Spectroscopy and Kinetics

Programme course

6 credits

Spektroskopi och kinetik

TFKE43

Valid from: 2017 Spring semester

Determined by
Board of Studies for Chemistry, Biology and Biotechnology

Date determined
2017-01-25

Main field of study
Biotechnology, Chemical Engineering, Chemistry

Course level
First cycle

Advancement level
G1X

Course offered for
- Chemical Biology, M Sc in Engineering
- Chemical Analysis Engineering, B Sc in Engineering

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites
General Chemistry 1, 2, Organic Chemistry 1, Biochemistry 1, Mathematics entry level course Analysis in one and several variables or equivalent.

Intended learning outcomes
The course aims to confer knowledge in physical chemistry within the areas kinetics, quantum mechanics and molecular spectroscopy and skills in problem solving and laboratory tasks within the areas listed in the course contents below. After successfully completed course the course participant will be able to:

- understand the basic principles underlying the physical processes covered in the course
- describe and discuss the physical phenomena as well as the kinetic and spectroscopic instruments and measurement techniques, and account for, explain and exemplify the theory
- perform calculations in one or more dimensions and solve problems within the course content area.
- apply the acquired facts and skills on and analyse complex physical processes
- conclude whether obtained results are reasonable and reflect over fundamental physical-chemistry problems in science, nature and society
- work with physical-chemistry problems solitarily and in groups
- organize the laboratory work and analyse, compile and account for the laboratory exercise results in laboratory reports.

Course content

Lectures, lessons and laboratory exercises cover the following areas:

- Kinetics: rate equations and their integration, reaction order, half life, reaction mechanisms, catalysis, photochemistry, techniques for measuring fast reactions, flow, flash and relaxation methods, activation energies and molecular reaction dynamics.
- Quantum mechanics: basic quantum-mechanical concepts, one- and multidimensional particle-in-a-box, harmonic and anharmonic oscillator, rotation on a ring and on a sphere, the hydrogen atom, plus elementary introduction to many-electron atomic and molecular electron structure.
- Spectroscopy: interaction between electromagnetic radiation and matter by absorption and emission, fluorescence and phosphorescence, lasers, and rotational, vibrational and electron spectroscopic methods such as microwave, infrared, visible/UV, X-ray photoelectron and magnetic resonance spectroscopy.

Teaching and working methods

The theory is presented during the lectures. Problem solving is practised during the lessons. In the laboratory exercises fundamental laboratory techniques and moments connected to the theory and problem solving are practised. The laboratory exercises, whose laboratory exercise instructions and safety rules must be studied prior to the exercise, are mandatory. Written reports are handed in within five workdays from the laboratory exercise occasion.

Examination

LAB1	Laboratory work	1.5 credits	U, G
TEN1	Written examination	4.5 credits	U, 3, 4, 5

For approved laboratory work carried-through laboratory exercises and approved reports are required.

Grades

Four-grade scale, LiU, U, 3, 4, 5

Other information

Supplementary courses: Biological Measurements and Nanochemistry

Department

Institutionen för fysik, kemi och biologi

Director of Studies or equivalent
Magdalena Svensson

Examiner
Lars Ojamäe

Course website and other links
http://www.ifm.liu.se/physchem/courses/

Education components
Preliminary scheduled hours: 56 h
Recommended self-study hours: 104 h

Course literature
Atkins P.W.: Physical Chemistry (valda delar). Problemsamling och laborationstenciler.

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.