

**ME 301: HW Assignment 3 – (50 points)**

1. Calculate the atomic packing factor for the FCC structure. **(10 points)**
2. Draw direction vectors in unit cells for the following cubic directions: **(4×3 = 12 points)**

(a)  $[1\bar{1}\bar{1}]$       (b)  $[1\bar{1}0]$       (c)  $[\bar{1}2\bar{1}]$       (d)  $[\bar{1}\bar{1}3]$

3. What are the {100} family of planes of the cubic system? **(6 points)**
4. Draw in unit cubes the crystal planes that have the following Miller indices: **(4×3 = 12 points)**

(a)  $(1\bar{1}\bar{1})$       (c)  $(\bar{1}2\bar{1})$   
(b)  $(10\bar{2})$       (d)  $(21\bar{3})$

5. Pure iron goes through a polymorphic change from BCC to FCC upon heating through 912°C. Calculate the volume change associated with the change in crystal structure from BCC to FCC if at 912°C the BCC unit cell has a lattice constant  $a = 0.293$  nm and the FCC unit cell  $a = 0.363$  nm. **(10 points)**