method
10 Time integration method
(a) Scalar equation

11
(b) System equation

12 Initial and boundary condition
13 Numerical method on unstructured grid
14 Numerical method for turbulence
15 Stability analysis and recent topics

General Course Policies

Lectures are given by the above items, and exercises and review reports are required to promote understanding of the content of the lecture.

Course Objectives

1. Understand the role of numerical analysis methods in fluids
2. Understand the difference method
3. Understand the numerical flux method
4. Understand the time integration method

Evaluation Methods and Grading Criteria

Grade is evaluated by attendance of class, reports, and final examination.

Assignment Instructions

You should read distributed materials before the lecture and investigate some technical home works. Students are expected to set aside 4 hours a week as time for class preparation.

Keywords

Compressible Flow, Numerical Simulation, Compressible Flow

Required Textbooks

K. Fujii, Numerical Methods for Computational Fluid Dynamics, University of Tokyo Press(1994), in Japanese

References/Recommended Reading

(1)C. Hirsch, Numerical Computation of Internal and External Flows(2nd Edition), Butterworth-Heinemann(2007)
(2)小林敏夫 編，数値流体力学ハンドブック，丸善(2003), in Japanese
(3) R. W. MacCormack, Numerical Computation of Compressible and Viscous Flow, AIAA Education Series(2014)

Notes

It is desirable or recommended for the students to take courses related to “Fluid Dynamics”, “Compressible Fluid Dynamics” and so on in the undergraduate course.

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High-speed Gas Dynamics (高速気体力学特論)

【Course code】 26440903 **[Instructor] TSUBOI Nobuyuki [Credits] 2**
【Semester】 3rd quarter
【Class Time】 Mon 4 period, Thu 1 period

Course Description

Rockets, airplanes, and space vehicles fly under severe environments. The flight velocity changes from subsonic speed to supersonic and hypersonic speeds. The flight environment changes from a continuum regime to a low-density regime. This course presents fluid dynamics under such the flight environments of the space vehicles to understand the fundamental of the fluid dynamics.

Course and Curriculum linkage

Basic knowledge of thermal and fluid mechanics-related subjects, especially compressible fluid dynamics, is mandatory. This course is the basis for understanding high Mach number flow.

Course Calendar/Class Topic

1 Introduction
2 Fundamental theory of compressible flow
3 Hypersonic gas dynamics
(1) What is hypersonic low?

4
(2)Experimental approach

5
(3) Various approximate solution methods

6
(4) Inviscid hypersonic flow

7
(5)Viscous hypersonic flow

8
(6)Real gas effects

9
(7)Radiation

10
(8)Wind tunnel testing for hypersonic flow

11 4. Rarefied gas dynamics
(1)What is rarefied gas dynamics?

12
(2)Feature of gas dynamics from microscopic view

13
(3)Feature of gas under equilibrium state

14
(4)Gas-surface interaction

15
(5)Numerical simulation on rarefied gas dynamics

General Course Policies

Lectures are given by the above items, and exercises and review reports are required to promote understanding of the content of the lecture.

Course Objectives

1. Understand the concept of hypersonic flow
2. Understanding the various approximate solutions
3. Understand the real gas effect
4. Understand the rarefied gas flow

Evaluation Methods and Grading Criteria

Grade is evaluated by attendance of class, reports, and final examination.

Assignment Instructions

You should read distributed materials before the lecture and investigate some technical home works. Students are expected to set aside 4 hours a week as time for class preparation.

Keywords

Hypersonic Flow, Compressible Flow, Reentry, Rarefied Gas Flow

Required Textbooks

Distributed prints

References/Recommended Reading

(1)J.D.Andarson, Jr., Hypersonic and High Temperature Gas Dynamics, McGraw-Hill(1989)
(2)Bird, G.A., Molecular Gas Dynamics and the Direct Simulation of Gas Flow, Oxford(1994)
(3)日本機械学会 編，原子・分子の流れ，共立出版(1996)
(4)小林敏夫 編，数値流体力学ハンドブック，丸善(2003)

Notes

It is desirable or recommended for the students to take courses related to “Fluid Dynamics”, “Compressible Fluid Dynamics” and so on in the undergraduate course.

