

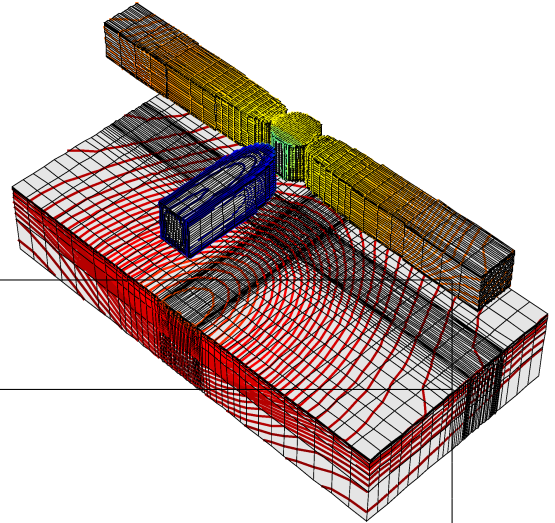
Lecture Course in Autumn Semester 2023
 Master: D-ITET, D-MATH, D-PHYS, D-MAVT

Semiconductor Devices: Physical Bases and Simulation

(227-0157-00L)

Prof. Andreas Schenk, Dr. Cosmin Roman

Location: ETZ G91, Gloriastr 35
 Time: Monday 9:15 - 11:00
 Start: Monday, Sep 25, 2023



Date	Topic
25. Sep. 2023	Quantum transport I Quantum Devices: RTD, QD, SET
02. Oct. 2023	Quantum transport II Physics of SET, Quantum transport equations*
09. Oct. 2023	Boltzmann equation “Derivation”, Direct solution methods, Monte-Carlo method
16. Oct. 2023	Method of moments Hydrodynamic transport equations, Drift-diffusion model
23. Oct. 2023	Silicon I Band structure, Density of states
30. Oct. 2023	Silicon II Fermi-Dirac distribution*, Equilibrium densities
06. Nov. 2023	Scattering processes Transition probability for ionized impurity scattering, Scattering mechanisms, Matthiessen rule
13. Nov. 2023	Mobility of cold and hot carriers Mobility models for cold carriers in the bulk, Mobility in MOSFET channels, Mobility of hot carriers
20. Nov. 2023	Non-radiative recombination Deep impurities, GR rates for band-to-band and band-to-trap transitions, Rate equations for trapping and SRH recombination, SRH life times
27. Nov. 2023	Metal-Semiconductor (MS) contact Contact models, MS contact in equilibrium, Thermionic field emission, Boundary conditions in device simulation
04. Dec. 2023	Numerical methods for device simulation Discretization, Mesh generation
11. Dec. 2023	Impact ionization Rates, Models for ionization coefficient, Breakdown
18. Dec. 2023	Tunnel FET Band-to-band tunneling, Imaginary dispersion, TCAD modelling, Working principle & performance

Autumn Semester 2023

Semiconductor Devices: Physical Bases and Simulation

Simulation Exercises

Location: ETZ D61.2, Gloriastr 35

Time: Monday 11:00 - 12:00

Date	Topic	Assistant
25. Sep. 2023	Introduction into the simulation environment	Qian Ding
02. Oct. 2023	MOS diode, Static CV-characteristics	A. Schenk
09. Oct. 2023	MOSFET, Simulation of IV-curves	A. Schenk
16. Oct. 2023	Bipolar transistor, Gummel-curves and gain	A. Schenk
23. Oct. 2023	Simulation of GaAs/AlGaAs laser	A. Schenk
30. Oct. 2023	Meshing, Mesh dependence of IV-curves	A. Schenk
06. Nov. 2023	Tunnel FET, Simulation of IV-curves	A. Schenk
13. Nov. 2023	Flash-EEPROM, Fowler-Nordheim tunneling	A. Schenk
20. Nov. 2023	Impact ionization, Avalanche breakdown, substrate currents	A. Schenk
27. Nov. 2023	Simulation with different mobility models	A. Schenk
11. Dec. 2023	pn-diode, Impact of SRH recombination	A. Schenk
18. Dec. 2023	Schottky diode, Impact of doping on rectification, MESFET	A. Schenk