Space Engineering International Course
Syllabus 2025

2025年度開講　工学府

2025年度開講　工学府-工学府博士前期課程

Subject Code　26009663
Subject Name　English ＸＡ
Subject Name　英語ＸＡ
Class　01
Teacher Name　WATANABE Hiroaki
Subject by Technical Teachers　－
Grade　First grader,Second grader,Third grader
Campus Category　戸畑
Course Semester　1st Semester
Course Term　1Q　～　2Q
Day of the Week and Period　MON5
Lecture Room　Project Laboratory
Subject Type
Numbering
Subject Category　Advanced Language Subject
Credit Category　Elective and required course
The number of Credits　1

Course Description

To teach students how to write technical abstracts, and full research papers that meet global standards. Students will bring in contents related to their fields of study, 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. IEEE conventions will be introduced. Students will be expected to summarize research, write several abstracts of original research, and present findings through an effective poster. Students will also learn how to critically assess good/bad abstracts and presentations.

Course and Curriculum Linkage (Diploma Policy and Learning Objectives)

This rigorous course is highly recommended for students aspiring to write research papers.
Intended for students of the Space Engineering International Course (SEIC).

Course Objectives

By the end of this course, students should:

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

Class Topic / Course Calendar

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.

Teaching Methods and Course Formats

【Teaching Methods】 Lectures, Seminars, Practical training

This course may be conducted online using Moodle and/or MS Teams in case of a school closure. In this case, make sure that you register yourself for the Moodle course and fulfill your attendance assignments; quizzes or exams should
be taken on Moodle. Whether the class will be held on demand, in real-time, or combination will be announced before the class.
【Course Formats】 Face-to-Face only.

Summary of Evaluation Methods and Grading Criteria

20% Summary of Student's Study
20% Research Drafts
20% Teacher Discretion
40% Exams

Details of Evaluation Methods and Grading Criteria

Summary of Student's Study 20 %
Research Drafts 20 %
Teacher Discretion Activity 20 %
Mid-Term Exam Essay 10%
Final Exam Research Paper 20%
Research Presentation 10% 40 %
%
%

Assignments 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.

Estimated Preparation Time

0.5 hours per week

Keywords

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

Textbooks

Writing Research Papers 4 (published by Macmillan)

References

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

Remarks

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

How to Contact

watanabe_hiro_kyutechST*runbox.com (Replace * with @)

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=3842

Subject Code 42000809
Subject Name Japanese for Beginners
Subject Name 日本語入門
Class 01
Teacher Name Yamaji Naoko
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 3Q ～ 4Q
Day of the Week and Period WED2
Lecture Room Project Laboratory
Subject Type
Numbering
Subject Category Advanced Language Subject
Credit Category Elective and required course
The number of 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 (Diploma Policy and Learning Objectives)
This class is only for the international students

Course Objectives
To get used to Japanese phoneme system
To be able to catch learned words and phrases
To be able to interact with others by using simple Japanese expressions

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures
【Course Formats】 Hybrid (over 50% of classes are Face-to-Face)
Online Course Formats:On-Demand only

Summary of Evaluation Methods and Grading Criteria
Class participation, assignments, the final test.

Details of Evaluation Methods and Grading Criteria
Class participation 30 %
Assignments 20 %
The final test 50 %
%
%
%

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

Estimated Preparation Time
0.5 hours per week

Keywords
Elementary Japanese

Textbooks
Learning materials will be provided in class.

References
To be announced as needed

Remarks
None

How to Contact

yamaji@dhs.kyutech.ac.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=4374

Subject Code 26000813
Subject Name Space Environment Testing Workshop
Subject Name 宇宙環境試験ワークショップ
Class 01
Teacher Name CHO Mengu
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 1st Semester
Course Term 2Q
Day of the Week and Period FRI4、FRI5
Lecture Room (General Research1)S-2B
Subject Type
Numbering
Subject Category Practical Training Subject
Credit Category Elective and required course
The number of Credits 1

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 (Diploma Policy and Learning Objectives)
Space Environment Testing Workshop is a subject for the Space Engineering International Course (SEIC).

Course Objectives
Obtain hands-on experience of spacecraft testing
Understand the testing principle

Class Topic / Course Calendar
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

Teaching Methods and Course Formats
【Teaching Methods】 Laboratory Workshop
【Course Formats】 In-person Only

Summary of Evaluation Methods and Grading Criteria
Report

Details of Evaluation Methods and Grading Criteria
Report 100 %
%
%
%
%
%

Assignments Instructions
Download and read the lecture material before each lecture.

Estimated Preparation Time
1 hours per week

Keywords
Spacecraft Environment, Testing

Textbooks
None

References
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"

Remarks
This workshop is for students who register the Space Engin

eering International Course only. Students are supposed to finish Space Environment Testing.

How to Contact

cho.mengu801(at)mail.kyutech.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=3370

Subject Code 26990824
Subject Name Space Systems PBL Ⅰ
Subject Name 宇宙システムＰＢＬⅠ
Class 01
Teacher Name CHO Mengu
Subject by Technical Teachers －
Grade First grader,Second grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 3Q
Day of the Week and Period Outside of Timetable
Lecture Room
Subject Type
Numbering
Subject Category Practical Training Subject
Credit Category Elective and required course
The number of 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 (Diploma Policy and Learning Objectives)
Space Systems PBL I is a subject for the Space Engineering International Course (SEIC).

Course Objectives
Obtain experience of space system design
Obtain experience of inter-cultural communication

Class Topic / Course Calendar
To be announced by the project supervisors.

General Course Policies
To be announced by the project supervisors.

Teaching Methods and Course Formats
【Teaching Methods】 Project work (exercise, experiment, laboratory work, group discussion)
【Course Formats】 In-person

Summary of Evaluation Methods and Grading Criteria
Contribution to the project

Details of Evaluation Methods and Grading Criteria
Contribution to the project 100 %
%
%
%
%
%

Assignments Instructions
To be announced for each project.

