Universität Bremen

Fachbereich 4
Produktionstechnik
Maschinenbau &
Verfahrenstechnik

People 4 Production

Heat Happens: Thermodynamics in Daily Life

04-GS-ING-001

Johannes Kiefer

Technische Thermodynamik
Universität Bremen
E-Mail: jkiefer@uni-bremen.de

Heike Glade

Technische Thermodynamik
Universität Bremen
E-Mail: heike.glade@uni-bremen.de

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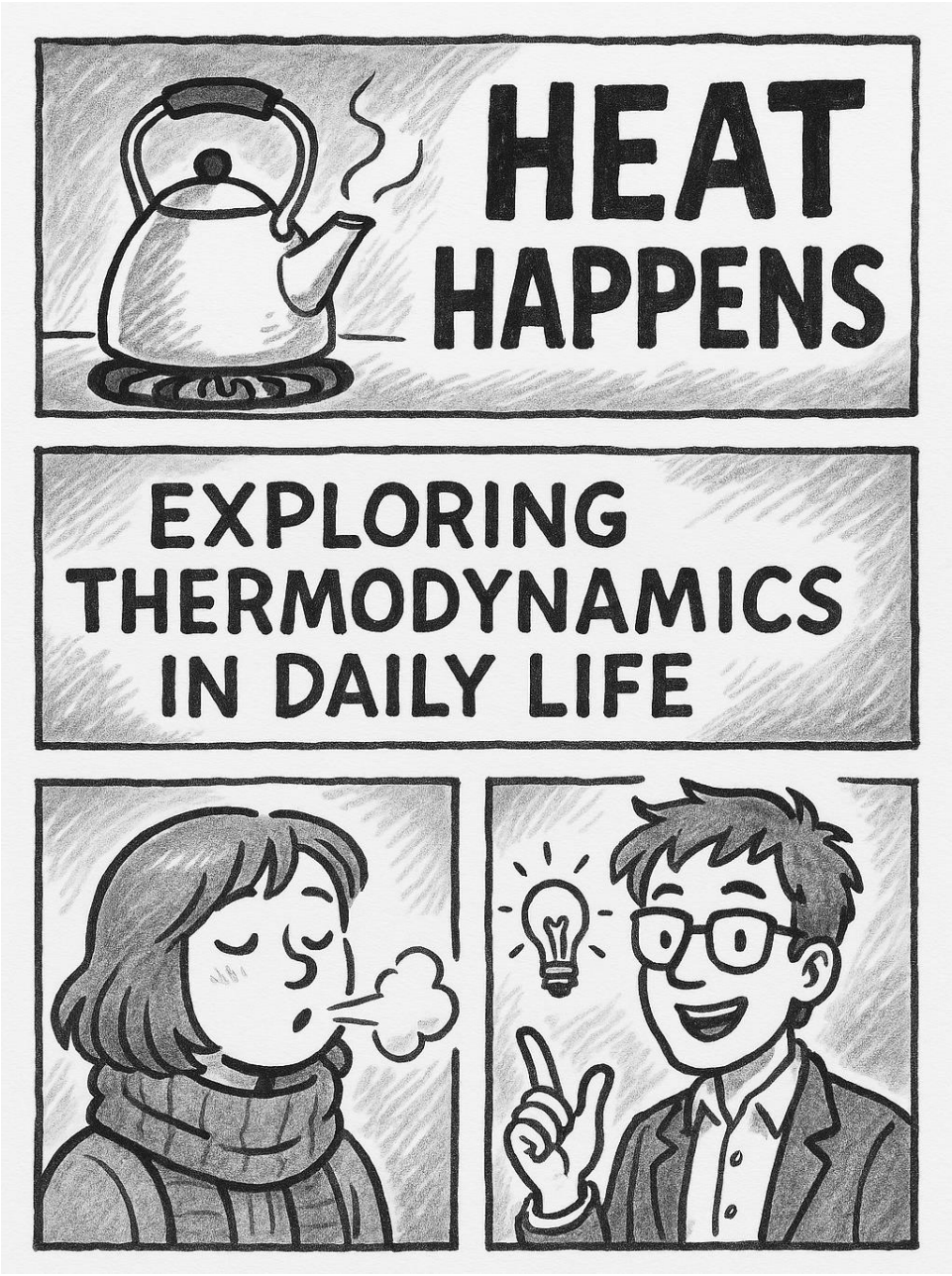
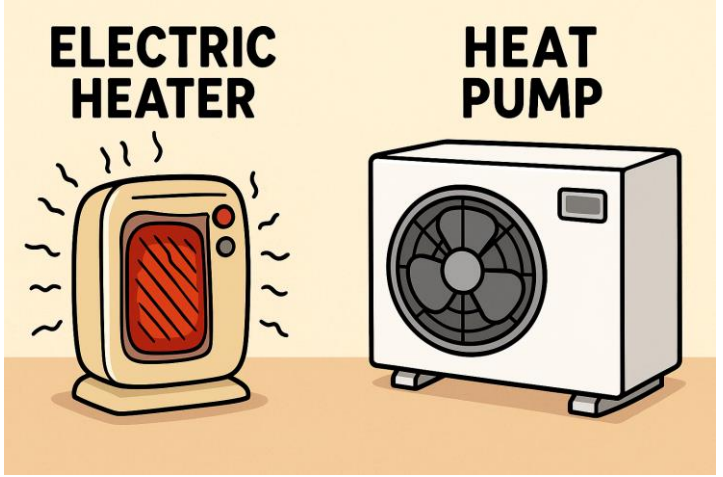
Agenda

