9/05/07

ECE 495N, Fall'07 MSEE B010, MWF 330P – 420P

Fundamentals of Nanoelectronics

HW#2: Due Friday Sept.14 in class.

All exercises, page numbers refer to

S.Datta, Quantum Transport: Atom to Transistor, Cambridge (2005)
ISBN 0-521-63145-9.

Please turn in a copy of your MATLAB codes for Problems 2 and 3.
You can use the MATLAB code at the end of the text as a guide,
but the code you turn in should be your own work, not copied from the text.

Problem 1: Electrons in a semiconductor obey a modified Schrodinger equation which in one dimension has the form

$$i\hbar\frac{\partial\psi}{\partial t} = -\frac{\hbar^2}{2m}\frac{\partial^2\psi}{\partial x^2} + \alpha\frac{\partial^4\psi}{\partial x^4}$$

where α and m are constants. Assume a solution of the form (ψ_0 being a constant)

$$\psi(x,t) = \psi_0\, e^{ikx}\, e^{-iEt/\hbar}$$

to find the dispersion relation E (k).

Problem 2: Exercise E.2.1, Page 49.

Problem 3: Exercise E.2.2, Page 49-50.