Reg No: CBAD81/20261

Faculty of Health, Science and Technology
Physics

Syllabus

Functional materials

Course Code:	CBAD81
Course Title:	Functional materials *Funktionella material*
Credits:	7.5
Degree Level:	Master's level
Progressive Specialisation:	Second cycle, has second-cycle course/s as entry requirements (A1F)

Major Field of Study:
FYA (Physics)

Course Approval
The syllabus was approved by the Faculty of Health, Science and Technology 2025-09-01, and is valid from the Spring semester 2026 at Karlstad University.

Prerequisites
Physics, 60 ECTS credits, including Solid State Physics, 7.5 ECTS credits, Quantum Physics I, 7.5 ECTS credits, Nanoscience I, 7.5 ECTS credits, Mathematics, 30 ECTS credits, and registered for Physical Electronics, 7.5 ECTS credits, plus upper secondary level English 6 or English level 2, or equivalent

Learning Outcomes
The purpose of this course is to give participants in-depth knowledge of some functional materials that were developed for specific purposes, their properties and their function in technical applications. Practical projects give students the opportunity to become familiar with preparation of materials and structures, along with evaluation of their properties and function. Special attention is paid to materials and structures in the nanometer or micrometer scale in at least one dimension. Students are trained in poster presentation techniques.

Upon completion of the course, students should be able to:
1. give an account of various types of functional materials, their properties and applications,
2. independently search for scientific sources on functional materials and their applications and present these findings,
3. guided by instructions and scientific articles, perform an independent experimental project and write a project report, and
4. make and present a poster on a chosen project on functional materials.

Content
Functional materials are materials made for a specific purpose, such as mechanical, electronic, photonic, chemical, medicinal, or biological functions. The course covers crystalline and molecular materials as well as inorganic and organic compounds. Further, the course covers physical and chemical properties of materials and phenomena that arise from nanostructuring. Technical applications of functional materials are also discussed.

The course covers the following categories of functional materials:
- Photonic and electronic materials for the transmission of information
- Traditional and new materials for information storage
- Inorganic and organic materials for solar cells and new light sources
- Materials for batteries
- Biomaterials
- Polymers
- Surface active materials.

The laboratory component of the course encompasses the manufacture of functional materials and structures, including nanoparticles, self-organised molecular monolayers patterned by soft lithography, and thin films of polymer blends.

Instruction is in the form of lectures, seminars, and laboratory projects. Participation in seminars and projects is mandatory.

Reading List
See separate document.

Examination
Assessment is based on individual written hand-in assignments and an individual poster presentation of a projects. Written laboratory reports are completed in groups and submitted for each project. Participation in seminars and projects is mandatory.

If students have a decision from Karlstad University entitling them to Targeted Study 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 5 (Distinction), 4 (Some Distinction), 3 Pass, or Fail (U), 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.