- **This is not a thermodynamics/heat transfer course for engineering programmes!**
- **Aims:**
  - **Develop an understanding of the basic principles of thermodynamics and heat transfer**
  - **Apply principles to examples of everyday life**
  - **Avoid any complicated math**
- **Format:**
  - **3 CP Lecture with multiple choice exam**
  - **3 CP Seminar with presentation (PechaKucha style)**



Learning Outcomes

- **Basic knowledge of technical terms, e.g.**
  - **Types of energy, temperature, heat, work, efficiency**
  - **Classification of systems**
  - **Classification of processes**
- **Basic understanding of the laws of thermodynamics**
- **Thermodynamic cycles, e.g.**
  - **Heat pumps & refrigerators**
  - **Heat engines**
- **Basic understanding of daily life phenomena**



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Course Format & Examinations

Course 3 CP:

- Lectures (Mo, 14:15 – 15:45 p.m., FZB 0240)
- Lecture slides, blackboard/screen
- Examination: multiple choice

Course 6 CP:

- Lectures (Mo, 14:15 – 15:45 p.m., FZB 0240)
- Lecture slides, blackboard/screen
- Examination: multiple choice

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- Seminar with student presentations on selected topics
- PechaKucha
  - 20 slides
  - 20 seconds each
  - Automatically advancing

Thermodynamics and Heat Transfer in Everyday Life

www.istockphoto.com

www.istockphoto.com

www.oranier-kuechentechnik.de

www.livingathome.de

www.heim24.de

www.gentside.de

www.capsamania.de

www.wikipedia.org

www.heizung-staudinger.de

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Thermodynamics of Everyday Life

Questions that we want to answer in the course:

1. Where does the term thermodynamics come from?
2. What is a thermodynamic system and how can it be described?
3. What is the difference between temperature and heat?
4. How can we visualize gases, liquids and solids in simplified terms?
5. What is energy and why can it neither be created nor destroyed?
6. What does entropy have to do with disorder?
7. Why do power stations have cooling towers?
8. Why does nothing burn in a water bath?
9. Why is cooking in high mountains a particular challenge?
10. Why does food cook faster in a pressure cooker?
11. How critical is the critical point?

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Thermodynamics of Everyday Life

Questions that we want to answer in the course:

12. How do gas turbines, steam power stations etc. work?
13. How does a refrigerator work?
14. Do heat pumps really have efficiencies of over 100%?
15. Why does 1 plus 1 not always equal 2 in thermodynamics?
16. Why do we spread salt on icy roads?
17. Why does a plume of fog briefly appear when we breathe out in winter?
18. How do portable air conditioners work?

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Heat Transfer in Everyday Life

Questions that we want to answer in the course:

1. Why do different materials feel differently “warm”?
2. What is the difference between measured and perceived temperature?
3. Why do we feel colder in the wind than in still air?
4. Why does wet skin feel especially cold in the wind?
5. How does a radiator heat a room, and what is the difference compared to underfloor heating?
6. Why does the sun warm us even when the air is cold?
7. Why are ice cream trucks white and not black? Why are emergency blankets silver and shiny?
8. How can a thermal imaging camera measure temperature?
9. How does heat get into meat or grilled cheese when grilling?
10. Gas stove, electric stove, and induction stove: how does the pot get “hot”?
11. How does a thermos flask keep a drink “hot” or “cold”?
12. Why are houses insulated? What does the temperature profile look like in an insulated wall?

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Students' Prior Knowledge

- **What do you remember from school?**
  - **Physical quantities**
  - **Physical units and dimensions**
  - **Forms of energy**
  - **Properties of matter**