DEPARTMENT OF CHEMISTRY AND MOLECULAR BIOLOGY

KEM350 Design and Production of Biomolecules, 15 credits

Design och produktion av biomolekyler, 15 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Chemistry and Molecular Biology on 2013-09-24 and was last revised on 2018-08-28 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. This course replaces the courses KEM090, Biochemistry 2 and KEM300, Protein Engineering and may not be counted in together with any of these courses for a degree.

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) Master's Programme in Chemistry (N2KEM), 5) Bachelor of Science Programme in Medicinal Chemistry (N1LMK), 6) Bachelor of Science Programme in Chemistry (N1KEM) and 7) Biology, Master's Programme (N2BIO)

Main field of studies	*Specialization*
Chemistry	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 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

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. On completion of the course, the student is expected to be able to:

Knowledge and understanding

- **accoun**t for general function-structure relationship of proteins on an advanced level,
- **account** for methods for expression, purification and characterisation of both soluble and membrane-bound proteins,
- **account** for the most common spectroscopic methods (absorption of visible and UV light as well as fluorescence) for characterisation of proteins,
- **account** for theoretical and practical enzyme kinetics applied on multiple-substrate reactions,
- **account** for principles of membrane transport catalysed by membrane proteins and give specific examples,
- **describe** how signal transduction is accomplished by means of proteins.

Competence and skills

- **plan** and **design** a biochemical project,
- **apply** methods for expression, purification, and characterisation of both soluble and membrane-bound proteins,
- **to a certain extent apply** the most common spectroscopic methods (absorption of visible and UV light as well as fluorescence) for characterisation of proteins,
- **suggest** and **justify** appropriate mutations in order to characterise stability, structure and/or function of proteins,
- **design** cloning experiments as well as primers for PCR,
- **follow** a laboratory protocol on one's own,
- **present** laboratory results in a written report in a correct and understandable way,
- **implement** an advanced literature study that covers flow from mutagenesis to characterisation of modified protein for a membrane-bound protein, as well as present result orally and in writing in English.

Judgement and approach

- **interpret** and **discuss** laboratory results as well as draw reasonable conclusions,
- **draw conclusions** concerning effect of the completed mutation on properties of a protein,
- **reflect** on application of protein design from a societal perspective.

Course content

The course provides advanced knowledge of directed mutagenesis and recombinant DNA technology, production of proteins in different systems as well as structure and function of proteins. The course is divided into three modules; a theoretical, a practical and an independent project work.

Sub-courses

1. **Design and Production of Biomolecules, theory** *(Design och produktion av biomolekyler, teori),* 5 credits
   Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
   The theoretical module gives advanced knowledge of how proteins are involved in transport over a membrane as well as signal transduction. Furthermore, the module treats the theory behind the methods that are used in module 2 and in practical applications as well as project planning of the latter.

2. **Advanced Biochemical Methodology and Analysis** *(Avancerad biokemisk metodik och analys),* 5 credits
   Grading scale: Pass (G) and Fail (U)
   The practical module gives advanced knowledge in methodology for production, separation, purification and characterisation of proteins through laboratory work. The following methods are used for example: protein design and production, electrophoresis, chromatography, spectroscopy and enzyme kinetics.

3. **Independent Project** *(Självständigt projektarbete),* 5 credits
   Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
   The independent project work includes a literature study concerning flow from gene design to characterisation of pure protein product. The study is organised as problem-based learning.

Form of teaching

Part 1: Lectures.

Part 2: Laboratory sessions, written laboratory reports.

Part 3: Literature project including written and oral presentation.

Laboratory sessions, written laboratory reports and written as well as oral presentation of literature project are compulsory.

Language of instruction: English and Swedish
As principal rule, the course is given in Swedish but can be given completely or partly in English if the circumstances require it.

Assessment

Part 1: Written examination at the end of the course.

Part 2: Laboratory reports and practical laboratory examination.

Part 3: Written and oral presentation of project work that is assessed according to a special model.

For students who have not passed the regular examination, additional examination sessions are offered. If a student who has 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).
For grade Pass for the whole course, at least grade Pass in all modules is required. For grade Pass with distinction in the whole course, grade Pass with distinction on module 1, grade Pass on module 2 and grade Pass with distinction on module 3 are required.

Regarding application of the ECTS scale for grade please see decision 28/05/2007, diary nr G 8 1976/07.

Course evaluation

The course evaluation is done in relation to the expected learning outcomes and content 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 the possibility to anonymously express experiences of and views on 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.