FSK3800 Laser Spectroscopy 8.0 credits

Laserspektroskopi

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for FSK3800 valid from Spring 2010

Grading scale

G

Education cycle

Third cycle

Specific prerequisites

Quantum Physics for F3, or Molecular Structure for K2 and BIO2, or Quantum Chemistry and Spectroscopy for K4.

Language of instruction: English

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The course aims to give basic knowledge about the construction and function of the laser, and about its use in optics, molecular physics, biophysics, physical chemistry, and chemical physics. The students will gain skills in handling modern lasers, spectrometers and detectors.

After the course the student will be able to:

- solve technical problems concerning frequency conditions and mode structure of a laser
- explain how a confocal resonator is designed and how it works, and suitable measuring methods and instrumentation to be able to perform measurements on a laser resonator
- explain level diagrams of the laser medium
- perform measurements with advanced spectrometers within the field of laser induced fluorescence, laser Raman spectroscopy, and to analyze fluorescence spectra
- to be able to use search engines on scientific information and on scientific literature in a systematic way
- be able to explain front areas as femtosecond spectroscopy, LIBS and ionisation spectroscopy

Course contents

The topics of the course are: Structure and dynamics of molecules. Construction and function of the laser. Interaction between light and matter. Laser types: dye lasers, continuous lasers, pulsed lasers, ultra fast lasers, semiconductor lasers. Laser applications in molecular physics and chemical physics: molecules (free radicals and ions), femtosecond chemistry and spectroscopy on transition states, selective breaking of chemical bounds and IVR (intramolecular vibrational redistribution), the use of the laser for diagnostic purposes.

Course literature

Laser Chemistry: Spectroscopy, Dynamics & Applications
Helmut H. Telle, Angel González Ureña, Robert J. Donovan, University of Edinburgh, Scotland
ISBN: 978-0-471-48571-1 2007

Distributed material.

Examination

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

- LAB1 - Laboratory Work, 2.0 credits, grade scale: P, F

- TEN1 - Examination, 6.0 credits, grade scale: P/F

Other requirements for final grade

One written exam (TEN1; 6 university credits). To get the final mark the laboratory experiments have to be completed and approved (LAB1; 2 university credits).

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.