Email

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Advanced Space Robotics (宇宙ロボティクス特論)

【Course code】 26630001 **[Instructor] NAGAOKA Kenji [Credits] 2**
【Semester】 1st quarter
【Class Time】 Tue 1 period, Thu 3 period

Course Description

Currently, robotics technologies have been required for various space applications to support or replace human space activities. In particular, robotics exploration is necessary for deep space exploration. This course introduces the fundamentals and applications of space robotics. Specifically, this course expects students to learn and have a better understanding of fundamental dynamics, control technique, and autonomous technology of space robotics.

Course and Curriculum linkage

This lecture expects that students have understood the fundamentals of dynamics, control engineering, and robotics. Understanding space engineering is also preferable, but not necessarily required.

Course Calendar/Class Topic

1 Introduction of Space Robotics
2 Kinematics and Dynamics of Space Manipulator
3 Control of Space Manipulator
4 Contact Dynamics of Space Manipulator
5 Object Capture by Space Manipulator
6 Vibration Suppression Control of Flexible Space Structure
7 Tele-Operation Technology and Autonomy
8 Locomotion Mechanism of Planetary Robot
9 Terramechanics for Planetary Robotics (1)
10 Terramechanics for Planetary Robotics (2)
11 Autonomous Technology for Planetary Robotics (1)
12 Autonomous Technology for Planetary Robotics (2)
13 Robotics for Minor Body Exploration
14 Drilling Technology on Extraterrestrial Body
15 State-of-the-Art Topics in Space Robotics

General Course Policies

This lecture is provided based on Moodle and Zoom with the lecture notes according to the above topics.

Course Objectives

This lecture aims at understanding Space Robotics and the followings are goals/objectives.

1. Understanding of foundations of microgravity robotics
2. Understanding of foundations of planetary robotics

Evaluation Methods and Grading Criteria

Comprehensive evaluation of attendance and reporting assignments.

Assignment Instructions

Four-hour-a-week of self-learning for preparation based on the lecture materials and reference books.

Keywords

Robotics, Control Engineering, Space Technology, Contact Dynamics, Terramechanics

Required Textbooks

N/A.

References/Recommended Reading

[1] A. Elley, An Introduction to Space Robotics, Springer.
[2] R. Vepa, Dynamics and Control of Autonomous Space Vehicles and Robotics, Cambridge University Press.
[3] J. Y. Wong, Theory of Ground Vehicles, Wiley.
[4] J. A. Pytka, Dynamics of Wheel-Soil Systems, CRC Press.

Notes

This lecture the SEIC subject and thus is given in English while supplementary explanations is provided in Japanese as appropriate.

Email

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Advanced Space Dynamics (スペースダイナミクス特論)

【Course code】 26440819 **[Instructor] HIRAKI Koju [Credits] 2**
【Semester】 3rd quarter
【Class Time】 Mon 1 period, Thu 2 period

Course Description

This course aims to promote the understandings of the basic formulations of two-body problems in three-dimensional coordinates, taking an artificial satellite and a spacecraft as examples. The lectures are given in English.

Course and Curriculum linkage

Advanced Space Dynamics is a subject for the Space Engineering International Course (SEIC).

Course Calendar/Class Topic

1 Two-body problem
2 Eccentricity and orbital energy
3 Trajectory equation and Keplerian orbit
4 Kepler's law
5 Kepler's equation
6 Orbital elements
7 Orbits of planets in solar system
8 Transformation of coordinates
9 Hohmann transfer
10 Launch window
11 Sphere of influence
12 Patched conics
13 Swing by
14 Trajectory design of planetary swingby
15 Presentations

General Course Policies

All the lectures are made completely in English. Only the fundamentals of dynamics are required.

Course Objectives

The goal of this course is to be able to design an interplanetary orbit.

1. understand orbital elements
2. predict the positions of a satellite on the orbital element
3. understand a launch window

Evaluation Methods and Grading Criteria

Several assingments will be given. Students are required to submit documents for them. For some assingments students are requested to make presentations in front of attendee.

