Course number	U-LAS70 10002 SE50				
Course title (and course title in English)	ILAS Seminar-E2 :Fundamentals of Earth's atmosphere dynamics and climate（地球大気の力学と気候の基礎） ILAS Seminar-E2 :Fundamentals of Earth's atmosphere dynamics and climate	**Instructor's name, job title, and department of affiliation**	Research Institute for Sustainable Humanosphere Professor,Luce, Hubert		
Group	Seminars in Liberal Arts and Sciences	**Number of credits**	2	**Number of weekly time blocks**	1
Class style	seminar (Face-to-face course)	**Year/semesters**	2025・First semester	**Quota (Freshman)**	5 (5)
Target year	Mainly 1st year students	**Eligible students**	For all majors	**Days and periods**	Fri.5
Classroom	04, Yoshida-South Campus Bldg. No. 1			**Language of instruction**	English
Keyword	Atmosphere / weather / climate				

[Overview and purpose of the course]

This seminar provides an accessible introduction to the physics of the Earth's atmosphere. Based on fundamental concepts and principles, it is designed for all students who want to understand the structure and dynamics of the atmosphere. Topics will include current climate, weather patterns, cloud systems, and extreme weather events, all presented without complex theoretical modeling. The students will also have the necessary tools to better understand various aspects of climate change, in line with the United Nations Sustainable Development Goals (SDG13: Climate Action).

[Course objectives]

In this seminar, students will gain insight into the main mechanisms responsible for the state and dynamics of the atmosphere, the life cycle of clouds, weather systems, and extreme events (such as cyclones, thunderstorms, and tornadoes). Students will also acquire the physical background for understanding how human activities can affect these processes.

[Course schedule and contents)]

1. (Weeks 1-2)
Composition and Vertical Structure of the Atmosphere
- Composition of the air and its origins
- Temperature, density, and pressure: Hydrostatic equilibrium

2. (Weeks 3-5)
Terrestrial and Solar Radiation: Energy Balances
- Radiative balance of the Earth
- Greenhouse effect: A simplified model
- Complications: Effects of convection
- How our activities impact these balances

3. (Weeks 6-8)
Contribution of Water
- Water in all its phases

Continue to ILAS Seminar-E2 :Fundamentals of Earth's atmosphere dynamics and climate（地球大気の力学と気候の基礎）(2)↓↓↓

- Principles of saturation and latent heat
- Cloud formation and precipitation
- Thermal gradient of the troposphere and atmospheric stability

4. (Weeks 9-11)
Atmospheric Circulations and Weather Systems
- Key features and prevailing winds
- Monsoons
- Mid-latitude circulations
- Examples of extreme weather systems

5. (Weeks 12-13)
Ocean-Atmosphere Coupling
- The role of the ocean in the climate system
- Example 1: El Nino-Southern Oscillation (ENSO)
- Example 2: North Atlantic Oscillation (NAO)

6. (Week 14)
Cryosphere-Atmosphere Coupling
- The role of ice in the climate system
- The impact of melting ice on climate

7. (Week 15)
Final Examination

8. (Week 16)
Feedback

[Course requirements]

This course requires a high school level science background. Although mathematical modeling is kept to a minimum, students should be familiar with the fundamentals of vector analysis and differential calculus. These tools are nonetheless provided in appendices.

[Evaluation methods and policy]

Evaluation will be:
Active participation in class: 40 pts
Assignments/projects at home: 30 pts
Final examination: 30 pts

[Textbooks]

There is no specific textbook for this course. Its content will be based on multiple references (books, websites) that will be mentioned during the course.

[References, etc.]

（References, etc.）
Introduced during class

Continue to ILAS Seminar-E2 :Fundamentals of Earth's atmosphere dynamics and climate（地球大気の力学と気候の基礎）(3)↓↓↓

[Study outside of class (preparation and review)]

Materials (pdf files) will be made available before class.
Students are encouraged to study the materials before and after each class in order to assimilate technical or uncommon words.
Depending on the topic, studying the materials and preparing the report for evaluation may take several hours per week.

[Other information (office hours, etc.)]

Materials (pdf files) are available on the Kulasis website. Email communication is available for questions outside of class time.

[Essential courses]