Molecular Physics

Programme course

6 credits

Molekylär fysik

TNE024

Valid from: 2017 Spring semester

Determined by
Board of Studies for Electrical Engineering, Physics and Mathematics

Date determined
2017-01-25

Main field of study
Applied Physics, Physics

Course level
Second cycle

Advancement level
A1X

Course offered for
- Electronics Design Engineering, M 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
Physical Modelling, Modern Physics

Intended learning outcomes
The course introduces the basics in molecular physics necessary to tackle more advanced courses in organic electronics. To succeed the course, the student is expected to be able to:

- use the knowledge from modern physics and mathematics
- describe the Schrödinger equation for atoms and molecules
- predict the structure and bonds in molecules and polymers
- explain the results from vibrational and optical spectroscopies used to characterize molecules and polymers
- explain various concepts and definitions (electron affinity, ionisation potential, electronegativity, Pauli principle, spin of particles and transition dipole moment)
- propose ways to control the optical properties of organic materials
- calculate the electronic structure of molecules and polymers in the Hückel approximation

Course content

Basics of quantum mechanics is introduced. Application of basic quantum mechanics to describe the formation of bonds in molecules and between molecules. The Schrödinger equation is used to extract the electronic structure of small conjugated molecules. Basics of chemical nomenclature is introduced. Bloch's theorem is applied to monomer units to predict the electronic structure of conjugated polymers. Spectroscopic techniques are introduced to show how to characterize various molecular properties: molecular vibrations, optical excitations and electronic structure. The principle of those spectroscopies is introduced using quantum mechanics.

Teaching and working methods

Lectures, Lessons

Examination

TEN1	Written examination	6 credits	U, 3, 4, 5

Grades

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

Department

Institutionen för teknik och naturvetenskap

Director of Studies or equivalent

Adriana Serban

Examiner

Igor Zozoulenko

Course website and other links

Education components

Preliminary scheduled hours: 40 h
Recommended self-study hours: 120 h

Course literature

Additional literature

Books

Atkins, de Paula, *Physical Chemistry*

Websites

Lecture notes

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.