Assignment Instructions

The basics are given in the course. The assignments are achievable based on the knowledge given in the lectures. Students are expected to set aside 8 hours a week as time for class preparation.

Keywords

planets, trajectory design, deep-space exploration

Required Textbooks

No textbook is necessary.

References/Recommended Reading

Not specified. You can refer to the internet, if necessary.

Notes

The assignments need calculations using a spreadsheet application or program language.

Email

hiraki.koju735@mail.kyutech.jp

Introduction to Satellite Engineering (衛星工学入門)

【Course code】 26500908 **[Instructor] CHO Mengu [Credits] 2**
【Semester】 4th quarter
【Class Time】 Thu 1 period, Thu 2 period

Course Description

The purpose of this lecture is to provide an overview of satellite engineering with its emphasis on micro- and nano-satellite technologies and systems engineering approach such as verification and test.

Course and Curriculum linkage

Introduction to Satellite Engineering is a subject for the Space Engineering International Course (SEIC).

Course Calendar/Class Topic

1. Introduction
2. Propulsion Basics
3. Propulsion System
4. Orbital Mechanics
5. Mission Analysis part.1
6. Mission Analysis part.2
7. Mission Analysis (constellation)
8. Electrical Power Systems
9. Prelaunch Environment and Spacecraft Structures
10. Spacecraft Dynamics and Attitude Control part.1
11. Spacecraft Dynamics and Attitude Control part.2
12. Thermal Control
13. Communication part.1
14. Communication part.2
15. Small Satellite Engineering

General Course Policies

The lectures will be done according to the schedule above. Some of the lectures will be done remotely.

Course Objectives

1. Understand the basic of satellite system

Evaluation Methods and Grading Criteria

Home works and discussion in the class

Assignment Instructions

Download and read the lecture material before each lecture.
Students are expected to set aside 4 hours a week as time for class preparation.

Keywords

satellite engineering, Spacecraft Systems Engineering

Required Textbooks

1. Spacecraft Systems Engineering, edited by Peter Fortescue et al., Wiley

References/Recommended Reading

1. Space Mission Analysis and Design, Third Edition, edited by James Werts and Wiley Larson, Space Technology Library
2. Space Vehicle Design, second edition, Michael Griffin and Jame French, AIAA

Notes

This lecture is provided in English.

Email

cho.mengu801(at)mail.kyutech.jp

Satellite Power System I (衛星電力システム特論I)

【Course code】 26500928 **[Instructor] CHO Mengu [Credits] 1**
【Semester】 3rd quarter
【Class Time】 Fri 4 period, Fri 5 period

Course Description

Power system is one of the most important subsystems to determine the fate of satellite mission. Without power, a satellite is useless. This lecture provides introduction of satellite power system from individual elements to overall pictures, as well as future prospect.

Course and Curriculum linkage

Satellite Power System I is a subject for the Space Engineering International Course (SEIC).

Course Calendar/Class Topic

1 Architecture of electrical power system
2 Photovoltaic-Battery System
3 Power system design
4 Solar cell principle
5 Space solar cell state-of-art
6 Environmental effect
7 Environmental effect
8 Solar array system

General Course Policies

The lectures will be done according to the schedule above. Some of the lectures will be done remotely.

Course Objectives

Understand the satellite power system

Evaluation Methods and Grading Criteria

Reports and mini tests

Assignment Instructions

Read a paper listed as reference during each lecture.
Students are expected to set aside 2 hours a week as time for class preparation.

Keywords

Satellite Power, Solar Array, Battery, Power Control, Power Distribution

Required Textbooks

None

References/Recommended Reading

Reference book;
Spacecraft Power Systems by Mukun R. Patel, CRC Press, 2005

Notes

This lecture is provided in English. It is desirable for students to take Space Systems Engineering (宇宙システム工学) and/or Introduction to Satellite Engineering (衛星工学入門) as well. It is strongly recommended to take Satellite Power System Ⅱ with this subject.

Email

cho.mengu801[at]mail.kyutech.jp (Replace [at] with @)

Satellite Power System II (衛星電力システム特論II)

【Course code】 26500929 **[Instructor] CHO Mengu [Credits] 1**
【Semester】 4th quarter
【Class Time】 Fri 4 period, Fri 5 period

Course Description

Power system is one of the most important subsystem to determine the fate of satellite mission. Without power, a satellite is useless. This lecture provides introduction of satellite power system from individual elements to overall pictures, as well as future prospect.

