Advanced Semiconductor Theory (RP 4.1.19)

Crystal structure: Basic structures, planes, Miller indices; strained heterostructures; defects (2)

Semiconductor Bandstructure: Bloch theorem and crystal momentum; Metals, insulators and semiconductors; Tight binding method; k.p method; Carriers in doped semiconductors; (3)

Bandstructure modification: Alloying; heterostructures, Simple band structures for Quantum Wells, Wires, Dots and Superlattice. (4)

Transport: Drude model;Boltzmann equation; averaging procedure; High frequency conductivity. (3)

Scattering Mechanisms: Quantization of lattice vibrations; electron-phonon interactions; Fermi Golden Rule; relaxation times; different scattering mechanisms (6)

Optical Properties of Semiconductors: Electrons in an EM field; Photons: quantization of EM waves; Electron-photon interactions; absorptions; stimulated and sponraneous emission; Interband and intersubband transitions. (8)

Excitonic effects: Excitonic states; Excitonic effects in bulk and Quantum Nanostructures; Effect of electric field. (2)

Quantum Transport: Transport in 2D and 1D systems; Ballistic effects; Mesoscopic systems; Landauer formula; Resonant tunneling; Coulomb blockade. (4)