03-IMS-CNT	Computational Nanotechnologies

Lehrform *(teaching format)* / **SWS** *(hours per week)*: 2SE

Kreditpunkte *(credit points)*: 3

Turnus *(frequency)*: offered once (summer term 2024)

Inhaltliche Voraussetzungen *(content-related prior knowledge/skills)*: NONE

Sprache *(language)*: English

Lehrende *(teaching staff)*: Prof. Dr. Marcel Walter

Studiengang *(degree program)*	Module	Semester
Informatik (Master)	IMS	ab 1.Sem.
Informatik (Bachelor VF)	(nur *Freie Wahl*)	ab 4.Sem.

Lernergebnisse / *Learning Outcome*:

Students will learn:

- the basic principles of a computational nanotechnology of their choice, i.e.,
  - underlying physical phenomena,
  - information representation and propagation,
  - computation via composition of elementary gates,
  - technology constraints and limitations,
  - major cost factors,
  - interfacing with other technologies.
- to judge about the feasibility of a technology by readiness index estimations.
- to identify important (open) research questions in the technology of their choice.
- to (re-)implement a solution to an important (open) problem.

Inhalte / *Contents*:

"Moore's Law is dead." We keep hearing that the scaling process of modern processors is already behind the famous prediction by several generations. Is it not time then to look for alternatives to conventional transistors that enable us to break free of the restrictions CMOS technologies are imposing? A plethora of candidates has been proposed by interdisciplinary teams over the decades. Most failed due to monetary, technical, or scalability issues. In this seminar, students have the opportunity to look into a realm of (still) promising contestants for the crown of a post-CMOS era of computation: Nanotechnologies. Among others, this domain offers Silicon Dangling Bond Logic, Photonics, Spintronics, Memristors, Quantum-dot Cellular Automata, and many more. Literature for topics of interest will be provided. Students will conduct a programming project and write a report, on which they will give a presentation at the end of the lecturing period.

Hinweise *(remarks)*: The table lists only the primary / most specific modules to which this course is assigned.