Course and Curriculum linkage

Satellite Power System II is a subject for the Space Engineering International Course (SEIC).

Course Calendar/Class Topic

1 Battery
2 Space battery state-of-art
3 Battery safety
4 Power control algorithm
5 Power control hardware
6 Reliability
7 High voltage power system
8 Small satellite power system

General Course Policies

The lectures will be done according to the schedule above. Some of the lectures will be done remotely.

Course Objectives

Understand the satellite power system

Evaluation Methods and Grading Criteria

Reports and mini tests

Assignment Instructions

Read a paper listed as reference during each lecture.
Students are expected to set aside 2 hours a week as time for class preparation.

Keywords

Satellite Power, Solar Array, Battery, Power Control, Power Distribution

Required Textbooks

None

References/Recommended Reading

Spacecraft Power Systems by Mukun R. Patel, CRC Press, 2005

Notes

This lecture is provided in English. It is desirable for students to take Space Systems Engineering (宇宙システム工学) and/or Introduction to Satellite Engineering (衛星工学入門) as well. It is strongly recommended to take Satellite Power System I before taking this subject.

Email

cho.mengu801(at)mail.kyutech.jp

Space Environment Testing (宇宙環境試験)

【Course code】 26500915 **[Instructor] CHO Mengu [Credits] 2**
【Semester】 1st quarter
【Class Time】 Fri 4 period, Fri 5 period

Course Description

A satellite is exposed to extreme environments such as vacuum, radiation and plasma. It is also exposed to severe vibration and shock onboard a rocket. Satellites have to operate maintenance-free and need to be tested thoroughly before the launch. The purpose of the lectures is to understand from the basics about necessity, background of test levels and conditions, judgment criteria of each test.

Course and Curriculum linkage

Space Environment Testing is a subject for the Space Engineering International Course (SEIC).

Course Calendar/Class Topic

1 Space environment tests, why necessary?
2 Satellite development and test strategy
3 Vibration test principle
4 Vibration test methods and analysis
5 Shock test principle
6 Shock test and analysis
7 Thermal vacuum test principle
8 Thermal vacuum test method and analysis
9 Thermal vacuum or thermal cycle
10 Antenna and communication test
11 EMC test
12 Outgas test
13 Radiation test
14 Radiation test
15 Test standard

General Course Policies

The lectures will be done according to the lecture schedule above. Some of the lectures will be given remotely.

Course Objectives

1. Understand the effects of space environment on spacecraft
2. Understand spacecraft verification processes
3. Understand rationales of each testing
4. Understand testing procedures

Evaluation Methods and Grading Criteria

Reports and mini-test

Assignment Instructions

Download and read the lecture material before each lecture.
Students are expected to set aside 4 hours a week as time for class preparation.

Keywords

Space Environment, Verification, Testing

Required Textbooks

None

References/Recommended Reading

参考書: HARRIS' SHOCK AND VIBRATION HANDBOOK, Allan G. Piersol, Thomas L Paez, Macgrawhill, Spacecraft Thermal Control Handbook, David G. Gilmore, Aerospace Press
JAXA-JERG-2-130「宇宙機一般試験標準」
SMC-S-016 "TEST REQUIREMENTS FOR LAUNCH, UPPER-STAGE AND SPACE VEHICLES"
ISO-15864 " Space systems — General test methods for space

Notes

This lecture is provided in English. It is desirable for students to take space system related subjects, such as Space Systems Engineering and Introduction to Satellite Engineering. Also, laboratory workshop will be held in Space Environment Testing Workshop

Email

cho.mengu801(at)mail.kyutech.jp

Space Systems Engineering I (宇宙システム工学I)

【Course code】 26500950 **[Instructor] IWATA Takanori [Credits] 1**
【Semester】 3rd quarter
【Class Time】

Course Description

A large-scale integrated system that consists of spacecraft (satellite, probe, and space station), launch vehicle, ground systems, and communication network is required to realize space mission for space utilization and space exploration. Engineering management including project management, systems engineering, and safety and mission assurance is indispensable process for us to enable to build and operate such a complex space system to accomplish the mission goal. The scope of the two courses, Space Systems Engineering I & II, is to review element, system, and mission technologies of space system and to provide an overview of the engineering management methodologies, with an emphasis on project management (PM) and systems engineering (SE). The goal of these courses is to train students to be able to design, propose, and implement space missions.

