

Fall 2009

EE 656: ELECTRONIC TRANSPORT IN SEMICONDUCTORS

Lectures and reading assignments

Date	Topic	Secs. in Lundstrom
Aug. 24	L0 Course Introduction / L1 Bandstructure review	1.2
Aug. 26	L2 Evaluating sums and integrals	1.4, 1.5.2, 3.1
Aug. 28	L3 General model for transport	
Aug. 31	L4 Density of states and density of modes	3.1
Sept. 02	L5 1D resistors	9.9, 9.10
Sept. 04	L6 Discussion	
Sept. 07	Labor Day (no class)	
Sept. 09	L7 2 and 3D resistors	
Sept. 11	L8 Thermoelectric effects	
Sept. 14	L9 Coupled current equations	4.5, 4.6
Sept. 16	L10 The drift-diffusion equation	1.3, 4.10, 5.7
Sept. 18	L11 Discussion	
Sept. 21	L12 The Boltzmann Transport Equation (BTE)	1.6, 3.2, 3.3
Sept. 23	L13 BTE: equilibrium / ballistic	3.4.1
Sept. 25	L14 Relaxation Time Approximation (RTA)	3.4, 3.5, 4.3
Sept. 28	L15 Transport in a B-field	4.4
Sept. 30	L16 Hall effect / Hall mobility	4.7
Oct. 02	L17 Landauer vs. Boltzmann	
Oct. 05	Exam 1: Near-equilibrium transport	
Oct. 07	Review Exam 1	
Oct. 09	L18 Percolation 1	
Oct. 12	October Break (no class)	
Oct. 14	L19 Percolation 2	
Oct. 16	L20 Characteristic times	2.1
Oct. 19	L21 Transmission and backscattering	9.2-9.4
Oct. 21	L22 Scattering and Fermi's Golden Rule	1.7, 1.8
Oct. 23	L23 Ionized impurity scattering	2.2.1, 2.4

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Lectures and reading assignments (continued)

Date	Topic	Secs. in Lundstrom
Oct. 26	L24 Phonon scattering	2.2.2, 2.3, 2.5-2.9
Oct. 28	L25 Scattering in 1D, 2D, and 3D	2.11
Oct. 30	L26 Discussion	
Nov. 02	L27 Surface roughness scattering	2.12
Nov. 04	L28 Scattering in common semiconductors	2.14
Nov. 06	L29 Low-field mobility in Si, GaAs, and graphene	4.9
Nov. 09	L30 Balance equation approach	5.1
Nov. 11	L31 Momentum and energy balance	5.3
Nov. 13	L32 Monte Carlo Simulation	Chapter 6
Nov. 16	L33 High-field transport / Si and GaAs	7.1-7.5
Nov. 18	L34 Discussion	
Nov. 20	Exam 2: Scattering and high-field transport	
Nov. 23	Review Exam 2	
Nov. 25	Thanksgiving Break (no class)	
Nov. 27	Thanksgiving Break (no class)	
Nov. 30	L35 Velocity overshoot	8.6
Dec. 02	L36 Ensemble effects	8.7
Dec. 04	L37 Ballistic transport	8.5
Dec. 07	L38 Quantum transport: ballistic	1.5, 9.7, 9.8
Dec. 09	L39 Quantum transport: scattering	9.12
Dec. 11	L40 Course review	