Estimated Preparation Time
4 hours per week

Keywords
To be announced for each project.

Textbooks
To be announced for each project.

References
To be announced for each project.

Remarks
To be announced for each project.

How to Contact
To be announced for each project.

Moodle Course URL
https://ict-t.el.kyutech.ac.jp/course/view.php?id=3936

Subject Code 26990825
Subject Name Space Systems PBL Ⅱ
Subject Name 宇宙システムＰＢＬⅡ
Class 01
Teacher Name CHO Mengu
Subject by Technical Teachers －
Grade First grader,Second grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 4Q
Day of the Week and Period Outside of Timetable
Lecture Room
Subject Type
Numbering
Subject Category Practical Training Subject
Credit Category Elective and required course
The number of 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 (Diploma Policy and Learning Objectives)
Space Systems PBL I is a subject for the Space Engineering International Course (SEIC).

Course Objectives
Obtain experience of space system design
Obtain experience of inter-cultural communication

Class Topic / Course Calendar
To be announced by the project supervisors.

General Course Policies
To be announced by the project supervisors.

Teaching Methods and Course Formats
【Teaching Methods】 Project work (exercise, experiment, laboratory work, group discussion)
【Course Formats】 In-person

Summary of Evaluation Methods and Grading Criteria
Contribution to the project

Details of Evaluation Methods and Grading Criteria
Contribution to the project 100 %
%
%
%
%
%

Assignments Instructions
To be announced for each project.

Estimated Preparation Time
4 hours per week

Keywords
To be announced for each project.

Textbooks
To be announced for each project.

References
To be announced for each project.

Remarks
To be announced for each project.

How to Contact
To be announced for each project.

Moodle Course URL
https://ict-t.el.kyutech.ac.jp/course/view.php?id=3936

Subject Code 26100001
Subject Name Advanced Embedded Systems
Subject Name 組み込みシステム特論
Class 01
Teacher Name ASAMI Kenichi
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 1st Semester
Course Term 2Q
Day of the Week and Period THU5、THU6
Lecture Room (General Research1)S2-252
Subject Type
Numbering
Subject Category Mathematical Information Subject
Credit Category Elective and required course
The number of Credits 2

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 (Diploma Policy and Learning Objectives)
Intended for students of the Space Engineering International Course (SEIC).
Students understand embedded systems design process.

Course Objectives
Students expand understanding of embedded systems design.
Students enhance understanding of digital systems development.
Students utilize understanding of systems modeling languages.

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures
【Course Formats】 Online only

Online Course Formats: Realtime Streaming only

Summary of Evaluation Methods and Grading Criteria
The grade is evaluated by mini-tests, presentation, and final report.

Details of Evaluation Methods and Grading Criteria
mini-tests 50 %
presentation 20 %
final report 30 %
%
%
%

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

Estimated Preparation Time
4 hours per week

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

Textbooks
The lecture slides will be provided on Moodle.

References
[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 Compute

r Architecture ARM Edition, Morgan Kaufmann, 2015.
[3] Clive Maxfield, The Design Warrior's Guide to FPGAs, Newnes, 2004.

Remarks

Nothing special.

How to Contact

Provided on Moodle.

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=3506

Subject Code 26500911
Subject Name Vision and Image Recognition
Subject Name 視覚画像認識特論
Class 01
Teacher Name HANAZAWA Akitoshi
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 3Q
Day of the Week and Period WED3、FRI2
Lecture Room Tobata MILAIS
Subject Type
Numbering
Subject Category Mathematical Information Subject
Credit Category Elective and required course
The number of Credits 2

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 (Diploma Policy and Learning Objectives)
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 Objectives
Understand basics of digital image processing.
Understand statistical characteristics of digital image components.
Understand image recognition by machine learning.

Class Topic / Course Calendar
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.)

Teaching Methods and Course Formats
【Teaching Methods】 Lectures, Seminars
【Course Formats】 Face-to-Face only

Summary of Evaluation Methods and Grading Criteria
Task submission 60% and final exam 40%,

Details of Evaluation Methods and Grading Criteria
Task submission 60 %
final exam 40 %
%
%
%
%

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

Estimated Preparation Time
4 hours per week

Keywords
Image Recognition, Machine Learning

Textbooks

Use online (moodle) materials.

References

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

Remarks

It is recommended to review Python language.

How to Contact

hanazawa.akitoshi344@mail.kyutech.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=3966

Subject Code 26450810
Subject Name Advanced Mechanics of Materials
Subject Name 材料力学特論
Class 01
Teacher Name YAMAGUCHI Eiki
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 1st Semester
Course Term 1Q
Day of the Week and Period MON2、MON5
Lecture Room (Education & Research1)1-3A
Subject Type
Numbering
Subject Category Specialized Subject (Compulsory elective)
Credit Category Elective and required course
The number of Credits 2

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 (Diploma Policy and Learning Objectives)
Prerequisite: structural mechanics
Without a good understanding of structural mechanics, no one could pass this course in the past.
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.

Course Objectives
To learn basic theory of plasticity and plasticity-based stress-strain relationship

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures,
【Course Formats】 Face-to-Face

Summary of Evaluation Methods and Grading Criteria
The mid-term exam and the final exam

Details of Evaluation Methods and Grading Criteria
MId-term Examination 40 %
Final Examination 60 %
%
%
%
%

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

Estimated Preparation Time
4 hours per week

Keywords
stress, strain

Textbooks
None

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

Remarks

This lecture is given in English.

How to Contact

Given in the lecture.

