# University of Alberta
# Department of Chemical and Materials Engineering

**Lecturer: Dr. Stojan Djokić**

# MAT E 201
# Materials Science I

Assignment No.1 **(13 marks)**
Due Date: January 17, 2020, by 3:00 pm

1. Define the following terms: (a) composition, (b) structure, (c) synthesis, (d) processing, and (e) microstructure. **(1 mark)**

2. Explain the difference between the terms materials science and materials engineering. **(0.5 marks)**

3. What is the difference between the microstructure and the macrostructure of a material? **(2 marks)**

4. Determine the mass in grams and thickness in μm of bismuth film which contains $2.5 \times 10^{21}$ atoms. Consider that the Bi film is rectangular and that its surface area is 50 $cm^2$. Density of Bi is 9.808 $g/cm^3$ and its relative atomic mass is 208.98 g/mol. **(2 marks)**

5. Density of indium is 7.286 $g/cm^3$, and its atomic relative mass is 114.82 g/mol. Density of aluminum is 2.699 $g/cm^3$ and it relative atomic mass is 26.981 g/mol. Calculate the number of atoms per cubic centimetre for a) In and b) Al. Which element In or Al contains more atoms per cubic centimetre? **(3 marks)**

6. An electronic circuit pattern with the total surface area of 3 $cm^2$, should be coated with 2 μm thick tungsten film. Calculate: a) how many atoms of W are required? b) how many moles of W are required? ($A_r$ (W) = 183.85 g/mol, ρ (W) = 19.254 $g/cm^3$). **(3 marks)**

7. Suppose an element has a valence of 2 and an atomic number of 27. Based only on quantum numbers, how many electrons must be present in the 3d energy level? **(0.5 marks)**

8. Calculate the fraction of bonding of $Sb_2S_3$ that is ionic, if the electronegativity of antimony is 2 and the electronegativity of sulphur is 2.5. **(1 mark)**