

<b>Course number</b>		U-LAS13 10027 LE60					
<b>Course title (and course title in English)</b>	Equilibrium and Energy-E2 :A Macroscopic Perspective of Chemistry			<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Science Associate Professor,THUERMER, Stephan		
	Equilibrium and energy-E2 :A Macroscopic Perspective of Chemistry						
<b>Group</b>	Natural Sciences			<b>Field(Classification)</b>	Chemistry(Foundations)		
<b>Language of instruction</b>	English			<b>Old group</b>	Group B		<b>Number of credits</b> 2
<b>Number of weekly time blocks</b>	1	<b>Class style</b>	Lecture (Face-to-face course)		<b>Year/semesters</b>	2024 • First semester	
<b>Days and periods</b>	Mon.3		<b>Target year</b>	Mainly 1st & 2nd year students		<b>Eligible students</b>	For science students
<b>[Overview and purpose of the course]</b>							
<p>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.</p>							
<b>[Course objectives]</b>							
<p>Students will gain the following form this lecture:</p> <ul style="list-style-type: none"> <li>- Interest and fun to learn more about how things work in daily life and technical processes.</li> <li>- An intuitive understanding of thermodynamic laws, which is fundamental to further studies of physics and chemistry.</li> <li>- The ability to understand scientific terminologies and express their own ideas of natural sciences in English.</li> </ul>							
<b>[Course schedule and contents)]</b>							
<p>The course will cover the following topics:</p> <p>1) The big picture: Introduction to thermodynamic systems and their states, and phases. (3 weeks) We learn how processes in nature are controlled by a few simple properties, like pressure and temperature.</p> <p>2) It gets hot: Temperature and its scales. (3 weeks) We ask “ What is temperature? ” and answer this question from various viewpoints.</p> <p>3) Order and disorder: Phases, the phase diagram, and mixtures. (4 weeks) We discuss the changes substances undergo when varying temperature and pressure.</p> <p>4) One-way flow: Forms of energy, energy conservation and transformation. (4 weeks) We learn about different forms of energy, laws for energy flow and their application in daily life.</p>							
<b>[Course requirements]</b>							
None							
<b>[Evaluation methods and policy]</b>							
<p>Preparing the homework (40%)</p> <p>Two short test during the lecture (20%)</p> <p>Final examination (40%)</p>							
<div style="text-align: right;">Continue to Equilibrium and Energy-E2 :A Macroscopic Perspective of Chemistry(2)</div>							

**[Textbooks]**

Not used

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

**[References, etc.]**

**( References, etc. )**

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 #199engel, 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 )

**[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.

**[Other information (office hours, etc.)]**

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.