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=3854

Subject Code 26600001
Subject Name Advanced Analysis of Structures
Subject Name 構造解析特論
Class 01
Teacher Name Chen Pei-shan
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 4Q
Day of the Week and Period TUE3、TUE4
Lecture Room (Education & Research1)1-3A
Subject Type
Numbering
Subject Category Specialized Subject (Compulsory elective)
Credit Category Elective and required course
The number of Credits 2

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 (Diploma Policy and Learning Objectives)
It is desirable that the attendees have the basic knowledge of Structural Mechanics.

Course Objectives
Knowledge of nonlinear analysis of space frames and mechanical structures.
Knowledge of analysis of cable structures.
Elasto-plastic analysis of building and mechanical structures.

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures
【Course Formats】 Face-to-Face only

Summary of Evaluation Methods and Grading Criteria
The overall grade will be decided based on short reports and the attendance.

Details of Evaluation Methods and Grading Criteria
short reports and the attendance 100 %
%
%
%
%
%

Assignments Instructions

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

Estimated Preparation Time

3 hours per week

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

Textbooks

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

References

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

Remarks

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

How to Contact

chen@civil.kyutech.ac.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=3933

Subject Code 26440902
Subject Name Computational Fluid Dynamics
Subject Name 数値流体力学特論
Class 01
Teacher Name TSUBOI Nobuyuki
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 1st Semester
Course Term 1Q
Day of the Week and Period TUE2、FRI2
Lecture Room (Education & Research1)1-2C、(Education & Research1)1-3C
Subject Type
Numbering
Subject Category Sub-Major Subject
Credit Category Elective course
The number of Credits 2

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 (Diploma Policy and Learning Objectives)
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 Objectives
Understand the role of numerical analysis methods in fluids
Understand the difference method
Understand the numerical flux method
Understand the time integration method

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures
【Course Formats】 Face-to-Face only

Summary of Evaluation Methods and Grading Criteria
Grade is evaluated by attendance of class, reports, and final examination.

Details of Evaluation Methods and Grading Criteria
Reports(standard) 30 %
Final report 30 %
Final examination 40 %
%
%
%

Assignments 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.

Estimated Preparation Time
4 hours per week

Keywords
Compressible Flow, Numerical Simulation, Compressible Flow

Textbooks

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

References

(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)

Remarks

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.

How to Contact

tsuboi@mech.kyutech.ac.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=3661

Subject Code 26440903
Subject Name High-speed Gas Dynamics
Subject Name 高速気体力学特論
Class 01
Teacher Name TSUBOI Nobuyuki
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 3Q
Day of the Week and Period MON4、THU1
Lecture Room (Education & Research1)1-3D
Subject Type
Numbering
Subject Category Sub-Major Subject
Credit Category Elective course
The number of Credits 2

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 (Diploma Policy and Learning Objectives)
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 Objectives
Understand the concept of hypersonic flow
Understanding the various approximate solutions
Understand the real gas effect
Understand the rarefied gas flow

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures
【Course Formats】 Face-to-Face only

Summary of Evaluation Methods and Grading Criteria
Grade is evaluated by attendance of class, reports, and final examination.

Details of Evaluation Methods and Grading Criteria
Reports(standard) 40 %
Final report 40 %
Final examination 20 %
%
%
%

Assignments 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.

Estimated Preparation Time
4 hours per week

Keywords
Hypersonic Flow, Compressible Flow, Reentry, Rarefied Gas Flow

Textbooks
Distributed prints

References

(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)

Remarks

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.

How to Contact

tsuboi@mech.kyutech.ac.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=4200

Subject Code 26630001
Subject Name Advanced Space Robotics
Subject Name 宇宙ロボティクス特論
Class 01
Teacher Name NAGAOKA Kenji
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 1st Semester
Course Term 1Q
Day of the Week and Period TUE1、THU3
Lecture Room
Subject Type
Numbering
Subject Category Sub-Major Subject
Credit Category Elective course
The number of Credits 2

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 (Diploma Policy and Learning Objectives)
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.
This lecture aims at understanding Space Robotics and the followings are goals/objectives.

Course Objectives
Understanding of foundations of microgravity robotics
Understanding of foundations of planetary robotics

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures
【Course Formats】 Online only

Online Course Formats: Realtime Streaming and On-Demand

Summary of Evaluation Methods and Grading Criteria
Comprehensive evaluation of attendance and report assignments (homework).

Details of Evaluation Methods and Grading Criteria
Homework 100 %
%
%
%
%
%

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

Estimated Preparation Time
4 hours per week

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

Textbooks
N/A.

References

[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.

Remarks

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

How to Contact

Kenji Nagaoka: nagaoka.kenji572@mail.kyutech.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=3536

Subject Code 26440819
Subject Name Advanced Space Dynamics
Subject Name スペースダイナミクス特論
Class 01
Teacher Name HIRAKI Koju
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 3Q
Day of the Week and Period MON1、THU2
Lecture Room (General Research1)S-2A
Subject Type
Numbering
Subject Category Specialized Subject (Compulsory elective)
Credit Category Elective and required course
The number of Credits 2

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

Course and Curriculum Linkage (Diploma Policy and Learning Objectives)
Advanced Space Dynamics is a subject for the Space Engineering International Course (SEIC).
The goal of this course is to be able to design an interplanetary orbit from the earth to the planets in the solar system.

Course Objectives
To be able to understand the curves given by the trajectory equation
To be able to solve the Kepler's equation
To be able to understand a launch window
To be able to evaluate a swing-by

Class Topic / Course Calendar
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. The fundamentals of dynamics will be given in the course.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures
【Course Formats】 Face-to-Face only (We may have one or two on-demand lectures.)

Summary of Evaluation Methods and Grading Criteria
Five assignments will be given. Students are required to submit documents for them. For some assignments students are requested to make presentations in front of attendee.

