Faculty of Science

KEMM87, Chemistry: Advanced Surface and Colloid Chemistry, 15 credits

Kemi: Avancerad yt- och kolloidkemi, 15 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2022-09-08 to be valid from 2022-09-08, autumn semester 2023.

General Information

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

Language of instruction: 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 enable students to acquire in-depth physicochemical knowledge in the field of surface and colloid chemistry from a molecular perspective and a quantitative understanding of selected fundamental colloid and interface phenomena.

Knowledge and understanding

On completion of the course, the students shall be able to

- explain the self-association of amphiphilic molecules and the underlying thermodynamics
- explain the concept of surface energy and relate it to interface phenomena
- explain electrostatic exchange in molecular and colloidal systems

- describe the structure and properties of micelles of amphiphilic molecules
- describe different forces between colloidal aggregates and and how they control colloidal stability
- describe the properties of amphiphilic bilayer systems
- explain the effects of polymers in colloidal systems
- describe the structure and properties of micro and macro emulsions
- explain phase equilibria and describe phase diagrams
- describe a number of applications (primarily biological and technical ones) in which the systems and phenomena mentioned above are central

Competence and skills

On completion of the course, the students shall be able to

- plan and perform an experimental study in surface and colloid chemistry
- compile and analyse experimental data and summarise them in a written report
- present and discuss research articles in the subject area
- apply conceptual understanding within surface and colloid chemistry in order to explain everyday phenomena

Judgement and approach

On completion of the course, the students shall be able to

- propose qualitative molecular interpretations of macroscopic properties and phenomena of complex materials
- identify and independently acquire the knowledge required to implement a project in surface and colloid chemistry

Course content

Part 1 Theory 7.5 credits
The *theoretical part* consists of lectures and exercises dealing with surface and colloid chemistry from a molecular physicochemical perspective The key topics comprise the self-association of amphiphilic molecules, polymers in colloidal systems, phase equilibria in solutions, interface phenomena, and interactions between molecules and surfaces with applications to colloidal stability.

Part 2 Practical compulsory part 7.5 credit
The *practical part* consists of laboratory sessions, computer exercises and a literature exercise. The laboratory sessions introduce key experimental techniques within the field of surface and colloid chemistry and illustrate, together with the computer exercises, central phenomena from the theory part. The literature exercise includes literature searches in a database, oral presentation of a research article and participation in discussions at the oral presentations.

Course design

The teaching consists of teacher-directed sessions, which presuppose that the student has prepared the material in the textbook in advance and make use of computer-based learning activities, computer exercises, literature exercise and laboratory sessions. Compulsory participation is required in the literature exercise, computer exercises, laboratory sessions and associated elements.

Assessment

Assessment takes the form of an oral exam at the end of the course as well as participation in compulsory components (literature exercise, computer exercise and laboratory sessions) during the course.

Students who do not pass a regular assessment will be offered another opportunity for assessment soon thereafter.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

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.
For a Pass grade on the whole course, the student must have Pass grades on the exam, the laboratory reports, the computer exercises, and active participation in the literature exercise.

The grading scale for the exam is Fail, Pass and Pass with Distinction, whereas the compulsory components are graded according to the scale Fail, Pass.

The final grade is determined by the grade on the exam.

Entry requirements

To be admitted to the course, students must meet the general entry requirements for higher education and requirements for English proficiency equivalent to English 6/B from Swedish upper secondary school, and have passed 90 credits in natural science studie, including knowledge equivalent to:

- KEMA20 General Chemistry 15 credits
- KEMA01 Organic Chemistry - Basic Course 7.5 credits
- KEMA03 Biochemistry - Basic Course 7.5 credits
- KEMB09 Physical Chemistry - Basic Course 15 credits, and
- MATA03 Mathematics for Scientists 1, 15 credits, or the equivalent.

Students also satisfy the entry requirements if they meet the general entry requirements for higher education and requirements for English proficiency equivalent to English 6/B from Swedish upper secondary school, and have passed courses equivalent to:

- 75 credits in physics
- 30 credits in mathematics

Students who have obtained the equivalent knowledge by other means may also be admitted to the course.

Further information

The course replaces KEMM77 Advanced surface and colloid chemistry, 15 credits, and credits from that course cannot count towards a degree together with this course, or together with KEMM07 Surface and Colloid Chemistry - Advanced Course, 15 credits.

The course is offered at the department of chemistry, Lund University.

Subcourses in KEMM87, Chemistry: Advanced Surface and Colloid Chemistry

Applies from H23

2301 Subcourse 1: Theory, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction
2302 Subcourse 2: Practical compulsory components, 7,5 hp
Grading scale: Fail, Pass