Nanoscience and technology
Aangeboden door: TN, ST, EE
Taal: Engels
Primaire doelgroep: TN, ST, EE
Voorkennis: Calculus (2WBB0 of 2WCB0), Toegepaste natuurwetenschappen (3NBB0)
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Inhoud en samenstelling
Nanoscience and nanotechnology are intimately related. Together they form a research area in which state-of-the-art science and high-end technological applications go hand in hand. In this track students will establish a quantitative picture of the most important aspects of ‘nano’. In the three courses, preparation & fabrication of nanomaterials, physical properties & characterization of nanomaterials and device applications & system integration will be discussed successively. This way, the whole chain of knowledge, from designing the properties, via making the objects to their final use will be treated. All course consist of a combination of theory and relevant examples, ranging from medical sensors to intelligent coatings, and from applications in ICT to sustainable energy.

Volgorde binnen het pakket
Although the three courses are intentionally placed in a logical order, it is not strictly necessary to follow all of them in the indicated order.

Beschrijving vakken
Nanomaterials: Chemistry and Fabrication
In this course, the broad field of Nanoscience and nanotechnology will be introduced, with a strong emphasis on how nanomaterials and nanodevices can be fabricated using bottom-up and top-down techniques. A quantitative theoretical description of the most relevant production processes will presented, such as used e.g. in the production of (future) telecom components, sensors and dyes. Cross links with other field of research such as thermodynamics will be addressed.

Nanomaterials: Physics and Characterization
The first objective of this course is to provide students with a conceptual picture of the special properties of nanomaterials, and how these properties quantitatively depend on the (nanometer) length scales. The second objective is to introduce the principles of contemporary techniques used to characterize nanomaterials. For both objectives basic knowledge of quantum mechanics is essential; a brief introduction thereof –aiming at students with no background therein– forms an integral part of the course.

Nanomaterials: Devices and Integration
The knowledge about potential and properties of nanomaterials, as acquired by the students in the first two courses, will be extended towards devices and integration in complete systems with unique properties Examples thereof are systems for optical communication/cryptography,
ultra-sensitive sensors, or devices for ‘harvesting’ energy from movement or temperature differences. Similar to examples sketched in the other courses in this track, the systems addressed here derive their functionality from the specific properties that emerge due to the nanoscale design of the relevant materials.