Details of Evaluation Methods and Grading Criteria
Assignment 1: Observation of cosmic event 20 %
Assignment 2: Computation of a trajectory of a comet 20 %
Assignment 3: Design of Homman transfer orbit from the earth 20 %
Assignment 4: Design of fly-by trajectory with a planet 20 %
Assignment 5: Design and evaluation of Swing-by trajectory with a planet 20 %
%

Assignments 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 4 hours a week as time for class preparation.

Estimated Preparation Time
4 hours per week

Keywords
planets, trajectory design, deep-space exploration

Textbooks

Not specified.

References

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

Remarks

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

How to Contact

hiraki.koju735@mail.kyutech.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=4095

Subject Code 26500908
Subject Name Introduction to Satellite Engineering
Subject Name 衛星工学入門
Class 01
Teacher Name CHO Mengu
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 4Q
Day of the Week and Period THU1、THU2
Lecture Room (General Research1)S-2A
Subject Type
Numbering
Subject Category Specialized Subject (Compulsory elective)
Credit Category Elective and required course
The number of Credits 2

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 (Diploma Policy and Learning Objectives)
Introduction to Satellite Engineering is a subject for the Space Engineering International Course (SEIC).

Course Objectives
Understand the basic of satellite system

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lecture
【Course Formats】 In-person and online (50/50)

Summary of Evaluation Methods and Grading Criteria
Reports, attendance and contributions to lecture discussion

Details of Evaluation Methods and Grading Criteria
Report 100 %
%
%
%
%
%

Assignments 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.

Estimated Preparation Time
4 hours per week

Keywords
satellite engineering, Spacecraft Systems Engineering

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

References
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

Remarks
This lecture is provided in English.

How to Contact

cho.mengu801(at)mail.kyutech.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=3935

Subject Code 26500928
Subject Name Satellite Power System Ⅰ
Subject Name 衛星電力システム特論Ⅰ
Class 01
Teacher Name TOYODA kazuhiro、CHO Mengu、Mitsuru Imaizumi、Teppei Okumura
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 3Q
Day of the Week and Period FRI4、FRI5
Lecture Room (Education & Research6)6-2A
Subject Type
Numbering
Subject Category Sub-Major Subject
Credit Category Elective course
The number of Credits 1

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 (Diploma Policy and Learning Objectives)
Satellite Power System I is a subject for the Space Engineering International Course (SEIC).

Course Objectives
Understand the satellite power system

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures
【Course Formats】 Hybrid (over 50% of classes are Face-to-Face)

Online Course Formats: Realtime Streaming and On-Demand

Summary of Evaluation Methods and Grading Criteria
Reports and mini tests

Details of Evaluation Methods and Grading Criteria
Reports and mini tests 100 %
%
%
%
%
%

Assignments 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.

Estimated Preparation Time
2 hours per week

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

Textbooks
None

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

Remarks
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.

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

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=4334

Subject Code 26500929
Subject Name Satellite Power System Ⅱ
Subject Name 衛星電力システム特論Ⅱ
Class 01
Teacher Name TOYODA kazuhiro、CHO Mengu、Hitoshi Naito、Hiroaki Kusawake
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 4Q
Day of the Week and Period FRI4、FRI5
Lecture Room (Education & Research6)6-2A
Subject Type
Numbering
Subject Category Sub-Major Subject
Credit Category Elective course
The number of Credits 1

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 (Diploma Policy and Learning Objectives)
Satellite Power System II is a subject for the Space Engineering International Course (SEIC).

Course Objectives
Understand the satellite power system

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures
【Course Formats】 Hybrid (over 50% of classes are Face-to-Face),
Online Course Formats: Realtime Streaming and On-Demand

Summary of Evaluation Methods and Grading Criteria
Reports and mini tests

Details of Evaluation Methods and Grading Criteria
Reports and mini tests 100 %
%
%
%
%
%

Assignments 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.

Estimated Preparation Time
2 hours per week

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

Textbooks
None

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

Remarks
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.

How to Contact
cho.mengu801(at)mail.kyutech.jp

Moodle Course URL
https://ict-t.el.kyutech.ac.jp/course/view.php?id=4335

Subject Code 26500915
Subject Name Space Environment Testing
Subject Name 宇宙環境試験
Class 01
Teacher Name CHO Mengu
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 1st Semester
Course Term 1Q
Day of the Week and Period FRI4、FRI5
Lecture Room (General Research1)S-2A
Subject Type
Numbering
Subject Category Specialized Subject (Compulsory elective)
Credit Category Elective and required course
The number of Credits 2

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 (Diploma Policy and Learning Objectives)
Space Environment Testing is a subject for the Space Engineering International Course (SEIC).

Course Objectives
Understand the effects of space environment on spacecraft
Understand spacecraft verification processes
Understand rationales of each testing
Understand testing procedures

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lecture
【Course Formats】 In-person and online (50/50)

Summary of Evaluation Methods and Grading Criteria
Reports, attendance and contributions to lecture discussion

Details of Evaluation Methods and Grading Criteria
Report 100 %
%
%
%
%
%

Assignments 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.

Estimated Preparation Time
4 hours per week

Keywords
Space Environment, Verification, Testing

Textbooks
None

References
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

Remarks

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

How to Contact

cho.mengu801(at)mail.kyutech.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=3371

Subject Code 26500950
Subject Name Space Systems Engineering Ⅰ
Subject Name 宇宙システム工学Ⅰ
Class 01
Teacher Name CHO Mengu
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 3Q
Day of the Week and Period Outside of Timetable
Lecture Room
Subject Type
Numbering
Subject Category Specialized Subject (Compulsory elective)
Credit Category Elective and required course
The number of Credits 1

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 (Diploma Policy and Learning Objectives)
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.
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:

Course Objectives
To understand space missions, space systems, and spacecraft design
To understand basics of project management and systems engineering
To understand mission realization processes and their engineering management, including project management and systems enginnering applied to space development

Class Topic / Course Calendar
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 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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures
【Course Formats】 Face-to-Face only

Summary of Evaluation Methods and Grading Criteria
Attendance at lectures and final examination

Details of Evaluation Methods and Grading Criteria
Attendance 50 %
final examination 50 %
%
%
%
%

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

Estimated Preparation Time

2 hours per week

Keywords

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

Textbooks

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

References

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.

