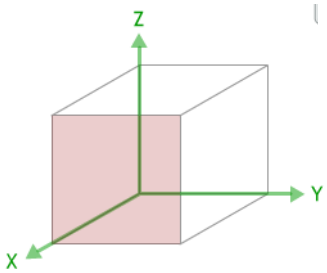
ECE 305 – Spring 2018

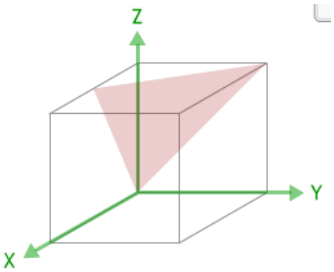
Homework 1 – Due Tuesday, January 16 at 12:00 PM in class (or EE 326B)

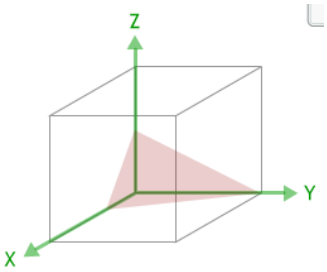
1. Gold is an element discovered in ancient times, prized for its lustrous, shiny appearance, which lasts over thousands of years. About 100 years ago, X-rays were discovered and used to probe its structure at the nanoscale. These experimentalists found that it follows a face-centered cubic Bravais lattice, with lattice constants of 3.61 Å in each direction. You may use the nanoHUB Crystal Viewer to complete this question, available at: https://nanohub.org/tools/crystal_viewer
   a. Print (or sketch) the (001) surface of gold. Use 2 unit cells in each direction.
   b. What is the nearest-neighbor spacing between gold atoms in the x, y, and z directions?
   c. Assume that the diameter of each gold atom equals its nearest-neighbor spacing. What fraction of the total volume of the unit cell is filled by gold atoms?

For the following two questions, you may use the Cambridge University 'Draw Your Own Lattice Planes' tool: http://www.doitpoms.ac.uk/tlplib/miller_indices/lattice_draw.php

2. What are the Miller indices for the planes shown below?

a. 

b. 

c. 

3. Sketch the following Miller planes:
   a. (011)
   b. $(1\bar{2}0)$
   c. (312)