Faculty of Science

KEMM18, Chemistry: Statistical Thermodynamics, 7.5 credits

Kemi: Statistisk termodynamik, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2008-04-29 and was last revised on 2008-04-29. The revised syllabus applies from 2008-04-30, autumn semester 2008.

General Information

The course is an optional second-cycle course for a degree of Master of Science in Chemistry and is a compulsory course for a degree of Master of Science in Organizing Molecular Matter.

Language of instruction: Swedish and English
When necessary, the course in full is given in English.

Main field of studies	*Depth of study relative to the degree requirements*
Organizing Molecular Matter	A1N, Second cycle, has only first-cycle course/s as entry requirements
Chemistry	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The aim of the course is to provide basic knowledge of Statistical Mechanics. An important aim of the course is to provide in-depth understanding of the concept of entropy and thus bridge the opposition between a microscopic approach (statistical mechanics) and a macroscopic one (thermodynamics). An important aim of the course is to understand how intermolecular interaction affects the properties of matter.

The aim of the course is that on its completion students will have acquired the following skills and knowledge:

- the ability to understand and apply the principles of statistical mechanics on ensembles of molecules

- the ability to understand the association between statistical mechanics and thermodynamics
- deep understanding of how intermolecular interaction affects the properties of matter
- the ability to use statistical mechanical computer programmes to calculate the properties of macroscopic systems, interpret results and assess sources of errors

Course content

Lectures: The course starts with the introduction of basic statistical mechanical concepts. Thermodynamic transformations are compared to the equivalent ensembles within statistical mechanics. Great emphasis is placed on the comparison between thermodynamics and statistical mechanics. First, the properties of systems built on non-interactive particles are studied. Then systems are studied where particles interact with each other and, for example, exact expressions are derived for other viral coefficients.

Project: A small project will be carried out in which, through the use of simulations, statistical mechanical theory is applied to real problems.

Course design

Teaching comprises lectures and calculation exercises in which theoretical aspects are treated. During the course there is one compulsory project that is presented orally and in writing.

Assessment

The course is assessed with a written or oral examination. Re-sit examinations are offered soon after the examination to students who do not pass.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.
To be awarded Pass on the whole course, students must pass the examination and pass the project.

The examination grades are: Pass with Distinction, Pass or Fail. Grades for the compulsory components are: Pass or Fail.

The final grade for the course is determined by the result of the examination.

Entry requirements

To be eligible for this course students must have basic eligibility and 90 higher education credits in completed Science courses, including passes in courses equivalent to:

- KEMA00 General and Analytical Chemistry 7.5 credits, KEMA01 Organic Chemistry – Basic Course 7.5 credits, KEMA02 Inorganic Chemistry – Basic Course 7.5 credits and KEMA03 Biochemistry – Basic Course 7.5 credits, or KEM101 General Chemistry 1 15 credits and KEM102 General Chemistry 2 15 credits, or
  KEM111 Chemistry for Environmental and Biological Sciences – General Course 1 15 credits and KEM122 Chemistry for Environmental and Biological Sciences – General Course 2 15 credits

and

- KEMB09 Physical Chemistry – Basic Course 15 credits or KEM103 General Chemistry 3 15 credits,
- KEMB08 Molecular Interactions and Structure 15 credits, or
  KEM016 Physical Chemistry 15 credits/KEMB19 Physical Chemistry 15 credits and
- one of the courses MATA01 Mathematics for Scientists 1 15 credits, MATA11 Mathematics 1 Alpha 15 credits, MAT015 Mathematics for Scientists 1 15 credits or MAT131 Mathematics 1 Alpha 15 credits.

Admission requirements are also fulfilled for those with basic eligibility and passes in courses equivalent to:

- 90 credits in Physics including Physics 3: Modern Physics 30 credits or FYS023 Physics 3: General Course 30 credits and
- 30 credits in Mathematics

or

- 60 credits in Chemistry, 60 credits in Physics and 60 credits in Mathematics

Equivalent knowledge that has been gained in another way also provides eligibility for the course.

Further information

The course cannot be credited as part of a degree programme that also includes KEM063 Theoretical Chemistry 15 credits or KEMM08 Theoretical Chemistry 15 credits.

Subcourses in KEMM18, Chemistry: Statistical Thermodynamics

Applies from H13

0711 Statistical Thermodynamics, 6,0 hp
Grading scale: Fail, Pass, Pass with distinction
0712 Statistical Thermodynamics, Compulsory Elements, 1,5 hp
Grading scale: Fail, Pass

Applies from H07

0701 Statistical Thermodynamics, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction
0702 Statistical Thermodynamics, Compulsory Elements, 0,0 hp
Grading scale: Fail, Pass