Remarks

Recommended prerequisite: "Introduction to Satellite Engineering"

How to Contact

To be provided in the first lecture.

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=4006

Subject Code 26500951
Subject Name Space Systems Engineering Ⅱ
Subject Name 宇宙システム工学Ⅱ
Class 01
Teacher Name CHO Mengu
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 4Q
Day of the Week and Period Outside of Timetable
Lecture Room
Subject Type
Numbering
Subject Category Specialized Subject (Compulsory elective)
Credit Category Elective and required course
The number of Credits 1

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 (Diploma Policy and Learning Objectives)
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.
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:

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

Class Topic / Course Calendar
1 SE: NASA's SE Fundamentals & Program/Project Life Cycle
2 SE: System Design Processes
3 SE: Product Realization Processes
4 SE: Technical Management & Selected Crosscutting Topics
5 PM: Overview of NASA's Program & Project Management
6 PM: Project Planning and Control
7 PM: WBS and Schedule Management
8 PM: Cost and Risk Management

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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures, Seminars (Partially)
【Course Formats】 Face-to-Face only

Summary of Evaluation Methods and Grading Criteria
Attendance at lectures and submission of assignments

Details of Evaluation Methods and Grading Criteria
Attendance 50 %
assignments 50 %
%
%
%
%

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

Estimated Preparation Time

2 hours per week

Keywords

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

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

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.

Remarks

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

How to Contact

To be provided in the first lecture.

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=4007

Subject Code 26440801
Subject Name Spacecraft Environment Interaction Engineering
Subject Name 宇宙環境技術特論
Class 01
Teacher Name TOYODA kazuhiro、CHO Mengu、AKAHOSHI Yasuhiro、Yugo Kimoto、Kiyokazu Koga、TERAMOTO Mariko
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 1st Semester
Course Term 2Q
Day of the Week and Period MON3、MON4
Lecture Room (General Research1)S-2A
Subject Type
Numbering
Subject Category Sub-Major Subject
Credit Category Elective course
The number of Credits 2

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 (Diploma Policy and Learning Objectives)
This lecture is SEIC.
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 Objectives
the student understands space environment
the student understands spacecraft charging and discharge
the student understands space debris
the student understands space contamination
the student understands space radiation

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures
【Course Formats】 Hybrid (over 50% of classes are Face-to-Face),

Online Course Formats: Realtime Streaming and On-Demand

Summary of Evaluation Methods and Grading Criteria
Reports

Details of Evaluation Methods and Grading Criteria
Reports 100 %
%
%
%
%
%

Assignments 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.

Estimated Preparation Time
4 hours per week

Keywords
Space environment, spacecraft charging, space debris, contamination

Textbooks
none

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

Remarks
Students should be well informed about space engineering.

How to Contact

toyoda(at)ele.kyutech.ac.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=3809

Subject Code 26490802
Subject Name Energy Conversion and Plasma Physics
Subject Name エネルギー工学特論
Class 01
Teacher Name TOYODA kazuhiro
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 3Q
Day of the Week and Period TUE3、FRI3
Lecture Room (Education & Research6)6-2A、(General Research1)S-2A
Subject Type
Numbering
Subject Category Sub-Major Subject
Credit Category Elective course
The number of Credits 2

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

Course and Curriculum Linkage (Diploma Policy and Learning Objectives)
This lecture is SEIC.
To understand the application of energy convergion to new technology

Course Objectives
the student understands plasma
the student understands collisions
the student understands plasma fluid equations
the student understands waves in plasma
the student understands plasma and magnetic field
the student understands Electrical discharge
the student understands Electrical sheath

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures
【Course Formats】 Hybrid (over 50% of classes are Face-to-Face),

Online Course Formats: On-Demand only,

Summary of Evaluation Methods and Grading Criteria
Perticipation and weekly report

Details of Evaluation Methods and Grading Criteria
Report 100 %
%
%
%
%
%

Assignments 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.

Estimated Preparation Time
4 hours per week

Keywords
Plasma physics

Textbooks
none

References
(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)

Remarks
none

How to Contact

toyoda(at)ele.kyutech.ac.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=4333

Subject Code 26650002
Subject Name Advanced Space Environment Science
Subject Name 宇宙環境科学特論
Class 01
Teacher Name KITAMURA Kentaro
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 1st Semester
Course Term 2Q
Day of the Week and Period TUE3、THU4
Lecture Room (General Research1)S-2A
Subject Type
Numbering
Subject Category Sub-Major Subject
Credit Category Elective course
The number of Credits 2

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 (Diploma Policy and Learning Objectives)
SEIC subject

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

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures
【Course Formats】 Hybrid (over 50% of classes are Face-to-Face

Online Course Formats: Realtime Streaming and On-Demand

Summary of Evaluation Methods and Grading Criteria
A pass grade of 60% or higher will be given based on the evaluation of reports (80%) and student presentations (20%) given in class.

Details of Evaluation Methods and Grading Criteria
Report 80 %
Presentation 20 %
%
%
%
%

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

Estimated Preparation Time
8 hours per week

Keywords
space weather

Textbooks
none

References

(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

Remarks

none

How to Contact

kitamura.kentaro375(at)mal.kyutech.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=3522

Subject Code 26640001
Subject Name Advanced Rocket Propulsion Engineering
Subject Name ロケット推進工学特論
Class 01
Teacher Name KITAGAWA Koki
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 1st Semester
Course Term 2Q
Day of the Week and Period THU1、THU2
Lecture Room Project Laboratory
Subject Type
Numbering
Subject Category Sub-Major Subject
Credit Category Elective course
The number of Credits 2

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 (Diploma Policy and Learning Objectives)
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.
The purpose in this lecture is to acquire the ability to perform rocket sizing and rocket engine conceptual design for initial model setting.

