**Department of Environmental Engineering**
**Middle East Technical University**
**Spring 2023**
**EnvE 422 Treatment and Disposal of Water and Wastewater Sludges**

# HOMEWORK # 1

Assigned: April 14, 2023
Due on: April 24, 2023 by 17:00 Submission Deadline

**Question 1.** Using the typical values that we discussed in class, calculate the different kinds of sludges produced in a 100,000 $m^3$/day wastewater treatment plant which has a primary clarifier, activated sludge system and anaerobic digester.

**Question 2.** Discuss the importance of fuel value and fertilizer value of sludge. In addition, state for what purposes they are measured and evaluated. Give a couple of reasons for each about how these characteristics (fertilizer value and fuel value) can be improved for more efficient sludge management.

**Question 3.** List the analytical tests you would wish to perform and the stability criteria that you want to follow to determine the "stability" if a sludge were to be
a) placed on the ODTÜ lawn,
b) dumped in a river,
c) sprayed on a golf course.

**Question 4.** Which of the following alcohols have a higher methane production potential assuming that one mole of each chemicals given is degraded anaerobically; ethanol ($C_2H_5OH$), toluene ($C_6H_5CH_3$) or acetone ($C_3H_6O$)? Compare these with the methane that can be produced from 1 mole of sludge ($C_{10}H_{19}O_3N$) degradation.

**Question 5.** The city of Konya Wastewater Treatment Plant will construct an anaerobic digester system. If the digester receives 9.46 $m^3$/day of sludge having VSS content of 4.2%, estimate the minimum digester volume. Assume the digester volume will be designed to receive a maximum solids loading of 4 kg VSS/$m^3$.day.