



## DEPARTMENT OF CHEMISTRY AND MOLECULAR BIOLOGY

### **KEM360 Structure and Dynamics of Biomolecules, 15 credits**

Biomolekylerers struktur och dynamik, 15 högskolepoäng

*Second Cycle*

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#### **Confirmation**

This course syllabus was confirmed by Department of Chemistry and Molecular Biology on 2013-09-24 and was last revised on 2018-08-30 to be valid from 2018-09-01, autumn semester of 2018.

*Field of education:* Science 100%

*Department:* Department of Chemistry and Molecular Biology

#### **Position in the educational system**

The course can be read as a free-standing course. The course replaces course KEM450, Structural biochemistry, and the two courses may not be counted in together for a degree.

The course is classified at the level 120-180 credits for Degree of Bachelor and is regarded as a course at second cycle level for Degree of Master (120 credits).

The course can be part of the following programmes: 1) Molecular Biology, Master's Programme (N2MBI), 2) Chemistry and learning, Master's Programme (N2KOL), 3) Master's Programme in Organic and Medicinal Chemistry (N2KEL), 4) Bachelor of Science Programme in Medicinal Chemistry (N1LMK), 5) Master's Programme in Chemistry (N2KEM), 6) Bachelor of Science Programme in Chemistry (N1KEM) and 7) Biology, Master's Programme (N2BIO)

*Main field of studies*

Chemistry

*Specialization*

A1N, Second cycle, has only first-cycle course/s as entry requirements

#### **Entry requirements**

For admission to the course, completed and passed courses comprising 120 credits in the field of natural science are required including at least 45 credits in the field of

chemistry, in particular passed course KEM060 Biochemistry 1 (15 credits) or equivalent knowledge.

### Learning outcomes

After completing the course the student should be able to:

#### *Knowledge and understanding*

##### **Part 1:**

- **account for** the structure and dynamics of biomolecules on an advanced level.

##### **Part 2:**

- **account for** practical knowledge of methods for characterisation of proteins and determination of their three-dimensional structure,
- **account for** different analytical tools such as molecular graphics and Fourier transformation.

#### *Competence and skills*

##### **Part 2:**

- **account for** practical knowledge of methods for characterisation of proteins and determination of their three-dimensional structure,
- **implement** basic experimental tasks as protein crystallization and spectroscopic studies,
- **interpret, discuss and present** laboratory results as well as **draw** reasonable conclusions.

##### **Part 3:**

- independently and creatively **analyse** structure and function of a protein,
- **hold** given **deadlines**,
- **identify** and **use** relevant research literature as support for the current project,
- clearly **present** and **discuss**, orally as well as in writing, their conclusions and the knowledge and the arguments they are based upon, in dialogue with different groups, in both national and international contexts.

#### *Judgement and approach*

**Part 2:**

- critically **discuss** possibilities and limitations of different experimental methods.

**Part 3:**

- critically **assess** the achieved results and their reliability.

**Course content**

The emphasis of course is on experimental methods. The theoretical and laboratory components of the course are linked to current research and intend to prepare the students for a degree project in biochemistry or for continued postgraduate studies in the subject.

The course consists of three parts:

*Sub-courses*

**1. Structure and Dynamics of Biomolecules, theory** (*Biomolekylers struktur och dynamik, teori*), 6 credits

Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)

The sub-course provides advanced knowledge of biomolecules with regard to

- structure,
- dynamics,
- protein ligand and protein-protein interactions,
- function.

as well as about the following experimental methods:

- crystallisation,
- X-ray diffraction and scattering techniques,
- nuclear magnetic resonance (NMR) spectroscopy,
- electron magnetic resonance (EMR) spectroscopy,
- CD spectroscopy,
- vibration (FTIR, Raman spectroscopy, 2D-IR, isotope labelling),
- electron microscopy (EM),
- immune precipitation techniques,
- chemical cross linking,
- calorimetry,
- surface plasmon resonance.

**2. Biophysical Analysis of Biomolecules** (*Biofysikalisk analys av biomolekyler*), 1.5 credits

Grading scale: Pass (G) and Fail (U)

The sub-course provides advanced practical knowledge of structural analysis with X-ray diffraction techniques and resonance spectroscopy (NMR and EMR).

**3. Independent Project** (*Självständigt projektarbete*), 7.5 credits

Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)

The project work gives the students the possibility to independently elucidate structures of biomolecules and deepen their knowledge on structure and dynamics of selected biomolecules by literature studies.

### Form of teaching

**Part 1:** The instruction is given in the form of lectures.

**Part 2:** The instruction includes laboratory sessions and presentations.

**Part 3:** The instruction include an individual assignment including a presentation. Study visits may also be included.

*Language of instruction:* English and Swedish

The course is given as principal rule in English but can be given completely or partly in Swedish when circumstances admit this.

### Assessment

**Part 1:** Examination takes place through written examinations. For students who have not passed the regular examination additional examination sessions are offered.

**Part 2:** Assessment is based on laboratory sessions and presentations.

**Part 3:** Assessment is done through a written and oral presentation of the project.

If a student who has failed the same part of the examination twice wants to change the examiner before the next examination session such request should be submitted in writing to the department and be approved if there are not special causes against this.

**Grades**

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

**Part 1:** The grade corresponds to the result from the written examination.

**Part 2:** To pass are required participation in all laboratory sessions and approved laboratory reports.

**Part 3:** Grade is decided by project work and presentation.

**Final grade:** For grade Pass, at least grade Pass in all modules is required. For grade Pass with distinction, in addition grades Pass with distinction on modules 1 and 3 are required.

Regarding application of ECTS scale for grades please see the Vice-chancellor's decision 20070528, dnr G 8 1976/07.

**Course evaluation**

The course evaluation is done in relation to the expected learning outcomes and contents of the course and is carried out at the end of the course through an individual written questionnaire on the teaching platform of the University of Gothenburg. A student who participates in or has completed a course should be given possibility to anonymously express experiences of and views in the course in a course evaluation. A compilation of course evaluation and reflections of the responsible teacher should be made available to the students within reasonable time after the end of the course. Next time the course is given the compilation and, if applicable, actions taken should be presented for the students.