Course Objectives
Understand rocket sizing
Understand rocket engine conceptual design

Class Topic / Course Calendar
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.

Teaching Methods and Course Formats
【Teaching Methods】 Lecture, Exercises
【Course Formats】 In person

Summary of Evaluation Methods and Grading Criteria
A total of 60% or more of evaluation of presentations and presentation materials will pass

Details of Evaluation Methods and Grading Criteria
Presentation and presentation material 100 %
%
%
%
%
%

Assignments 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.

Estimated Preparation Time
8 hours per week

Keywords
Rocket, Sizing, Rocket engine, Conceptual design

Textbooks
N/A

References
(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)

Remarks
Lecture in English only .

How to Contact
kitagawa.koki862 (a) mail.kyutech.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=3519

Subject Code 26640002
Subject Name Solar System Planetary Physics and Environments
Subject Name 太陽系惑星環境特論
Class 01
Teacher Name TERAMOTO Mariko
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 4Q
Day of the Week and Period MON4、MON5
Lecture Room (Education & Research6)6-2A
Subject Type
Numbering
Subject Category Sub-Major Subject
Credit Category Elective course
The number of Credits 2

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 (Diploma Policy and Learning Objectives)
This lecture is SEIC.
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.

Course Objectives
the student understands planetary environments
the student understands the technology of planetary exploration

Class Topic / Course Calendar
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 & Exoplanets
14 Group Work: Designing a Solar System Mission
15 Group Presentations on Proposed Missions

General Course Policies
Lectures based on the topics above. In the final class, students will form groups to design a solar system mission, using knowledge from previous lectures, and present their proposed mission.

Teaching Methods and Course Formats
【Teaching Methods】 Lectures combined with some group work.
【Course Formats】 Face-to-Face only

Summary of 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.

Details of Evaluation Methods and Grading Criteria
Assignments/Reports 80 %
Final Presentation 20 %
%
%
%
%

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

Estimated Preparation Time
4 hours per week

Keywords
Space environment, Planetary environment

Textbooks
none

References

none

Remarks

none

How to Contact

teramoto.mariko418(at)mail.kyutech.jp

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=4316

Subject Code 26990832
Subject Name Comprehensive Subject of Practical Engineering G
Subject Name 実践工学総合科目G
Class 01
Teacher Name KITAMURA Kentaro
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 2nd Semester
Course Term 3Q ～ 4Q
Day of the Week and Period Outside of Timetable
Lecture Room
Subject Type
Numbering
Subject Category Sub-Major Subject
Credit Category Elective course
The number of Credits 2

Course Description
Increased awareness of the fundamental principles of international space law through a series of virtual and in person lectures by United Nations experts, as well as an in-person interactive scenario-based exercise taking advantage of the five consecutive in-person lectures at Kyutech. Students will be discussing within the break up groups as policy and law makers of a mock emerging space faring nation to overcome challenging scenarios to find solutions by setting necessary procedures and regulation.

Course and Curriculum Linkage (Diploma Policy and Learning Objectives)
The objective of this course is to help students become familiar with the principles of space law and policy which are crutial for every country.

Course Objectives
The goal of the course is to raise awareness and enhance students' understanding of key elements of international space law. Through a series of lectures, both in-person and online, students will be exposed to comprehensive and informative content on various aspects of space law. The course aims to deepen their knowledge of fundamental principles, regulations, and policies governing space activities. By the end of the course, students will have gained a broader perspective on the legal framework surrounding space exploration, fostering their ability to navigate and apply space law principles effectively.
1.Understanding the fundamental principles of international space law
2.Raising awareness of national space law and policy
3. Applying the knowledge through presentations and solving a Scenario Based Exercise

Class Topic / Course Calendar
1. Introduction to Space Law - Why Space Law Matters
2. From Vision to Action: The Role of National Space Policies
Introduction to National Space Policies
3. The Outer Space Treaty - key principles, obligations and benefits
The Outer Space Treaty [& student presentations]
4. Liability, Rescue and Return: International Obligations under Space Law
Liability Convention, Rescue and Return Agreement [& student presentations]
5. The Registration Convention: International and National Obligations
Registration Convention [& student presentations]
6. Space Debris: Mitigation and Emerging Remediation Approaches
Space Debris Mitigation Guidelines [& student presentations]
7. Long-Term Sustainability of Outer Space Activities
Space Resources and Long-term Sustainability of Outer Space Activities [& student presentations]
8.-Nuclear Power Sources in Outer Space-Dark and Quiet Skies: Protecting Astronomy and the Environment
Use of Nuclear Power Sources in Outer Space & Dark and Quiet Skies [& student presentations]
9. Mid-term Exam
10. Planetary Defense and Planetary Protection
Planetary Defence and Planetary Protection [& student presentations]
11. Space Resources: Legal and Policy Perspectives
Space Resources [& student presentations]
12. National Space Law, Purpose and Scope
National Space Law: Purpose and Scope [& student presentations & SBE]
13. 7 Key elements of a space law
Seven Key Elements of a National Space Law , Introduction of Scenario Based Exercise (SBE) [SBE in break up groups]
14. Authorization and Continuing Supervision of National Space Activitie

Authorization and Continuous Supervision[& student presentations& SBE]

15. Insuring space missions & Continuation of Scenario-based Exercise

Insuring space missions [& student presentations & SBE]

16. Group Presentations and Expert Feedback Session

In class student presentations of SBE in break up groups

General Course Policies

Lectures virtual, Lectures in person.

