Course number	U-LAS70 10002 SE50				
Course title (and course title in English)	ILAS Seminar-E2 :What are Liquids? Answers from Physics, Chemistry and Engineering（液体は何？液体の基礎物理学と化学） ILAS Seminar-E2 :What are Liquids? Answers from Physics, Chemistry and Engineering	**Instructor's name, job title, and department of affiliation**	Graduate School of Science Associate Professor,THUERMER, Stephan		
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)**	15 (15)
Target year	Mainly 1st year students	**Eligible students**	For all majors	**Days and periods**	Tue.5
Classroom	11, Yoshida-South Campus Academic Center Bldg. North Wing			**Language of instruction**	English
Keyword	Fluid engineering / Water / Liquids / Flow phenomena / Interfaces				

[Overview and purpose of the course]

Every day you see and use liquids such as water and oil, but also toothpaste, creams or glue. In this seminar we want to study ‘liquids’ from the point of view of physics, chemistry and engineering (in particular fluid dynamics). Have you ever wondered what makes water stick to a window or how toothpaste flows out of the tube? I invite you to study the properties of liquids, how they flow, stick or spread, and gain a deeper understanding of their behavior, which is so important in nature and your daily life. This course will take a closer look on liquids from various perspectives, combining various fields but without getting lost too much into details. Students with any major are welcome.

液体は水のように生命現象に欠くことができない物質の相であり、多くの化学合成や物質開発が溶液中で行われています。また、構造変化の大きな液体は、固体とは性質の似て非なる興味深い凝集相です。このセミナーでは、物理・化学・工学におよぶ多角的な視点から、液体の科学について学びます。

[Course objectives]

Students will gain the following form this seminar:
- Interest and fun to learn more about phenomena in nature and study topics on their own.
- Knowledge about liquid behavior as a starting point for other courses in natural science.
- The ability to look at problems and behavior from multiple scientific fields (physics, chemistry, engineering).
- The ability to express their ideas, discuss and present topics of natural sciences in English.

この講義の目的の一つは、英語で科学を議論するスキルを学ぶことですが、同時に、物理や化学、工学のように分野の境界を越えて、様々な視点から現象を考える機会を持つことです。

[Course schedule and contents)]

This seminar is held in a causal and interactive way! Students can influence the selection of topics based on their interest!

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The course will work though several aspects of liquids, which include the following topics. The plan below is not strict and rather serves as a guideline.

1. Introduction to liquids - Honey, toothpaste or even sand? (3 weeks)
We look at liquids from different scientific viewpoints and identify their behavior.

2. Oil and water do not mix? (4 weeks)
We learn why liquids form and which different forces hold liquids together.

3. The shape of a raindrop and the lotus effect. (4 weeks)
We take a closer look at liquid surface and interface effects such as adhesion, cohesion, surface tension.

4. How to get ketchup out of the tube? (3 weeks)
We see what makes liquids flow and how different liquids react to forces.

5. Feedback and presentation (1 week)

Depending on the available time and interest of the students, we may also discuss topics such as the application of liquids in nature, science, and technology or exotic liquids such as ionic or magnetic liquids.

[Course requirements]

None

[Evaluation methods and policy]

Preparing homework (30%)
Small exercises during the seminar (30%)
Giving a short presentation at the end of the seminar (40%)

[Textbooks]

Not used
No textbook is used. Handouts will be provided during class.

[References, etc.]

（References, etc.）

John Finney 『Water: A Very Short Introduction』（Oxford University Press）ISBN:9780198708728（This book is a short and interesting read specifically about water）
Bruce Hunt 『Fluid Mechanics for Civil Engineers』（Individually published, 2020）ISBN:9798685686510（Introduces the basic mathematics for the description of fluids）
Etienne Guyon, Jean-Pierre Hulin, Luc Petit, Catalin D. Mitescu 『Physical Hydrodynamics』（Oxford University Press）ISBN:9780198702450（An advanced book if you are really interested in the science behind liquids）

[Study outside of class (preparation and review)]

Students are expected to review the lecture handouts after each class and look up unknown English terms themselves. Homework assignments need to be prepared before the next lecture. It is also encouraged to refer to additional sources of information (books, websites) for the specific topics. If something is unclear or difficult, the instructor can be asked at any time.

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[Other information (office hours, etc.)]

The lectures will be held in English, but some supporting material and explanations are given in Japanese. Students are welcome to ask questions in English or Japanese during and after the class. Office hours are flexible. Appointments can be made directly or via email.

[Essential courses]