科目ナンバリング	U-LAS13 10036 LE60						
授業科目名<英訳>	Thermodynamics in Everyday Life-E2 Thermodynamics in Everyday Life-E2			担当者所属職名・氏名	理学研究科　准教授　THUERMER, Stephan		
群	自然科学科目群		分野(分類)	化学(基礎)		使用言語	英語
旧群	B群	単位数	2単位	週コマ数	1コマ	授業形態	講義（対面授業科目）
開講年度・開講期	2026・前期	曜時限	月3	配当学年	主として1・2回生	対象学生	理系向

[授業の概要・目的]

In this lecture you will learn about the fundamental ideas of thermodynamics in an understandable and fun way. If you are going to study natural sciences, especially physics or chemistry, you will come across these ideas again and again. Chemical reactions in nature, industrial processes, and of course all processes in your daily life are dependent on energy. As it turns out, energy comes in many different forms, and its flow and transformation follows fundamental laws, which we want to study in this course.

[到達目標]

Students will gain the following form this lecture:
- Interest and fun to learn more about how things work in daily life and technical processes.
- An intuitive understanding of thermodynamic laws, which is fundamental to further studies of physics and chemistry.
- The ability to understand scientific terminologies and express their own ideas of natural sciences in English.

[授業計画と内容]

The course will cover the following topics in a total of 15 lectures / weeks (not including the final examination). The course schedule is subject to change depending on the student's understanding.
1) The big picture: Introduction to thermodynamic systems and their states. (2 weeks)
We learn how processes in nature are controlled by a few simple properties, like pressure, temperature and volume.
2) Everything in balance: Equilibrium thermodynamics. (2 weeks)
We think about different types of equilibria and their usefulness in describing processes.
3) It gets hot: Temperature and its scales. (2 weeks)
We ask “What is temperature?” and answer this question from various viewpoints.
4) Order and disorder: Phases, the phase diagram, and mixtures. (4 weeks)
We discuss the changes substances undergo when varying temperature, pressure and volume.
5) One-way flow: Forms of energy, energy conservation and transformation. (2 weeks)
We learn about different forms of energy, laws for energy flow and their application in daily life.
6) Making energy do the work: Energy conservation in cyclic processes. (2 weeks)
Finally we apply our knowledge of energy conservation to machines which transport heat or convert energy.
<<Final Examination>>
8) Feedback session (1 week):
After the final examination we will discuss the answers of the exam questions and resolve any open questions.

[履修要件]

特になし

[成績評価の方法・観点]

Preparing the homework (40%)
Two short test during the lecture (20%)

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Thermodynamics in Everyday Life-E2(2)

Final examination (40%)

[教科書]

使用しない

No textbook is used. Lecture notes will be provided during class.

[参考書等]

（参考書）

Peter Atkins, Julio de Paula 『Physical Chemistry』（Oxford University Press）ISBN:9780199697403（(Topics from Part 1 - Thermodynamics) Always a good book to have for learning concepts in physical chemistry）

Peter Atkins 『The Laws of Thermodynamics: A Very Short Introduction』（Oxford University Press）ISBN:9780199572199（A short and easy to understand book about general concepts）

Yunus Cengel, Michael Boles 『Thermodynamics: An engineering approach』（McGraw-Hill Education）ISBN:9780073398174（Good for learning about thermodynamics with real-world examples and applications）

Georg Job, Regina Rueffler 『Physical Chemistry from a Different Angle』（Springer）ISBN:978-3-319-15666-8（A good book for getting an intuitive introduction into thermodynamics）

[授業外学修（予習・復習）等]

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.

[その他（オフィスアワー等）]

The lectures will be held in English, but some supporting material and explanations are also 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.

[主要授業科目（学部・学科名）]

理学部