Course Specifications
Valid as from the academic year 2018-2019

Physics 3: Thermodynamics (I001835)

Lecturers in academic year 2018-2019
Van der Meeren, Paul
LA24 lecturer-in-charge

Course offerings and teaching methods in academic year 2018-2019
A (semester 1) Dutch
- guided self-study 6.25 h
- seminar: coached exercises 15.0 h
- lecture: plenary exercises 2.5 h
- lecture 12.5 h

Offered in the following programmes in 2018-2019
Bachelor of Science in Bioscience Engineering (main subject Agricultural Sciences) 3 A
Bachelor of Science in Bioscience Engineering (main subject Cell and Gene Biotechnology) 3 A
Bachelor of Science in Bioscience Engineering (main subject Chemistry and Food Technology) 3 A
Bachelor of Science in Bioscience Engineering (main subject Environmental Technology) 3 A
Bachelor of Science in Bioscience Engineering (main subject Land and Forest Management) 3 A
Joint Section Bachelor of Science in Bio-Engineering 3 A

Teaching languages
Dutch

Keywords
General thermodynamics, technical physics

Position of the course
Aim of the course is to establish a basis of the physical aspects of thermodynamics. Following the discussion of the thermodynamical laws, the technical applications are discussed that are based on the transformation between heat and work. In the last part, the thermodynamical basis for the (decisive factors for the) equilibrium between different phases is discussed, both for pure compounds and for mixtures. The theoretical background is illustrated by means of calculation examples.

Contents
1. Introduction: basic concepts
2. Phases and phase transitions
3. Processes on ideal gases
   a) first law (work, heat and internal energy)
   b) Enthalpy
   c) Second law: entropy
   d) (Cyclic) processes (Carnot cycle)
4. Processes on ideal solids and liquids
5. Phase transitions

(Approved)
a) T,S and H,S-diagrams
b) Rankine steam cycle
c) Refrigeration cycle

6. Thermodynamic equilibrium: pure compounds
   Gibbs free energy and chemical potential

7. Thermodynamic equilibrium: mixtures
   colligative properties

Initial competences
   Knowledge of general chemistry, physics and mathematics

Final competences
   1 thorough knowledge of thermodynamic properties, such as internal energy, enthalpy,
      entropy and Gibbs free energy
   2 knowledge of technical applications of thermodynamics (e.g. electricity production
      and cooling cycles)
   3 being capable to locate thermodynamic processes within a p,V-, p,T-, T,S- or H,S-
      diagram
   4 being capable to numerically analyse thermodynamic processes
   5 being capable to calculate thermodynamic equilibria

Conditions for credit contract
   Access to this course unit via a credit contract is determined after successful competences
   assessment

Conditions for exam contract
   This course unit cannot be taken via an exam contract

Teaching methods
   Guided self-study, lecture, lecture: plenary exercises, seminar: coached exercises

Extra information on the teaching methods
   part of the exercises are solved during plenary sessions

Learning materials and price
   Course notes (written in Dutch) are available (15 euro)

References

Course content-related study coaching
   the lecturer is available for educational support

Evaluation methods
   end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period
   Written examination

Examination methods in case of periodic evaluation during the second examination period
   Written examination

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation
   not applicable

Extra information on the examination methods
   Theory: period aligned evaluation
   Exercises: period aligned evaluation
   Theory: written examination (closed book)
   Exercises: written examination (closed book)

Calculation of the examination mark
   Students who eschew period aligned and/or non-period aligned evaluations for this
   course unit may be failed by the examiner.