

Course Specifications

From the academic year 2014-2015 up to and including the

Physics and Chemistry of Nanostructured Materials (E024720)

Course size (nominal values; actual values may depend on programme)

Credits 6.0 Study time 180 h Contact hrs 52.5 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	English	lecture	30.0 h
		seminar: coached	15.0 h
		exercises	

Lecturers in academic year 2018-2019

Hens, Zeger	WE06	lecturer-in-charge
Moreels, Iwan	WE06	co-lecturer

Offered in the following programmes in 2018-2019

Master of Science in Engineering Physics	crdts	offering
	6	A

Teaching languages

English

Keywords

nanoscience, colloidal nanocrystals, quantum confinement, self-assembly, quantum transport

Position of the course

The course will give students an introduction in the chemical and physical background of nanosciences. The course focuses on the (physico)chemical principles used to make nano-objects and on the physical properties of these objects. The aim of the course is that students understand what nanoscience is, that students have insight in the course of actual nanoscience research and the students can situate and interpret scientific literature on nanoscience.

Contents

- Introduction: Nanoscience and nanotechnology: what, why and how?, Observation, measurement and manipulation at the nanoscale
- Building blocks of bottom-up nanotechnology: Synthesis of colloidal nanocrystals, Quantum confinement in semiconductor nanocrystals, Magnetic nanostructures, Carbon nanotubes
- Nanodesign by self-assembly: Thermodynamics of self-assembly, Self-assembled monolayers, Self-assembly of nanocrystals, Design of experimental nanodevices
- Quantum transport: Electron tunneling - tunnel junctions, Single-electron tunneling - Coulomb blockade, Spin-polarized electron transport

Initial competences

physics 1, physics 2, chemistry 1, chemistry 2, Physical chemistry, quantum mechanics 1, quantum mechanics 2, solid-state physics 1, solid-state physics 2

Final competences

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, seminar: coached exercises

Extra information on the teaching methods

Classroom lectures; Classroom problem solving sessions; Classroom lectures

Learning materials and price

The course is using recent review papers from the literature.

Price for copies: 7.5 euro

References

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Course content-related study coaching

Evaluation methods

continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Examination methods in case of periodic evaluation during the second examination period

Examination methods in case of permanent evaluation

Oral examination, report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Extra information on the examination methods

During semester: graded project reports; graded oral presentation. Second chance:

Possible in adapted form

Calculation of the examination mark

Evaluation throughout semester