University of Alberta
Department of Chemical and Materials Engineering

Lecturer: Dr. Stojan Djokić

MAT E 201
Materials Science I

Assignment No.2 **(15 marks)**
January 17, 2020
Due date: January 24, 2020 by 3:00 pm.

1. What is a polycrystalline material? **(0.2 marks)**

2. What is a liquid crystal material? **(0.4 marks**)

3. What is an amorphous material? **(0.4 marks)**

4. Determine the crystal structure for the following: a) a metal with a_o = 4.04159489 Å, r = 1.75 Å and one atom per lattice point and b) a metal with a_o = 0.42906 nm, r = 0.1517 nm and one atom per lattice point. **(3 marks)**

5. The density of iron, which has the BCC structure, is 7.87 g/cm^3. The atomic mass of iron is 55.847 g/mol. Calculate: a) the lattice parameter of Fe and b) the atomic radius of Fe. **(3 marks)**

6. A metal having a cubic structure has a density of 19.302 g/cm^3, an atomic mass of 196.97 g/mol and a lattice parameter 4.0786 Å. One atom is associated with each lattice point. Determine the crystal structure of the metal. **(2 marks)**

7. Yttrium has a hexagonal crystal structure, with a_o=0.3648 nm and c_o=0.5732 nm. The atomic radius is 0.1824 nm, the density is 4.469 g/cm^3 and atomic mass is 88.91 g/mol. Calculate a) the number of atoms in each unit cell and b) the packing factor in the unit cell **(3 marks)**

8. Determine the indices for the directions **A**, **B**, **C** and **D** in the cubic unit cell shown in the following Figure 1. **(3 marks)**