Tutorial – 1

EC2000 Solid State Electronic Devices

1. If the lattice constant of silicon is 5.43 Å, (a) Determine the surface density of atoms for silicon on the (111) plane. (b) Calculate the density of valence electrons in silicon.
2. Calculate the volume density of Si atoms (number of atoms/cm3), given that the lattice constant of Si is 5.43 Å. Calculate the areal density of atoms (number/cm2) on the (100) plane
3. A body-centered cubic lattice has a lattice constant of 4.83 Å. A plane cutting the lattice has intercepts of 9.66 Å, 19.32 Å, and 14.49 Å along the three cartesian coordinates. What are the Miller indices of the pane?
4. Consider a face-centered cubic lattice. Assume the atoms are hard spheres with the surfaces of the nearest neighbours touching. Assume the effective radius of the atom is 2.37 Å. (a) Determine the volume density of atoms in the crystal. (b) Calculate the surface density of atoms in the (110) plane. (c) Determine the distance between nearest (110) planes. (d) Repeat parts (b) and (c) for the (111) plane
5. Label the planes illustrated in Fig