University of California, Berkeley
EE230 - Solid State Electronics *Prof. J. Bokor*

PROBLEM SET 3

(Due Tues., March 11, 2008)

Computer Project

Carry out the calculation of the band structure for Si and GaAs using the semi-empirical tight binding method with only first-nearest neighbors. Calcluate the band dispersions along the (100), (111), and (110) directions for the first 8 bands (4 valence bands, 4 conduction bands). Plot your results in the reduced zone scheme, and use at least 10 **k** points in each direction.

Use the following values for the tight-binding parameters:

Table 1: SETBM Parameters for Si and GaAs in eV

	ε_s^A	ε_s^B	ε_p^A	ε_p^B	E_{ss}	E_{xx}	E_{xy}	E_{sp}^{AB}	E_{sp}^{BA}
Si	-4.03	-4.03	3.17	3.17	-2.03	0.79	1.51	1.47	1.47
GaAs	-6.01	-4.79	0.19	4.59	-1.75	0.23	1.18	1.82	0.93

You may use whatever computer and software you wish. I recommend MATLAB. Student accounts on EECS Instructional workstations are available.