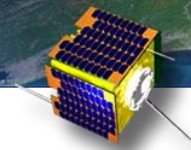


Ver.4.0
2018.05.31

Leadership Development Program for Space Exploration and Research

Nagoya University Program for Leading Graduate Schools



Syllabus



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1. Overview of Space Exploration and Research

Term(Semester): Spring Every Fri.1 st lecture Class Room: 241 Lecture Room, Engineering Building 2 South Course Category: Required Credits: 2.0	Contact Information Faculties in charge: Hiroyasu Tajima, Hosei Nagano, Ichiro Nishimoto Phone: Office: e-mail:tajima@nagoya-u.jp
Purpose and Aim of Course Basic knowledge for space exploration and research is lectured by specialists in various fields including industry about space engineering & science, manufacturing, numerical simulation, organization & management, science literacy etc. Wide-ranging, panoramic knowledge is given by omnibus of lectures.	
Registration Qualification LGS students (Leadership Development Program for Space Exploration and Research), and holder of students qualification of A Classes (Graduate School of Science) or Applied engineering courses (Graduate School of Engineering)	Completion Deadline Before advancing to the third year (D1)
Grading GP is calculated by averaging following individual grades. A and higher=4, B=3, C=2, D and lower=0	Requirements for Credits
Related Courses	For non-LGS students •Acceptable • Conditions : Graduate students of Nagoya University
Course Content Lecture Title 1. Overview of Space Exploration and Research 2. Foundations of Astrophysics 3. Space Environment Science 4. Composite Material 5. Satellite Development 6. Patent Right and Standardization 7. Computer Experiment 8. Space Observation Technology 9. Electronic Circuit Technology 10. Space Propulsion Engineering 11. Introduction to Radiation Detectors 12. Earth and Planetary Science 13. Spacecraft (HTV) Development 14. Project Management/System Engineering 15. Management of Research and Development	
Text Book	Reference Book
Notes Taking DVD video lectures in English is accepted for non-Japanese students whose mother tongue is not Japanese.	

2. Satellite Systems

Term(Semester): Spring Class Room: Course Category: Required electives Credits: 0.2 each, 2.4 (maximum)	Contact Information Faculties in charge: Hosei Nagano Phone: Office: e-mail: nagano@mech.nagoya-u.ac.jp
Purpose and Aim of Course To acquire basic and advanced knowledge on satellite systems and subsystems, and cultivate a broad perspective on satellite systems and their development process. It is also expected for students to utilize what they learn in this course in the ChubuSat Instrument Development Project.	
Registration Qualification Nothing in particular	Completion Deadline Before advancing to the third year (D1)
Grading GP is calculated by averaging following individual grades. A and higher=4, B=3, C=2, D and lower=0	Requirements for Credits
Related Courses •Overview of Space Exploration and Research •Satellite Development and Applications Courses below •Satellite Communication (in Japanese) •Micro-Satellite Development and Applications •Thermal design and analysis •Structural design and analysis	For non-LGS students •Acceptable •Conditions: Graduate students of Nagoya University
Course Content Courses are organized to cover the following topics. Note that they are not necessarily offered in the same order, classification, title, etc. as shown below. <ol style="list-style-type: none"> 1. Review of history of space exploration and solar system 2. Spacecraft configuration 3. Review of orbital mechanics 4. Space environment and its effect on spacecraft design 5. Spacecraft communication subsystem 6. Spacecraft attitude determination and control subsystem 7. Spacecraft guidance and navigation subsystem 8. Spacecraft thermal subsystem 9. Spacecraft structures and mechanisms 10. Spacecraft propulsion subsystem 11. Spacecraft power subsystem 12. Assembly, Integration and Testing 	
Text Book Shown on the spot from the lecturer	Reference Book Shown on the spot from the lecturer if necessary
Notes Expert professors in this field are invited from the overseas university as a lecturer. This course is offered in English.	

