Modern Physics II

Programme course

4 credits

Modern fysik II

TFYA74

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
First cycle

Advancement level
G2X

Course offered for
- Physics and Nanotechnology
- Applied Physics and Electrical Engineering - International, M Sc in Engineering
- Applied Physics and Electrical 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
Calculus, Mechanics, Wave Motion and Electromagnetic Field Theory

Intended learning outcomes
In Modern physics II applications of the foundations of relativity and quantum physics given in Modern Physics I are included. After completion of this course the student will be able to:

- outline the main ideas and theories in the more applied areas of modern physics
- solve problems in modern physics by choosing appropriate methods and assess the plausibility of the results obtained
- formulate and evaluate mathematical models describing physical problems
- explain the significance of the Swedish and English terms used in the field
- perform simple measurements and computer simulations of importance in modern physics

Course content

Modern physics is essentially the physics of the twentieth century, and has a huge range, from the smallest building blocks of the universe and everything in between. In this course we focus on the more applied parts of quantum physics and to some extent the theory of relativity and apply them to:

- Molecular physics: chemical bonds, molecular orbitals, hybridization, rotation and vibration, molecular spectra
- Solid State Physics: crystal structures and bonding, electronic structure, semiconductor physics and semiconductor devices
- Exotic materials and states of matter: fullerenes, laser, superconductivity, Bose-Einstein condensate
- Numerical solution of quantum mechanical problems: the principle of variation, computational materials science, quantum chemistry
- Quantum information theory: qubits, quantum computers and quantum cryptography
- Elementary particle physics: the standard model and beyond
- Cosmology: the Big Bang theory, the expansion of the universe, black holes
- Laboratory exercises in quantum physics and nuclear physics

Teaching and working methods

Lectures, problem solving exercises, laboratory exercises

Examination

LAB1	Laboratory work with written assignment	1 credits	U, G
TEN1	Written examination	3 credits	U, 3, 4, 5

Grades

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

Other information

Supplementary courses: Nanotechnology, Physics of Condensed Matter, Experimental Physics, Semiconductor Technology, Surface Physics, Analytical Mechanics, Theory of Relativity, Quantum Mechanics, Cosmology, Medical Radiation Physics

Department

Institutionen för fysik, kemi och biologi

Director of Studies or equivalent

Magnus Johansson

Examiner
Rickard Armiento

Course website and other links

Education components
Preliminary scheduled hours: 52 h
Recommended self-study hours: 55 h

Course literature
Randy Harris: Modern Physics, 2a upplagan., Pearson international edition, 2008
(ISBN-13: 978-0-321-52667-0)

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.