Course Specifications
Valid as from the academic year 2015-2016

Solid-state Physics and Semiconductors II (E024620)

Course size
 Credits: 3.0
Study time: 90 h
Contact hrs: 30.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 2) Dutch seminar 12.5 h
lecture 15.0 h
practicum 2.5 h

Lecturers in academic year 2018-2019
Detavernier, Christophe WE04 lecturer-in-charge
Strijckmans, Koen WE04 co-lecturer

Offered in the following programmes in 2018-2019
Bachelor of Science in Engineering Physics

Teaching languages
Dutch

Keywords
Surfaces, crystal defects, nanostructures, semiconductor junctions, superconductivity, crystal growth

Position of the course
To get acquainted with the physics of real crystals and crystals with small dimensions. To provide insight into processes and mechanisms governing the operation of semiconductor devices. To get acquainted with the phenomena and the theory of superconductivity.

Contents
- P-n junctions: Homojunctions, Heterojunctions
- Metal-semiconductor contacts and the MIS diode: Schottky barrier, Ohmic contact, MIS-diode and MOS
- Superconductivity: Overview of experimental phenomena, Theoretical overview, junctions of superconductors, High-Tc superconductors
- Surfaces and interfaces: Crystallography of surfaces, Surface states
- Crystal defects: Point defects, Dislocations and stacking faults
- Nanostructures: Quantum well, Quantum wires, Quantum dots
- Crystal growth: Growth techniques

Initial competences
Solid-state physics and semiconductors I

Final competences
1 Understanding the effect of electric fields and concentration gradients on the band structure in semiconductors.
2 Being able to draw and interpret energy band diagrams.
3 Using concepts from semiconductor physics to explain the operation of electronic components (p-n junction, heterojunction, metal/semiconductor contact, MOS structure).
4 Possess the practical skills for performing electrical measurements on semiconductor components.
5 Understanding the relationship between size and electronic properties of nanostructures and possess the scientific curiosity to explore them further.
6 Knowing key concepts related to superconductivity (e.g. Meissner effect, Cooper pair, Josephson junction) and possess the scientific curiosity to explore them further.

(Approved)
7 Knowing key concepts related to defects in solids (vacancies, interstitials, color center, dislocations, stacking fault, surface, work function).
8 Knowing key concepts related to crystal growth and epitaxial growth.
9 Have the skills for solving exercises related to concepts in solid-state physics.

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, practicum, seminar

Learning materials and price
course notes – 5 EUR

References

Course content-related study coaching

Evaluation methods
end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period
Written examination, open book examination

Examination methods in case of periodic evaluation during the second examination period
Written examination, open book examination

Examination methods in case of permanent evaluation
Skills test

Possibilities of retake in case of permanent evaluation
examination during the second examination period is not possible

Extra information on the examination methods

Calculation of the examination mark
Special conditions: 1 lab session, for 10% of the total result. The result of the lab work is transferred to the second exam period.