Course and Curriculum linkage

Space Systems Engineering I & II are subjects for the Space Engineering International Course (SEIC). Space Systems Engineering I provides a review of space mission, space system, constraints, and satellite system/subsystem design and fundamentals of project management/systems engineering with applications to space development. Space Systems Engineering II further explores detailed steps of project management/systems engineering processes applied to space development, with various exercises.

Course Calendar/Class Topic

1 Introduction and Space System Overview
2 Spacecraft System Design
3 Spacecraft Subsystem Design
4 Introduction to Project Management
5 Applied Project Management for Space Development
6 Introduction to Systems Engineering
7 Applied Systems Engineering for Space Development
8 Safety and Mission Assurance
9 Comparison of Space Agencies' PM/SE
10 Final Examination

General Course Policies

Lectures are given by oral presentation with lecture materials provided before each lecture. Language is English. Face-to-face presentation is a baseline, but some lectures could be given remotely.

Course Objectives

The goal of the two courses, Space Systems Engineering I & II, is to train students to be able to design, propose, and implement space missions. In particular, the goal of Space Systems Engineering I includes:

1. To understand space missions, space systems, and spacecraft design
2. To understand basics of project management and systems engineering
3.
To understand mission realization processes and their engineering management, including project management and systems enginnering applied to space development

Evaluation Methods and Grading Criteria

Attendance at lectures and final examination

Assignment Instructions

Download and study lecture materials. Students are expected to study for 2 hours per one lecture, in addition to the lecture itself.

Keywords

Space Mission, Space System, Space System, Spacecraft Design, Satellite Design, Engineering Management, Project Management, Systems Engineering, Safety and Mission Assurance

Required Textbooks

No textbook is assigned for this course. Lecture materials (mainly presentation files) are provided via Moodle prior to each lecture.

References/Recommended Reading

1. A Guide to the Project Management Body of Knowledge (PMBOK), 7th Edition, PMI, PMI, 2021.
2. Systems Engineering Handbook, 5th Edition, INCOSE, Wiley, 2023.
Other references and recommended reading will be introduced during the leacture.

Notes

Recommended prerequisite: "Introduction to Satellite Engineering"

Email

To be provided in the first lecture.

Space Systems Engineering II (宇宙システム工学II)

【Course code】 26500951 **[Instructor] IWATA Takanori [Credits] 1**
【Semester】 4th quarter
【Class Time】

Course Description

A large-scale integrated system that consists of spacecraft (satellite, probe, and space station), launch vehicle, ground systems, and communication network is required to realize space mission for space utilization and space exploration. Engineering management including project management, systems engineering, and safety and mission assurance is indispensable process for us to enable to build and operate such a complex space system to accomplish the mission goal. The scope of the two courses, Space Systems Engineering I & II, is to review element, system, and mission technologies of space system and to provide an overview of the engineering management methodologies, with an emphasis on project management (PM) and systems engineering (SE). The goal of these courses is to train students to be able to design, propose, and implement space missions.

Course and Curriculum linkage

Space Systems Engineering I & II are subjects for the Space Engineering International Course (SEIC). Space Systems Engineering I provides a review of space mission, space system, constraints, and satellite system/subsystem design and fundamentals of project management/systems engineering with applications to space development. Space Systems Engineering II further explores detailed steps of project management/systems engineering processes applied to space development, with various exercises.

Course Calendar/Class Topic

1 PM: Project Life Cycle, Oversight, and Activities
2 PM: Project Planning and Control
3 PM: WBS and Schedule Management
4 PM: Cost and Risk Management
5 SE: System Design 1
6 SE: System Design 2
7 SE: Product Realization
8 SE: Technical Management & Selected Crosscutting Topics

General Course Policies

Lectures are given by oral presentation with lecture materials provided before each lecture. Language is English. Face-to-face presentation is a baseline, but some lectures could be given remotely. Space Systems Engineering II includes excercise experiences through assignments in lectures to develop practical experiences.

