



Aalto University

CHEM-E6100

Fundamentals of chemical thermodynamics

General

Fall 2021

General

- **Course personnel**

- Prof. Daniel Lindberg (Daniel.k.Lindberg@aalto.fi)
- D.Sc. Jari Aromaa (tutorials and workshops) (jari.aromaa@aalto.fi)

General information

- **Hybrid teaching**
 - Lectures will be primarily be given from campus, streamed on Zoom, and recorded and uploaded to MyCourses after the lecture
 - Lecture presentations of the week will be uploaded to MyCourses, latest by the end of the week
 - Surveys will be done online, typically through zoom
 - Keep microphones muted during the lectures
 - If you have questions, either use the “raise hand” option or write the question in the chat. Questions in the chat will be dealt with during the break or after the lectures.
 - If you have questions that you don't want to be included in the recording, ask before or after the lecture, or during the break (which will not be recorded)

General

- **Compulsory course for Sustainable Metals Processing and Creative Sustainability MSc programs**
- **Course is composed of lectures, workshops and exercises**
- **Lectures twice a week 1.11-8.12.2020**
 - Mondays 13:15-15:00 (No lecture on December 6)
 - Wednesdays 10:15-12:00 (Next week scheduled lecture November 10 will be held November 9)
 - Lectures will be held on and will be recorded, and uploaded to MyCourses after the lecture
- Topic: Fundamentals of Chemical Thermodynamics
- <https://aalto.zoom.us/j/67623254856>

General

- **Exercises/tutorials starting 2.11.2021 → 7.12.2020**
 - Tuesdays 10:15-12:00 (Exercise November 9 will be moved to lecture time November 10)
 - Exercises will be held on Zoom and will be recorded, and uploaded to MyCourses after the lecture
 - Exercises will deal with practical issues of theoretical key topics discussed in the lectures
 - Examples in the tutorials follow the lectures on most weeks.
 - Exercise examples often in exam.
 - Link will be provided later on MyCourses

General

- **Workshops**

- Four interactive workshops(WS) will be organized and these will be graded (max 1.5 pts each):
- Workshops will be held on Microsoft Teams and will be recorded, and uploaded to MyCourses after the exercise.
- 12.11., 19.11., 26.11. and 3.12.
- 14:15-17:00
- Friday workshop link will be provided later.

Skills needed

- Inorganic and physical chemistry form the key disciplines and they are the necessary background of the course.
- Some maths are also needed –typically calculus, differential and integral equations which are high school material.

Learning outcomes

- **After the course the student can**
 - Calculate heat and energy balances in chemical reactions, including industrial reactors and processes
 - Calculate chemical equilibria between gas mixtures and pure substances and know energetic relations of the chemical reactions
 - Construct and apply various equilibrium and phase diagrams

Course information

- Mainly through MyCourses portal and in lectures as well as tutorials
- Group e-mails from Sisu will be used if necessary

Study materials

- The lecture hand-outs will be available as pdf files in MyCourses
- Textbook: D.R. Gaskell, Introduction to the Thermodynamics of Materials (4th or 5th edition); available to you as e-book in the Aalto library
 - Chapters 1-8 deal with issues in this course
- Written docs in tutorials and workshops

- Other useful material

Pelton, Phase Diagrams and Thermodynamic Modeling of Solutions

<https://www.sciencedirect.com/book/9780128014943/phase-diagrams-andthermodynamic-modeling-of-solutions>

- Section 2 is an overview of Thermodynamics
- Access to Aalto network via VPN is required for access

Testing and marks

- **Your skills will be tested in an exam (max. 30 points)**
 - Exam is Wednesday 17.12 9:00-13:00
 - Simple fundamental problems based directly on the lecture notes, as well as more demanding problems requiring independent skills in the art.
 - 6 questions, 0-2 essays and 4-6 computational problems.
- **Your performance in the workshops will add max. 1.5 points/WS to your total.**
- **Thus the max. number of points will be 36 points.**
- **Minimum 15 points is needed to pass the course, e.g. 5 points from WS and 10 points from exam.**

Testing and marks

- Exam is planned as a normal exam on campus
- No other materials allowed except calculator and a set of main thermodynamic equations, that will be provided in the exam
- Currently no plan for remote/online exam, but options will be discussed with Learning services