Teaching Methods and Course Formats

【Teaching Methods】 Lectures

【Course Formats】 Hybrid (under 50% of classes are Face-to-Face)

Online Course Formats: Realtime Streaming only

Summary of Evaluation Methods and Grading Criteria

Evaluation will be made through the following points;

・Mid-Term Exam ・Final Exam ・In class presentation ・In class participation

Details of Evaluation Methods and Grading Criteria

Mid-Term Exam 30 %

Final Exam 40 %

In class presentation 20 %

In class participation 10 %

%

%

Assignments Instructions

Students are expected to make a presentation on their country's national space activities as well as future plans and the surrounding national law in relations to space law. If more than one course participants come from the same country, the course lecturer will assign different countries.

Estimated Preparation Time

4 hours per week

Keywords

International Law, Space Law, National Space Law , Space Policy.

Textbooks

None.

References

1) Question of the Peaceful Use of Outer Space [RES 1348 (XIII)] (https://www.unoosa.org/oosa/oosadoc/data/resolutions/1958/general_assembly_13th_session/res_1348_xiii.html)

2) UNOOSA Annual Report 2024 (https://www.unoosa.org/documents/pdf/annualreport/UNOOSA_Annual_Report_2024.pdf)

3) Overview of UNOOSA's activities (https://www.unoosa.org/oosa/en/ourwork/index.html)

4) Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*

5) Convention on International Liability for Damage Caused by Space Objects*

6) Convention on Registration of Objects Launched into Outer Space*

7) Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*

8) International Co-operation in the Peaceful Uses of Outer Space [RES 1721 (XVI)]*

9) International Cooperation in the Peaceful Uses of Outer Space [A/RES/55/122]*

10) Application of the concept of the "launching State" [A/RES/59/115]*

11) Recommendations on enhancing the practice of States and international intergovernmental organizations in registering space objects [A/RES/62/101]*

12) Recommendations on national legislation relevant to the peaceful exploration and use of outer space [A/RES/68/74]*

13) Declaration on the fiftieth anniversary of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies [A/RES/72/78]*

14) The Principles Relating to Remote Sensing of the Earth from Outer Space [A/RES/41/65]*

15) The Principles Relevant to the Use of Nuclear Power Sources in Outer Space [A/RES/47/68]*

16) Safety Framework for Nuclear Power Source Applications in Outer Space [A/AC.105/934]*

17) Space Debris Mitigations Guidelines of the Committee on the Peaceful Uses of Outer Space [ST/SPACE/49]*

18) Compendium of space debris mitigation standards adopted by States and international organizations [A/AC.105/2023/CRP.12] (https://www.unoosa.org/res/oosadoc/data/documents/2023/aac_1052023crp/aac_1052023crp_12_0_html/AC105_2003_CRP12E.pdf)

19) Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space*

20) Working Group on Legal Aspects of Space Resource Activ

ities (https://www.unoosa.org/oosa/en/ourwork/copuos/lsc/space-resources/index.html)
21) Schematic overview of national regulatory frameworks for space activities [A/AC.105/C.2/2023/CRP.28*] (https://www.unoosa.org/res/oosadoc/data/documents/2023/aac_105c_22023crp/aac_105c_22023crp_28_0_html/AC105_C2_2023_CRP28E.pdf)
22) National Space Law and Policy Database, ASTRO (https://astro.unoosa.org/astro/en/national-space-law-landing-page.html)
23) Report of the Committee on the Peaceful Uses of Outer Space (A/80/20) (https://www.unoosa.org/oosa/oosadoc/data/documents/2025/a/a8020_0.html)

Remarks

* Documents can be found at https://astro.unoosa.org/astro/instruments-treaties-search.html and at https://www.unoosa.org/res/oosadoc/data/documents/2025/stspace/stspace61rev30html/stspace61rev03E.pdf

How to Contact

TBD

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=4471

Subject Code 26990856
Subject Name Comprehensive Subject of Practical Engineering(Space Systems Engineering) III
Subject Name 実践工学総合科目（宇宙）Ⅲ
Class 01
Teacher Name CHO Mengu
Subject by Technical Teachers －
Grade First grader,Second grader,Third grader
Campus Category 戸畑
Course Semester 1st Semester
Course Term 2Q
Day of the Week and Period Outside of Timetable
Lecture Room
Subject Type
Numbering
Subject Category Sub-Major Subject
Credit Category Elective course
The number of Credits 2

Course Description
This course introduces an overview of satellite communications, including satellite launching, satellite communication system concept, satellite link design, modulation technique, and multiple access technique. It also covers earth station technology and satellite systems and services.

Course and Curriculum Linkage (Diploma Policy and Learning Objectives)
This course covers an important subsystem of a satellite system, communication. Students will obtain specific knowledge about space engineering.

Course Objectives
The goal of this course is:
After completion, students will be able to
1.Describe the basic theories and principles in the satellite communications system
2.Solve problems related to orbital elements, orbital perturbations, antenna look angles,
noise and access methods
3.Analyze the link budget for a complete satellite system and different modes of interference
4.Understand the concepts of satellite services and related payloads
Course Objectives:
1. To provide students with a comprehensive understanding of the fundamental principles and theories of satellite communication systems.
2. To equip students with the analytical skills needed to design and evaluate satellite link budgets while considering system performance, interference, and noise parameters.
3. To familiarize students with various satellite services and their applications, preparing them for careers in the space industry