3. Satellite Communications

Term(Semester): Autumn Class Room: Science B 1F B110 Course Category: Required electives Credits: 1.0	Contact Information Faculties in charge: Hosei Nagano, Keisuke Tamura, Daisuke Ishihara, Hidetaka Tanaka, Kikuko Miyata Phone: Office: e-mail: nagano@mech.nagoya-u.ac.jp
Purpose and Aim of Course To understand satellite communication system and proper method for using related instrument through the part of the real small satellites' receiver and transmitter experiment. To understand the system design flow and analysis flow.	
Registration Qualification Nothing in particular	Completion Deadline Before advancing to the second year (M2)
Grading GP is calculated by averaging following individual grades. A and higher=4, B=3, C=2, D and lower=0	Requirements for Credits
Related Courses <ul style="list-style-type: none"> • Satellite Systems (Lecture Courses on Space Science and Engineering) • Micro-Satellite Development and Applications (Satellite Development and Applications Short Courses) 	For non-LGS students <ul style="list-style-type: none"> • Acceptable • Conditions : Graduate students of Nagoya University
Course Content The main plan is shown as follows: (subject to change) <ol style="list-style-type: none"> 1. Design and Analysis <ol style="list-style-type: none"> 1.1 Understand design condition 1.2 Explanation of the link budget analysis 1.3 Summary of the results 2. Experiment <ol style="list-style-type: none"> 2.1 Understand receiver specification 2.2 Understand transmitter specification 2.3 Receiver and transmitter's compatibility testing with cable 2.4 Wireless compatibility testing 2.5 Summary of the results 	
Text Book Shown on the spot from the lecturer	Reference Book Shown on the spot from the lecturer if necessary
Note This lecture will be canceled when the number of applicants are small. This course is offered in English.	

4. Micro-Satellite Development and Applications

Term(Semester): Spring Class Room: Science B 1F B105 Course Category: Required electives Credits: 1.0	Contact Information Faculties in charge: Hosei Nagano, Keisuke Tamura, Daisuke Ishihara, Hidetaka Tanaka, Kikuko Miyata Phone: Office: e-mail: nagano@mech.nagoya-u.ac.jp
Purpose and Aim of Course To understand the basis of the satellite subsystem and study the micro-satellite's wide knowledge and technologies, with the help of the class room satellite kit.	
Registration Qualification Nothing in particular	Completion Deadline Before advancing to the second year (M2)
Grading GP is calculated by averaging following individual grades. A and higher=4, B=3, C=2, D and lower=0	Requirements for Credits
Related Courses •Overview of Space Exploration and Research •Satellite Systems (Lecture Courses on Space Science and Engineering) •Satellite Communications (in Japanese) •Thermal design and analysis •Structural design and analysis	For non-LGS students • Acceptable • Conditions : Graduate students of Nagoya University
Course Content To understand the satellite subsystems through the classroom satellite kit	
Text Book Shown on the spot from the lecturer	Reference Book Shown on the spot from the lecturer if necessary
Note This course is offered in English.	

5. Thermal Design and Analysis

Term(Semester): Autumn Class Room: Bldg. B Room B110 (LGS laboratory), Graduate School of Science Course Category: Required electives Credits: 1.0	Contact Information Faculties in charge: Hosei Nagano, Keisuke Tamura Phone: Office: e-mail: nagano@mech.nagoya-u.ac.jp
Purpose and Aim of Course To develop the thermal control mechanism of satellites through learning the application feature of thermal control material and measuring its characteristics. To learn the thermal analysis method through practical operation of the thermal analysis tool "Thermal Desktop" which is used worldwide. By taking these courses, students are expected to acquire overview of ChubuSat thermal design, and develop a hardware-based practical ability on thermal control.	
Registration Qualification Nothing in particular	Completion Deadline Before advancing to the third year (D1)
Grading GP is calculated by averaging following individual grades. A and higher=4, B=3, C=2, D and lower=0	Requirements for Credits
Related Courses •Overview of Space Exploration and Research •Satellite Systems (Lecture Courses on Space Science and Engineering) •Micro-Satellite Development and Applications (Satellite Development and Applications Short Courses)	For non-LGS students •Acceptable •Conditions: Graduate students of Nagoya University
Course Content 1. Confirmation of Thermal Control Material Characteristics 1.1 To confirm the effectiveness of the thermal control material (MLI and/or Thermal Filler) applied to equipment samples, comparing the temperatures between the applied and non-applied samples in the vacuum chamber. 1.2 To measure and confirm the thermo-optical characteristics of various thermal control surfaces, through which the nature of the surface for thermal control is acquired as practical knowledge; besides, to learn the meaning of the thermal parameters and the measurement principle of the characteristics. 2. Training on Thermal Analysis Tool Operation 2.1 To give lectures on the tool "Thermal Desktop" 2.2 To analyze an example problem using "Thermal Desktop"	
Text Book Shown on the spot from the lecturer	Reference Book Shown on the spot from the lecturer if necessary
Notes This course is offered in English.	