Course Objectives

The goal of the two courses, Space Systems Engineering I & II, is to train students to be able to design, propose, and implement space missions. In particular, the goal of Space Systems Engineering II includes:

1.
To understand mission realization processes and their engineering management, including project management
2.
To practice applied project management and systems engineering processes for space to be able to start and implement space missions

Evaluation Methods and Grading Criteria

Attendance at lectures and submission of assignments

Assignment Instructions

Download and study lecture materials. Students are expected to study for 2 hours per one lecture, in addition to the lecture itself.

Keywords

Space Mission, Space System, Space System, Spacecraft Design, Satellite Design, Engineering Management, Project Management, Systems Engineering, Safety and Mission Assurance

Required Textbooks

No textbook is assigned for this course. Lecture materials (mainly presentation files) are provided via Moodle prior to each lecture. For the following materials, only internet links are provided:
1. NASA Space Flight Program and Project Management Handbook, NASA/ SP-2022-9501, 2022.
2. NASA Sysetems Engineering Handbook, Rev.2, NASA/SP-2016-6105, Rev.2, 2017.
3. Expanded Guidance for NASA Systems Engineering, Vol. 1: Systems Engineering Practices, NASA/SP-2016-6105-SUPPLE, 2016.
4. Expanded Guidance for NASA Systems Engineering, Vol. 2: Crosscutting Topics, Special Topics, and Appendices, NASA/SP-2016-6105-SUPPLE, 2016.

References/Recommended Reading

1. A Guide to the Project Management Body of Knowledge (PMBOK), 7th Edition, PMI, PMI, 2021.
2. Systems Engineering Handbook, 5th Edition, INCOSE, Wiley, 2023.
Other references and recommended reading will be introduced during the leacture.

Notes

Recommended prerequisite: "Introduction to Satellite Engineering" and "Space Systems Engineering I"

Email

To be provided in the first lecture.

Spacecraft Environment Interaction Engineering (宇宙環境技術特論)

【Course code】 26440801
【Semester】 2nd quarter
【Class Time】 Mon 3 period, Mon 4 period
[Credits] 2

[Main Instructor] TOYODA Kazuhiro,
[Sub instructors] AKAHOSHI Yasuhiro, CHO Mengu, KIMOTO Yugo, KOGA Kiyokazu, TERAMOTO Mariko

Course Description

A spacecraft must withstand the severe space environment which is widely different from the ground. The purpose of this class is to understand special characteristics of space environment, and to learn the basic knowledge needed to develop technologies against space environment.

Course and Curriculum linkage

This lecture is SEIC.

Course Calendar/Class Topic

Space environment
Spacecraft charging and discharge
Space debris
Spacecraft charging analysis
Lunar charging
Space environment measurement
Contamination on spacecraft

General Course Policies

This lecture will be given by faculty members of the Department of Space Systems Engineering and invited lecturers from related fields outside the university.

Course Objectives

The purpose of this class is to understand special characteristics of space environment, and to learn the basic knowledge needed to develop technologies against space environment.

1. the student understands space environment
2. the student understands spacecraft charging and discharge
3. the student understands space debris
4. the student understands space contamination
5. the student understands space radiation

Evaluation Methods and Grading Criteria

Reports

Assignment Instructions

Lecture materials will be uploaded on Moodle page. It is recommended to read lecture materials before the class. Students are expected to set aside 4 hours a week as time for class preparation.

Keywords

Space environment, spacecraft charging, space debris, contamination

Required Textbooks

none

References/Recommended Reading

(1) D. E. Hastings and H. Garret, Spacecraft Environment Interaction, Cambridge University Press

Notes

Students should be well informed about space engineering.

Email

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Energy Conversion and Plasma Physics (エネルギー工学特論)

【Course code】 26490802 **[Instructor] TOYODA Kazuhiro [Credits] 2**
【Semester】 3rd quarter
【Class Time】 Tue 3 period, Fri 1 period

Course Description

Plasma physics are introduced for understanding energy conversion from electric enegy to kinetic energy employed in electric propulsion.