Class Topic / Course Calendar
1. INTRODUCTION TO SATELLITE COMMUNICATION SYSTEM:
・Brief history of satellite communications
・Basic concepts of satellite communications: frequency allocations for satellite services.
・Satellite subsystem: space and earth segments
2. INTRODUCTION TO SATELLITE COMMUNICATION SYSTEM: Same as above
3. ORBITAL MECHANICS:
・Kepler's three basic laws: Definitions of terms for earth-orbiting satellites.
・Orbital elements and orbital perturbations.
・Inclined orbits.
・The geostationary orbit, look angle determinations.
・Launching vehicles and launching methods
4. ORBITAL MECHANICS: Same as above
5. ORBITAL MECHANICS: Same as above
6. SATELLITE SPACE LINK:
・Basic transmission theory. System noise temperature and G/T ratio
・Design uplink and downlink.
・Design of satellite links for specified carrier-to-noise ratio.
7. SATELLITE SPACE LINK: Same as above
8. SATELLITE SPACE LINK: Same as above
9. INTERFERENCE:
・Interference between satellite, downlink and uplink.
・Combined C/I due to interference.
10. INTERFERENCE: Same as above
11. MULTIPLE ACCESS:
・Frequency division multiple access (FDMA).
・Time division multiple access (TDMA).
・Code division multiple access (CDMA).
12. MULTIPLE ACCESS: Same as above
13. MULTIPLE ACCESS: Same as above
14. SATELLITE SERVICES:
・Direct broadcast satellite (DBS) services.
・Radarsat and Global Positioning Satellite System.
・Internet satellite services.
・Earth Observation Satellites
15. SATELLITE SERVICES: Same as above

General Course Policies

集中講義 (Intensive lectures) 対面(In-person)

Teaching Methods and Course Formats

【Teaching Methods】 Lectures, Seminars

【Course Formats】 Face-to-Face only

Summary of Evaluation Methods and Grading Criteria

Quiz/Assignments: 60%

Final Exam: 40%

Details of Evaluation Methods and Grading Criteria

Quiz/Assignment 60 %

Final Exam 40 %

%

%

%

%

Assignments Instructions

Quiz: One (1) quiz - 20%

Assignments: One (1) group assignment. Student will be given case study to solve based on link budget and multiple access that have been learned. Student needs to submit the report (40%).

Estimated Preparation Time

4 hours per week

Keywords

Satellite Communication, Orbital Mechanics, Link Budget, Multiplexer, Satellite Applications

Textbooks

None

References

(i) Timothy Pratt,Jeremy E. Allnutt, Satellite Communications, John Wiley & Sons, 2019, ISBN: 9781119482178

(ii) Gerard Maral,Michel Bousquet,Zhili Sun, Satellite Communications Systems: Systems, Techniques and Technology, 6th, John Wiley & Sons, 2020, ISBN: 9781119382089

Remarks

The slides notes will be provided to students for lecture. A face-to-face teaching approach will be conducted. Another approach such as Blended Learning by using online materials/platforms would also be used to support the study activities.

How to Contact

To be announced in the lecture

Moodle Course URL

https://ict-t.el.kyutech.ac.jp/course/view.php?id=4447

Subject Code 26990833
Subject Name Thesis Research for Degree
Subject Name 工学講究
Class
Teacher Name
Subject by Technical Teachers －
Grade Second grader
Campus Category 戸畑
Course Semester 1st Semester ～ 2nd Semester (ALL)
Course Term 1Q ～ 4Q
Day of the Week and Period Outside of Timetable
Lecture Room
Subject Type
Numbering
Subject Category Special Seminar Subject (Compulsory)
Credit Category Required course
The number of Credits 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.

Course and Curriculum Linkage (Diploma Policy and Learning Objectives)
mandatory for the Master's program
The aim of this class is to formulate a research plan, conduct research, experiments, and exercises, and summarize research results in relation to the research on the master's thesis theme.

Course Objectives

Class Topic / Course Calendar
The way of proceeding depends on the supervisor and the topics.

General Course Policies
The supervisor provide guidance and advice to encourage independent and systematic research efforts.

Teaching Methods and Course Formats
For the details, please consult with your supervisor.

.

Summary of Evaluation Methods and Grading Criteria
The evaluation will be based on a comprehensive evaluation of daily research activities, the completed master's thesis and its presentation, and responses to examination questions.

Details of Evaluation Methods and Grading Criteria

Assignments Instructions
To plan and manage the necessary activities toward the completion of the master's thesis.

Estimated Preparation Time
hours per week

Keywords
Research, Master's Thesis

Textbooks
Nothing in specific.

References
Introduce accordingly.

For the details, please consult with your supervisor.

Subject Code 26990834
Subject Name Special Laboratory Work
Subject Name 工学特別実験
Class
Teacher Name
Subject by Technical Teachers －
Grade Second grader
Campus Category 戸畑
Course Semester 1st Semester ～ 2nd Semester (ALL)
Course Term 1Q ～ 4Q
Day of the Week and Period Outside of Timetable
Lecture Room
Subject Type
Numbering
Subject Category Special Seminar Subject (Compulsory)
Credit Category Required course
The number of Credits 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.

Course and Curriculum Linkage (Diploma Policy and Learning Objectives)
mandatory for the Master's program

Course Objectives
The aim of this class is to formulate a research plan, conduct research, experiments, and exercises, and summarize research results in relation to the research on the master's thesis theme.

Class Topic / Course Calendar
The way of proceeding depends on the supervisor and the topics.

General Course Policies
The supervisor provide guidance and advice to encourage independent and systematic research efforts.

Teaching Methods and Course Formats
For the details, please consult with your supervisor.

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Summary of Evaluation Methods and Grading Criteria
The evaluation will be based on a comprehensive evaluation of daily research activities, the completed master's.

Details of Evaluation Methods and Grading Criteria

Assignments Instructions
To plan and manage the necessary activities toward the completion of the master's thesis.

Estimated Preparation Time
hours per week

Keywords
Research, Master's Thesis

Textbooks
Nothing in specific.

References
Introduce accordingly.

Remarks
For the details, please consult with your supervisor.