

Fall 2013

ECE 656: ELECTRONIC TRANSPORT IN SEMICONDUCTORS

General References

Ziman should be in every device researchers' library. See in particular, Chapter 6 on electron dynamics and Chapter 7 on transport.

- [1] J.M. Ziman, *Theory of Solids*, 2nd ed., Cambridge Univ. Press, New York, 1964.

Ashcroft and Mermin is another classic. In particular, see Chapters 1 and 2 on conduction in metals, Chapter 12 on semiclassical transport, and Chapter 13 on transport.

- [2] N.W. Ashcroft and N.D. Mermin, *Solid State Physics*, Saunders College, Philadelphia, 1976.

And a classic treatment of near-equilibrium transport is:

- [3] Arthur C. Smith, James F. Janak, and Richard B. Adler, *Electronic Conduction in Solids*, McGraw-Hill, New York, 1967

For a thorough treatment of the electron transport at the nanoscale, see

- [4] Supriyo Datta, *Lessons from Nanoelectronics: A new approach to transport theory*, Vol.1 in Lessons from Nanoscience: A Lecture Notes Series, World Scientific Publishing Company, Singapore, 2011.
- [5] S. Datta, *Electronic Conduction in Mesoscopic Systems*, Cambridge Univ. Press, Cambridge, U.K., 1995
- [6] S. Datta, *Quantum Transport: Atom to Transistor*, Cambridge Univ. Press, Cambridge, U.K., 2005.

Ridley gives an excellent treatment of electron-phonon and phonon scattering in Chapters 3, 4, and 10 of

- [7] B.K. Ridley, *Quantum Processes in Semiconductors*, 4th Ed., Oxford Science Publications, Clarendon Press, Oxford, U.K. 1999

Heinzel gives a clear treatment of magneto-transport, see Chapters 2.6.3 and 6 in

- [8] T. Heinzel, *Mesoscopic Electronics in Solid State Nanostructures*, 2nd Ed., Wiley-VCH, Weinheim, Germany, 2007.

Davies gives a nice treatment of the physics of low-dimensional nanostructures. Chapter 8 is a good introduction to scattering in semiconductors, and Sec. 8.8 is a gentle introduction to Feynman diagrams.

- [9] J.H. Davies, *The Physics of Low-Dimensional Semiconductors*, Cambridge Univ. Press, Cambridge, U.K., 1998.

For a treatment of electron and phonon transport and an introduction to thermoelectric devices, see Chen:

[10] G. Chen, *Nanoscale Energy Transport and Conversion*, Oxford University Press, 2005.

For a refresher on basic semiconductor physics and devices, see Pierret:

[11] R.F. Pierret, *Advanced Semiconductor Fundamentals*, 2nd Ed., Prentice-Hall, Upper Saddle River, N.J., 2003.

[12] R.F. Pierret, *Semiconductor Device Fundamentals*, Addison-Wesley, Reading, MA, 1996.