Course and Curriculum linkage

This lecture is SEIC.

Course Calendar/Class Topic

What is plasma?
Various Collisions
Transport of plasma fluid equations
Waves in plasma
Plasma and magnetic field
Electrical discharge
Plasma surface interaction Various discharges
Electrical sheath
Introduction of electric propulsion
Absorption

General Course Policies

The lecture will proceed according to the class topics.

Course Objectives

To understand the application of energy convergion to new technology

1. the student understands plasma
2. the student understands collisions
3. the student understands plasma fluid equations
4. the student understands waves in plasma
5. the student understands plasma and magnetic field
6. the student understands Electrical discharge
7. the student understands Electrical sheath

Evaluation Methods and Grading Criteria

Perticipation and weekly report

Assignment Instructions

Futher understanding is needed with reference books after the lecture.
Students are expected to set aside 4 hours a week as time for class preparation.

Keywords

Plasma physics

Required Textbooks

References/Recommended Reading

(1) F. F. Chen: Introduction to Plasma Physics and Controlled Fusion. (PLENUM)
(2) 栗木、荒川: 電気推進ロケット入門（東京大学出版会）

Notes

Email

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Advanced Space Environment Science (宇宙環境科学特論)

【Course code】 26650002 **[Instructor] KITAMURA Kentaro [Credits] 2**
【Semester】 2nd quarter
【Class Time】 Tue 3 period, Thu 4 period

Course Description

In space near the Earth, the interaction of plasma gas (solar wind) emitted from the Sun and the Earth's magnetic field causes complex electromagnetic disturbances (space weather), which often cause failures of spacecraft and other social infrastructure. This lecture aims to provide an overview of such electromagnetic disturbances in space and to discuss their effects on spacecraft and other social infrastructure from the viewpoint of space weather.

Course and Curriculum linkage

SEIC subject

Course Calendar/Class Topic

1-5 Solar wind, Geomagentic field, Magnetosphere, Ionosphere, Radiation Belt
6-7 Environment of Electromagnetism and Plasma physics in the Magnetosphere
8 Interim presentation
9 Concept of the Space Weather
10-12 Affection of the Space Weather to the satellite Systems and social infrastructures.
13-14 Interplanetary Dust
15 Final presentation

General Course Policies

The class will be conducted in a mixture of lecture style and group exercises based on the reading of materials presented in advance, and reports and presentations of exercises will be required as appropriate.

Course Objectives

The objective of this class is to understand the overview of the near-Earth space environment from the viewpoints of plasma physics and electromagnetism inspace, and to be able to discuss its impact on satellite systems and social infrastructure as space weather.
1. to understand the structure of magnetosphere and ionosphere
2. to understand the phenomena of disturbance in the magnetosphere and ionosphere
3. to understand the impact of space weather on satellite systems and ground infrastructure

Evaluation Methods and Grading Criteria

A pass grade of 60% or higher will be given based on the evaluation of reports and student presentations given in class.

Assignment Instructions

Requires about 8 hours of self-study per week other than class time

Keywords

space weather

Required Textbooks

none

References/Recommended Reading

(1) Introduction to Space Physics, Kivelson and Russell, ISBN :0521457149
(2) Space Weather, Singer et al., ISBN: 0875909841
(3) Fundamentals of Space Systems, Pisacane, ISBN: 0195162056
(4) Spacecraft-Environment Interactions, Hastings and Garret, ISBN: 0521607566
(5) The Space Environment, Alan C. Tribble, ISBN 0-691-10299-6

Notes

none

Email

kitamura.kentaro375(at)mal.kyutech.jp

Advanced Rocket Propulsion Engineering (ロケット推進工学特論)

【Course code】 26640001 **[Instructor] KITAGAWA Koki [Credits] 2**
【Semester】 2nd quarter
【Class Time】 Thu 1 period, Thu 2 period

Course Description

In order to develop a rocket, it is necessary to define the mission requiments, perform conceptual design and proceed with detailed design based on it. Setting the initial model by conceptual design is an important task because it affects the work efficiency. The purpose in this lecture is to acquire the ability to perform rocket sizing and rocket engine conceptual design for initial model setting.

