



Faculty of Health, Science and Technology
Physics

Syllabus

Solid State Physics

Course Code:	FYGC09
Course Title:	Solid State Physics <i>Fasta tillståndets fysik</i>
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has at least 60 credits in first-cycle course/s as entry requirements (G2F)

Major Field of Study:
FYA (Physics)
TKA (Engineering Physics)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2020-03-11, and is valid from the Autumn semester 2020 at Karlstad University.

Prerequisites

45 ECTS credits in Physics, including Wave Physics and Optics (7.5 ECTS credits) (or Wave Physics and Electric Circuits, 7.5 ECTS credits), Introduction to Modern Physics (7.5 ECTS credits), Mechanics with Applications 1 (7.5 ECTS credits), and Thermodynamics and Statistical Physics (7.5 ECTS credits), plus 30 ECTS credits in Mathematics, including Linear Algebra (7.5 ECTS credits) and Calculus in Several Variables (7.5 ECTS credits), or equivalent

Learning Outcomes

Upon completion of the course, students should be able to:

- explain and describe the structure of crystals, reciprocal space, and atomic bonds,

- give an account of and perform calculations on diffraction and its link to reciprocal space,
- explain and give an account of dynamics, phonons, and thermal properties of crystals,
- give an account of and perform calculations on the electron structure of crystals, electrical conductivity, dielectric function and plasmons, and
- describe and explain different magnetic properties and their origins.

Content

The structure of crystals: different crystal types, direct and reciprocal lattice, experimental determination of crystal structures, diffraction in crystals, bindings in crystals, cohesive energy.

The dynamics of crystals: lattice vibrations, vibrational modes, and thermal properties.

The electronic structure of crystals: free electron gas, nearly-free electron model, energy band, and effective band mass.

Band structure of metals, semi-conductors and insulators, Fermi surfaces, shielding, and plasmons.

Superconductivity, dielectric and magnetic properties.

Practical laboratory sessions on relevant phenomena.

Reading List

See separate document.

Examination

Assessment is based on written and oral exams, hand-in assignments, and laboratory reports.

If students have a decision from Karlstad University entitling them to special pedagogical support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades

One of the grades Fail (U), Pass (G), or Distinction (VG) is awarded in the examination of the course. For students in Engineering programmes, one of the grades 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), or U (Fail) is awarded in the examination of the course.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.