科目ナンバリング U-LAS12 10010 LE57																
授業科目 <英訳>									当者所 呂・氏	者所属 工学研究科・氏名			ļ <i>)</i>	准教授 KHAYYER ABBAS		
	群	自然科:	学科目群	1.	分野(分類)	物理						侵	使用言語 英		語	
	旧群	B群	単位数 2単位			週コマ数	'数 1コマ			授美	授業形態 講		義	義(対面授業		·目)
開講年度・ 開講期 20		2025 •	2025・後期		金2				配当学年		Ę.	≡ ±として1回		対象学生		理系向
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[授業の概要・目的]

This course provides an introduction to the basic concepts and principles of thermodynamics and their applications in science and engineering.

[到達目標]

The aim of this course is to achieve a comprehensive understanding of the fundamental concepts and principles of thermodynamics and their applications in science and engineering.

As the main outcomes of this course students should

- I. Gain a comprehensive understanding of thermodynamic principles and be able to apply them to engineering problem solving
- II. Be able to quantify energy transfer in thermodynamic systems

[授業計画と内容]

The following topics will be covered in this course:

- Lecture 1) Introduction and areas of application of thermodynamics
- Lecture 2) State of equilibrium, thermodynamic property of substance (equation of state, heat capacity), heat and work, state variables, quasi-static processes
- Lecture 3) First Law of Thermodynamics, equivalence of heat and work, internal energy, Thermodynamic processes
- Lecture 4) Heat Engines and Introduction to Second Law of Thermodynamics
- Lecture 5) Second Law of Thermodynamics, Kelvin-Planck statement, Clausius statement, perpetual motion
- Lecture 6) Entropy and the Clausius Inequality
- Lecture 7) Carnot Engine, Carnot Efficiency
- Lecture 8) Principle of increase of entropy, entropy variation for an ideal gas
- Lecture 9) Exergy and introduction to Thermodynamic Potentials
- Lecture 10) Thermodynamic potentials and property relations, Enthalpy
- Lecture 11) Helmholtz Free Energy, Gibbs Free Energy
- Lecture 12) Summary of thermodynamic property relations, derivation and application of Maxwell relations
- Lecture 13) Heat capacity in differential forms, the Joule-Thomson effect
- Lecture 14) Phase transition, the Clapeyron equation, the Clapeyron-Clausius equation
- * The lectures will be followed by Final Exam (Week 15) and then Feedback (Week 16).
- ** For Feedback the answers to Final Exam will be sent to Students using KULASIS in a few hours after the exam and students can visit instructor's office on the Feedback day (one week after final exam) for discussions towards comprehensive learning.

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Thermodynamics(2)

[履修要件]

Having taken the course "Fundamental Physics A" is preferable.

[成績評価の方法・観点]

Evaluation is based on

- 1) Final Exam (50 points),
- 2) Assignments, Quizzes & Class Discussions (50 points)
- Class discussions will contribute as bonus points.
- Best 2 quizzes (out of 4) will be considered for evaluation.
- Students being absent for 5 lectures or more will not be credited.

[教科書]

授業中に指示する

[参考書等]

(参考書)

授業中に紹介する

[授業外学修(予習・復習)等]

- After each class students are encouraged to review the handouts and presentation files thoroughly, and work on the given assignments

[その他(オフィスアワー等)]

- No office hour specified. However, students are encouraged to ask their questions before or after each lecture or via email.

Email: khayyer@particle.kuciv.kyoto-u.ac.jp

- Lectures are conducted by using both PowerPoint presentation and board.