Course and Curriculum linkage

This is Space Engineering International Course.
It is desirable to have completed rocket propulsion engineering, rocket/satellite system engineering, combustion engineering and thermo-fluid engineering related subjects in the faculty.

Course Calendar/Class Topic

1 Introduction
2～6 Rocket sizing
7, 8 Intermediate presentation
9～12 Rocket engine conceptual design
13, 14 Final presentation
15, 16 Feedback, Summary

General Course Policies

Lecture and group exercises.

Course Objectives

The purpose in this lecture is to acquire the ability to perform rocket sizing and rocket engine conceptual design for initial model setting.

1. Understand rocket sizing
2. Understand rocket engine conceptual design

Evaluation Methods and Grading Criteria

A total of 60% or more of evaluation of presentations and presentation materials will pass

Assignment Instructions

Read a paper listed as reference during each lecture.
Students are expected to set aside 8 hours a week as time for class preparation.

Keywords

Rocket, Sizing, Rocket engine, Conceptual design

Required Textbooks

N/A

References/Recommended Reading

（1）NASA SP-125, Design of Liquid Propellant Rocket Engines(NASA)
https://ntrs.nasa.gov/citations/19710019929
（2） Ronald Humble, Space Propulsion Analysis and Design (Learning Solutions)
（3）George P. Sutton, Rocket Propulsion Elements (WILEY)
（4）田辺英二：ロケットシステム（風虎通信）(in Japanese)

Notes

Lecture in English only .

Email

kitagawa.koki862 (a) mail.kyutech.jp

Solar System Planetary Physics and Environments (太陽系惑星環境特論)

【Course code】 26640002 **[Instructor] TERAMOTO Mariko [Credits] 2**
【Semester】 4th quarter
【Class Time】 Mon 4 period, Mon 5 period

Course Description

Since the late 1950s, humanity has sent numerous spacecraft to planets in the solar system for exploration. Based on the technology and discoveries gained from these planetary missions, plans are being made for human migration to the Moon and Mars, and we are on the cusp of the era of space exploration. To prepare for this new era, we need to learn about the latest technologies for planetary exploration and the environments of the planets in the solar system.

Course and Curriculum linkage

This lecture is SEIC.

Course Calendar/Class Topic

1. Introduction to the Solar System
２． Sun
3. Mercury
4. Venus
5-6. Moon
7-8. Mars
9. Jupiter
10. Saturn
11. Uranus
12. Neptune
13. Pluto
14. exoplanet
15 feedback

General Course Policies

Proceed with the lecture according to the class topics.

Course Objectives

The purpose of this class is to understand his lecture is to understand the technology of planetary exploration satellites and planetary environments in the solar system, and the following are the achievement goals.

1. the student understands planetary environments
2. the student understands the technology of planetary exploration

Evaluation Methods and Grading Criteria

The lecture grades will be evaluated comprehensively based on the exercises during lecture hours, assignment reports, and other related content carried out.

Assignment Instructions

It is recommended to review each class and prepare the next class by lecture materials, which will be uploaded on a Moodle page.

Keywords

Space environment, Planetary environment

Required Textbooks

none

References/Recommended Reading

none

Notes

none

Email

teramoto.mariko418(at)mail.kyutech.jp

Thesis Research for Degree（工学講究）

Subject code, Lecturer，Credit
26990833, Primary supervisor, Credit 2

Course Description
In the course of writing a master's thesis, students will be instructed on research plans, methods of research, and how to summarize research results regarding the master thesis subject. The course will guide students to write theis writing focusing thesis organization, research planning, problem solving methods, summarizing the results.

Special Laboratory Work（工学特別実験）

Subject code, Lecturer，Credit
26990834, Primary supervisor, Credit 1

Course Description
In the course of writing a master's thesis, students will be instructed on research plans, methods of research, and how to summarize research results regarding the master thesis subject. The course will guide students to do laboratgory works regarding data management, safety, experimental practice and other practical aspects of the research.