



# SK2800 Laser Spectroscopy 8.0 credits

## Laserspektroskopi

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

## Establishment

The course syllabus is valid from Spring 2022 according to the school principal's decision: S-2022-0529 Decision date: 2022-02-24

## Grading scale

A, B, C, D, E, FX, F

## Education cycle

Second cycle

## Main field of study

Physics, Engineering Physics

## Specific prerequisites

English B / English 6

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

## Language of instruction

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

## Intended learning outcomes

After completing the course the student should be able to:

- solve technical problems related to the quantum physical structure of atoms and molecules and their spectral properties.
- use laser spectroscopic measurement methods, instruments and calculation programs, and report results and evaluate limitations.

## Course contents

The course starts with a short introduction to the laser and its physical properties. We then discuss light-matter interaction using a quantum mechanical description, starting from the basics of atoms and molecules. We study a number of modern spectroscopic techniques and their use in biological and chemical physics, medicine, and environmental science. Focus is on practical examples from society and advanced techniques used in the research laboratory. The course includes laborations where we apply the measurement techniques and the data analysis studied.

The main topics of the course are: Structure and dynamics of molecules. The construction and function of lasers. Interaction between light and matter. Laser types: narrow band and tunable, continuous wave and pulsed lasers, ultra-fast lasers and their physics. Laser applications in molecular physics and chemical physics: high resolution spectroscopy, short lived molecules (free radicals and ions), laser induced breakdwn spectroscopy (LIBS) femtosecond chemistry and spectroscopy, the use of the laser in medicine and for diagnostic purposes.

## Examination

- **TEN1** - Examination, 6.0 credits, grading scale: A, B, C, D, E, FX, F
- **LAB1** - Laboratory Work, 2.0 credits, grading scale: P, F

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.

## 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.