

**Department of Environmental Engineering
Middle East Technical University
Spring 2023**

**EnvE 422 Treatment and Disposal of Water and Wastewater Sludges
HOMEWORK # 3**

Assigned: June 02, 2023

Due on: June 12, 2023 17:00

Question 1 (60 pts). Ankara city wastewater treatment plant needs to concentrate its sludge to 4% by employing a thickener before the sludge is pumped into an anaerobic digester. The following laboratory data have been collected on a similar sludge. Mixed sludge of 2250 kg/h has an initial solids concentration of 1.2 %. Design this thickener for the city of Ankara.

Solids Conc. (mg/L)	Settling Velocity (m/hr)
2500	42
5000	23
7500	8.3
10000	4
15000	1.7
30000	0.3
50000	0.17

Question 2 (40 pts). Determine the alum dosage (as mg Al^{3+}/L) used and calculate the alum sludge production (as mg/L) for a chemically treated wastewater in which 0.8 mg/L phosphorous residual is achieved with the initial P concentration as 5.8 mg/L and 21 mg/L $\text{Al}(\text{OH})_3(\text{s})$ is produced with the excess alum (assume all excess alum has gone into the formation of $\text{Al}(\text{OH})_3(\text{s})$).