MATERIALS SCIENCE II		
	GRAIN SIZE	
Student:		Year:
Date:		Teacher:

Program:

a) Definition of concepts: grain, grain boundary, subgrain

b) Micrographic determination of the grain size using Comparison method, Planimetric method and Intercept method.

c) Grain size effect on mechanical properties.

Tasks:

Task 1: Determine the grain size of the given micrograph using single methods.

Task 2: Compare results obtained by single methods.

Task 3: Calculate the increase of yield strength induced by grain boundary strengthening.

Micrograph:

Number: …….

Magnification: g = …….

A) Comparison method:

Used formula:

Calculated values:

Result (number of grain size G):

B) Planimetric method:

Used formulas:

$m = (\frac{g^2}{5000}) \cdot n_g$, m = mean count of grains on area of 1 mm^2, g = magnification, ng =

Measured values:

Calculation:

Result (mean count of grains *m* on area of 1 mm^2):

C) Intercept method

Used formulas:

Measured values:

Calculation:

Result (mean length of line section of grain *l* in mm):

Comparison of results obtained by various methods:

TABLE 1: *Measured and calculated values*

	G [-]	m [-]	l [mm]	$\overline{d}$ [mm]
Comparison method				
Planimetric method				
Intercept method				

Note:

Grain size number G in Comparison method - write down as a whole number.

In other methods round off G to the nearest whole number.

The average diameter of grain $\overline{d}$ round off to thousandths.

Calculation of yield strength:

Using Hall-Petch formula, determine from calculated value of the average diameter of grain $\overline{d}$ yield strength R_e if: $R_0 = 150$ MPa and $k = 20\ N \cdot mm^{-3/2}$

Hall-Petch formula:

Calculation of yield strength:

Yield strength of the given material (round off to the whole number):

Conclusion: