CIVL 1101 – Assignment #11

Name: _____

Objective

This assignment estimates the hydraulic loading rate on a filter and determines the required backwash velocity and the depth of the expanded medium bed in a sand filter.

You *must* hand in the coversheet for the assignment, a printout of the spreadsheet for Part 1, your calculations for Part 2, and the equation for Part 3. Additionally, please submit your Excel file for Part 1 and your Word file for Part 3 to the Dropbox in Canvas.

Part 1: Using the data obtained in the first week of the water filtration lab, present, analyze, and discuss the data. Your data should be presented in graphical form. The following table lists the results of Week 1:

	2A-6S		6A-2S	
Flowrate (mL/min)	FE (mL)	%Removed	FE (mL)	%Removed
500	30,126	99.7%	30,092	99.7%
700	41,675	99.1%	41,977	99.4%
900	51,698	95.7%	51,568	95.9%

Remember that Ms. Paanee is not an engineer; explain the concepts in terms that will help her understand the data and make an informed choice about the filter.

Part 2: Consider the filters in the lab using only sand as the filter medium. The flowrate through the filter is 1,300 ml/min, the diameter of the filter is 3.5 in., the depth of the filter bed is 9 in., the sand has a particle diameter of 0.5 mm or 0.02 in. with a settling velocity of 0.27 ft./s, and the porosity of the sand is 0.30.

1. Determine the hydraulic loading rate in gpd/ft.^{2}

2. Based on the hydraulic loading rate, classify the filter as either a *slow sand filter* or a *rapid sand filter*.

3. Determine the required backwash velocity to expand the sand filters in the lab to a porosity of 0.80.

4. Determine the depth of the expanded filter bed.

Part 3: Develop the equations to describe how to compute filter efficiency (see the project description for more details). Write this section as if it would be cut-and-pasted into your Project #3 report.

Part 4: Read Chapter 9 in *Strategies for Creative Problem Solving* by Fogler and LeBlanc.