ECE 656: Week 3 References

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Our semi-classical approach to screening assumes that the potential is slowly varying on the scale of the electron's wavelength. For rapidly varying potentials (in space and time), a more sophisticated approach is needed. See Ashcroft and Mermin for a discussion of the Lindhard theory.)

N.W. Ashcroft and N.D. Mermin, *Solid State Physics*, Saunders College, Philadelphia, 1976. (See pp. 340-344).

For potentials that vary rapidly in space and time, a "dynamic screening" treatment is needed. See Ridley for a discussion of how these effects are treated in semiconductors.

B.K. Ridley, *Quantum Processes in Semiconductors*, 4th Ed. Clarendon Press, Oxford, UK, 1999. (See Chapter 9)

B.K. Ridley, *Electrons and Phonons in Semiconductor Multilayers*, Cambridge Univ. Press, Cambridge, UK, 1997. (See Chapter 10)

We have discussed two different approaches to ionized impurity scattering – the Brooks-Herring approach (screened Coulomb potential) and the Conwell-Weisskopf approach (unscreened Coulomb potential). Ridley discusses how to reconcile these two approaches so that we get the correct answer in the two limits and a reasonable answer in between.

B. K. Ridley, "Reconciliation of the Conwell-Weisskopf and Brooks-Herring formulae for charged-impurity scattering in semiconductors: Third-body interference," *J. Phys. C: Solid State Phys*. **10,** p. 1589 doi:10.1088/0022-3719/10/10/003, 1977.

J.H. Davies, *The Physics of Low-Dimensional Systems*, Cambridge Univ. Press, 1998.

For a discussion of modulation doping, screening in 2D, and remote impurity scattering in 2D, see Chapter 8 in:

J.H. Davies, *The Physics of Low-Dimensional Systems*, Cambridge Univ. Press, 1998.