6. Structural Design and Analysis

Term(Semester): Autumn Class Room: Bldg. B Room B110 (LGS laboratory), Graduate School of Science Course Category: Required electives Credits: 1.0	Contact Information Faculties in charge: Hosei Nagano, Daisuke Ishihara, Keisuke Tamura, Hidetaka Tanaka Phone: Office: e-mail: nagano@mech.nagoya-u.ac.jp
Purpose and Aim of Course To learn the basic concept of a structural design, an analysis method using Finite Element Method (FEM), and the vibration test technique required for developing a satellite or a payload. By taking these courses, students are expected to develop a practical ability on the structural design, which will also be useful for ChubuSat Instrument Development Project.	
Registration Qualification Nothing in particular	Completion Deadline Before advancing to the third year (D1)
Grading GP is calculated by averaging following individual grades. A and higher=4, B=3, C=2, D and lower=0	Requirements for Credits
Related Courses •Overview of Space Exploration and Research •Satellite Systems (Lecture Courses on Space Science and Engineering) •Micro-Satellite Development and Applications (Satellite Development and Applications Short Courses)	For non-LGS students •Acceptable •Conditions: Graduate students of Nagoya University
Course Content 1. Training on the structural analysis using Finite Element Method (FEM) 1.1 Basic lecture on the structural analysis and FEM. 1.2 Hands-on FEM software training. 1.3 Model optimization to analyze a real structure. 2. Training on the vibration tests 1.4 Basic lecture on the operation of the vibration test machine. 1.5 Practice of a series of the pre-launch vibration tests.	
Text Book Shown on the spot from the lecturer	Reference Book Shown on the spot from the lecturer if necessary
Notes This course is offered in English.	

7. *Monozukuri* Lecture

(“Introduction to the experimental and observational techniques for particle and astrophysics research”)

This is a lecture in the curriculum of the Graduate School of Science and is given in Japanese. Lecture details are available in the Japanese version of this syllabus and in the following Japanese web page.

<http://www.frontier.phys.nagoya-u.ac.jp/jp/monozukuri/lecture/index.html>

Please consult K. Suzuki (kazuhito@hepl.phys.nagoya-u.ac.jp) about English support if you plan to take this lecture.

8. *Monozukuri* Laboratory Courses

The hands-on courses listed below will be available. Course details, including the date and registration, will be announced in the following web page.

http://www.frontier.phys.nagoya-u.ac.jp/en/monozukuri/lab_course/index.html

Course	Credit
Soldering and Assembling Course	1
Printed Wiring Board Production Course	1
Electronics Circuit Manufacturing Course	1
FPGA Training Course (*)	1
ASIC Training Course (*)	1
Monozukuri Practical Course: Vibration Cutting (*)	0.5
Monozukuri Practical Course: Automation Technology (*)	0.5
Monozukuri Practical Course: Evaluation of Tribological Properties of Carbon-based Hard Coatings with In-situ Observation of Sliding Surfaces (*)	0.5

(*) These courses will be held in collaboration with the organizations outside the University and will be given in Japanese. Please consult K. Suzuki (kazuhito@hepl.phys.nagoya-u.ac.jp) about the course details and English support if you plan to take these courses.

