8/28/09

ECE 495N, Fall'09 GRIS 280 MWF 1130A-1220P

Fundamentals of Nanoelectronics

HW#2: Due Friday Sept.18 in class.

Page numbers refer to the recommended reference

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 are welcome to consult the codes at the end of the book, but what you turn in should be your own work, not just cut and paste from the book.

Problem 1: Consider a wave equation of the form

$$\hbar^2 \frac{\partial^2 \psi}{\partial t^2} = \hbar^2 c^2 \nabla^2 \psi + m^2 c^4 \psi$$

where $\hbar$, c and m are constants. Assume a solution of the form (ψ_0 being a constant)

$$\psi(x,t) = \psi_0 e^{i\vec{k}.\vec{r}} e^{-iEt/\hbar} \qquad \text{where} \quad \vec{k}.\vec{r} = k_x x + k_y y + k_z z$$

to find the dispersion relation $E(\vec{k})$, that is, E (k_x, k_y, k_z) .

Problem 2: Exercise E.2.1, Page 49.

Problem 3: Exercise E.2.2, Page 49.