**Homework #2**

**ECEN 5060, Computational Semiconductor Physics**

**Problem 1:**

Derive the density of states for a three dimensional non-parabolic band material with non-parabolicity parameter of 1/Eg.

**Problem 2:**

Consider a bulk (3D) Silicon with non-parabolic conduction band.

1. Calculate the Fermi energy for the Silicon doped with Phosphorus with concentration of 1020 cm-3.
2. Plot Fermi energy as a function of doping concentration within 1017 to 1021 cm-3.

Assumptions:

T=300K

Eg=1.124 eV

ml= 0.98me

mt= 0.19me

Zero energy is the conduction band edge.

Non-parabolicity parameter is 1/Eg.

Consider only the main conduction band close to the X point and ignore state filling in other bands.