9. Global Leadership Training

<p>Term(Semester): GLT I :Spring , Autumn GLT II : Autumn</p> <p>Class Room:</p> <p>Course Category: Required electives</p> <p>Credits:2</p>	<p><u>Contact Information</u></p> <p>Faculties in charge:</p> <p>Akihiro Sasoh, Jiro Kasahara, Hosei Nagano, Susumu Hara, Hidetaka Tanaka, Naoko Yamazaki, Hiroyuki Kousaka, Janet Henderson, Reiko Furuya, Emanuel Leleito, Setsuko Aoki</p> <p>Phone: 4402</p> <p>Office:</p> <p>e-mail: sasoh@nuae.nagoya-u.ac.jp</p>		
<p>Purpose and Aim of Course</p> <p>To cultivate the English language proficiency, international outlook and project management ability required for a global leader.</p> <p>In Global Leadership Training I (GLT I), students strengthen their ability to communicate and discuss in English, essential in global communication.</p> <p>In Global Leadership Training II (GLT II), students acquire qualities that can be used globally such as during joint international development and in international competition through lectures and presentations on space law, international relations and business, and project management on the course of the space industry.</p>			
<p>Registration Qualification</p> <p>English score of IELTS ≥ 5.5</p>	<p>Completion Deadline</p>		
<p>Grading</p> <p>GP is calculated by averaging following individual grades.</p> <p>5 grades evaluations</p>	<p>Requirements for Credits</p>		
<p>Related Courses</p> <ul style="list-style-type: none"> •Overview of Space Exploration and Research •Satellite Systems •Leadership Development Seminar 	<p>For non-LGS students</p> <ul style="list-style-type: none"> •Acceptable •Conditions: Graduate students of Nagoya University 		
<p>Course Content</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top; width: 50%;"> <p>GLT I (Global Communication)</p> <p>Each class will include a speaking project, to be worked on in class. You must use English to do the project and to communicate with our classmates. In addition, each student will do a final project, to be presented in class. Students must actively participate in each class.</p> <p>Class 1: Unit 1 Biology</p> <p>Class 2: Unit 2 Marketing</p> <p>Class 3: Unit 3 Astronomy</p> <p>Class 4: Unit 5 Psychology</p> <p>Class 5: Unit 6 Sociology</p> <p>Class 6: Unit 8 Earth Science</p> <p>Class 7: Final Project</p> </td><td style="vertical-align: top; width: 50%;"> <p>GLT II (Program Management & Space Policy)</p> <p>International Space Law, International Relations & Business, Project Simulation</p> <ol style="list-style-type: none"> 1. Space Law 2.Space Business 3.Project Management Overview 4.NASA Project Management/System Engineering 5.ISS Development 6.SS Design Training : Case Study 7.SS Design Training : Presentation and Review </td></tr> </table>		<p>GLT I (Global Communication)</p> <p>Each class will include a speaking project, to be worked on in class. You must use English to do the project and to communicate with our classmates. In addition, each student will do a final project, to be presented in class. Students must actively participate in each class.</p> <p>Class 1: Unit 1 Biology</p> <p>Class 2: Unit 2 Marketing</p> <p>Class 3: Unit 3 Astronomy</p> <p>Class 4: Unit 5 Psychology</p> <p>Class 5: Unit 6 Sociology</p> <p>Class 6: Unit 8 Earth Science</p> <p>Class 7: Final Project</p>	<p>GLT II (Program Management & Space Policy)</p> <p>International Space Law, International Relations & Business, Project Simulation</p> <ol style="list-style-type: none"> 1. Space Law 2.Space Business 3.Project Management Overview 4.NASA Project Management/System Engineering 5.ISS Development 6.SS Design Training : Case Study 7.SS Design Training : Presentation and Review
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<p>Text Book</p> <p>GLT I : Academic Connections, by David Hill</p> <p>GLT II : Shown on the spot from the lecturer</p>	<p>Reference Book</p>		
<p>Notes</p> <p>Students who have already obtained an IELTS score ≥ 7.0 or the equivalent are not required to take GLT I (GC), and are awarded 1 credit.</p>			