Linnæus University

Jnr: UGA 2015/696-3.1.2

Course syllabus

Faculty of Health and Life Sciences
Department of Chemistry and Biomedical Sciences

2KE501 Modern kemi och livsmedelsvetenskap, 15 högskolepoäng
Current Chemistry and Food Science, 15 credits

Main field of study
Chemistry

Subject Group
Chemistry

Level of classification
First Level

Progression
G2F

Date of Ratification
Approved by Faculty of Health and Life Sciences 2015-03-02
The course syllabus is valid from autumn semester 2015

Prerequisites
45 credits in Chemistry.

Objectives

Through the course the student should acquire knowledge of and skills in methods within chemistry and food science.

After completing the course the student should be able to:
• Apply chosen methods within chemistry and food science
• Make a case for and draw conclusions regarding the possibilities and limits of the chosen methods, based on the scientific literature
• Give an account of and discuss the effects of different methods on the environment and on society based on the scientific literature, legislation and ethical considerations.

The course consists of 4 (four) subcourses.

After completing subcourse 1 (Livsmedelsvetenskap - Food Science, 5hp) the student should be able to:
• give an account of Swedish and EU legislation for the food industry
• give examples of and give an account of how the Swedish food industry works
• give an account of scientific work within the food industry and food technology as well as
• give an account of aspects of the above in oral and written presentations.

After completing subcourse 2 (Organisk kemi - Organic Chemistry, 2hp) the student should be able to:
• Give an account of the concept of solid-phase peptide synthesis

• Give an account of the methods for isolating natural products, including their limitations and areas of application;
• Give an account of the concept of the use of biomolecules in organic synthesis, including their limitations and areas of application;
• Conduct solid-phase peptide synthesis, including isolation and characterization of the product;
• Conduct organic synthesis with the help of enzymes, including isolation and characterization of the product, and
• Present aspects of the above in oral and written presentations.

After completing subcourse 3 (Biomaterial kemi – Biomaterials, 5hp) the student should be able to:

• Give a general account of the structure and function of the most common types of macromolecules, biological as well as synthetic (carbon-based).
• Give an account of some of the common types of biomaterials and their areas of use;
• Give an account of the interaction between cells and non-biological material (in vitro);
• Give an account of the interaction between tissue (blood) and non-biological material (in vitro);
• Give an account of test systems for measuring the activation of blood's cascade system and cells;
• Give an account of methods for producing synthetic polymers and dendrimers
• Give a general account of methods used to produce proteins
• Conduct a polymer synthesis, including isolation and characterization of the product; and
• Present aspects of the above in oral and written presentations.
After completing subcourse 4 (Analytisk kemi med inriktning mot sensorer och livsmedelsanalys – Analytical chemistry with a focus on sensors and food analysis, 3 credits) the student should be able to:

• Give an account of the physical principles used in sensor technology and chromatography;
• Give an account of the technical structure of a sensor and chromatographic instrument;
• Give an account of the use of various sensor techniques and chromatographic methods during the qualitative and quantitative characterization of food products in food production and quality control;
• Present aspects of the above in oral and written presentations.

Content

Subcourse 1 Food science 5 credits
• Swedish and EU legislation on food safety
• Study visits to several companies in the food product industry
• Written presentation based on legislation, study visits and scientific literature
Subcourse 2 Organic chemistry, 2 credits
• Solid phase peptide synthesis, Merrifield synthesis, modern FMOC and BOC strategies, orthogonal protecting group strategy.
• The use of food related enzymes in organic synthesis.
• Isolation and verification of natural products

Subcourse 3 Biomaterials chemistry, 5 credits
• Structure and function of biomolecules and synthetic macromolecules.
• Principles for polymer synthesis.
• Common types of biomaterials and their areas of use.
• Interaction between artificial materials and cells.
• Interaction between artificial materials and tissue (blood).
• Composition of blood: protein systems and cells.
In vitro systems for studies of the interaction between blood and artificial materials.
• ELISA, western blot, flow cytometry.

Subcourse 4 Analytical chemistry with a focus on sensors and food analysis, 5 credits
• Physical principles for generating measurement signals: piezoelectricity, surface plasmon resonance and luminescence.
• The technical construction of a sensor and chromatographic equipment : sample introduction, flow cell, detector, amplifier, translator, computer.
• Sensor techniques: QCM, SPR, fluorescence spectroscopy
• Electronic nose/tongue, glucose sensor, aerosol sensor and powder sensor.

Type of Instruction

The instruction consists of seminars, exercises and laboratory work. Participation in seminars, exercises and laboratory work is obligatory; all obligatory elements are presented in the schedule. The course is designed to train the student to actively seek, gather and evaluate knowledge, apply knowledge in practice as well as present and discuss results in association with exercises and seminars.

Examination

The course is assessed with the grades A, B, C, D, E, Fx or F.
The grade A constitutes the highest grade on the scale and the remaining grades follow in descending order where the grade E is the lowest grade on the scale that will result in a pass. The grade F means that the student's performance is assessed as fail.

Examination of each respective subcourse is conducted through written assignments and oral and written presentations. The number of opportunities for examination is limited to five. Resubmission of an examination should as a general rule occur within 10 days of feedback.

The subcourses are evaluated with the grades A to F. The final grade for the course is calculated based on the grade for each subcourse, in proportion to the number of credits. The criteria for a passing grade are listed in Objectives (see above).

Course Evaluation

A written course evaluation is conducted at the end of the course. The results of the evaluation are compiled in a course report that is archived by the department's administration. The results and any measures taken are communicated to the head of department och presented to the students who have completed the course and those who are taking it at the next occasion.

Other

Grade criteria for the A–F scale are communicated to the student through a special document. The student is to be informed about the grade criteria for the course by the start of the course at the latest.

The language of instruction is normally English but the course may be conducted in Swedish if only Swedish speaking students participate.

Required Reading and Additional Study Material

SUBCOURSE 1 (Food science, 5 credits)
Relevant literature on Swedish and EU legislation current at the time when the course starts.
In addition: scientific articles.

SUBCOURSE 2 (Organic chemistry, 2 credits)
Bloch, Daniel (2006). Organic Chemistry Demystified. McGrawHill Professional Publishing. ISBN 9780071487108 (Ebook available through the university library).
In addition: scientific articles.

SUBCOURSE 3 (Biomaterials chemistry, 5 credits)
Hill, A.J., Hannink, H. J. (Eds) (2006). Nanostructure Control of Materials. Woodhead Publishing, New York. ISBN 9781845691189 (Ebook available through the university library).

In addition: scientific articles.

SUBCOURSE 4 (Analytical chemistry with a focus on sensors and food analysis, 3 credits)

Eggins, Brian R. (2008). Chemical sensors and biosensors. John Wiley & Sons, Chichester. ISBN 9780471899143 (Ebook available through the university library).

Skoog (2013). Fundamentals of Analytical Chemistry. Cengage Learning, Andover. 1072pp. ISBN 13: 978-0495558286

In addition: scientific articles.