Importance of the Course:

One of the major sources of air pollution is industry. Smokestacks of factories continually emit air pollutants. One of primary air pollutants that have variety of impacts on the environment and adverse effects on human health is particulate matter (PM). The effects are on the respiratory system, may cause lung damage, and worsen existing asthma. VOCs and metallic species may be found on PM; therefore, there may be additional effects due to these contaminants. Particles can be carried over long distances by wind and then deposit onto ground or surface waters. Effects of this settling include making lakes and streams acidic, chancing the nutrient balance in coastal waters or in large river basins, depleting the nutrients in soil, damaging sensitive forests and farm crops, and affecting the diversity of ecosystems. Soot, a type of PM, stains and damages stone and other materials, including culturally important objects such as monuments and statues. Therefore, controlling emission of particles is of primary importance. This course focuses on designing particulate matter control processes.

Catalog Description:

Properties of particles, particle behavior in fluids, theory of particle control mechanisms, cyclones, fabric filters, electrostatic filters, wet scrubbers, auxiliary equipment.

Course Objective:

The objective of this course is to enable the student to understand mechanisms used in control of particulate matter air pollution, and to design control devices.

Prerequisites:

None

Textbook(s):


Tentative Course Outline

1. Fundamentals of Particle Emission Control
   Parameters that characterize particulate collection, filter and water drop collection efficiency, particle size distribution, collection efficiency, penetration concept.

2. Cyclones
   Standard cyclone configuration, pressure drop, prediction of collection efficiency, effect of particle re-entrainment, multiple cyclones, optimizing design

3. Fabric Filters
   Fabric selection, fabric cleaning, filtration velocity (air-to-cloth ratio), pressure drop, reverse air baghouses, pulse-jet baghouses, multi compartment baghouses

4. Electrostatic Precipitators
   Corona, resistivity, internal configuration, plates and wires, removal of dust, power consumption, flue gas conditioning

5. Wet Scrubbers
   Spray-chamber scrubbers, cyclone spray chambers, orifice and wet-impingement scrubbers, venturi and venturi-jet scrubbers

6. Auxiliary Equipment
   Hoods, ducts, fans, coolers

Homework, Projects:
Several homework, Term project

Instructor:
Asst. Prof. Dr. Sait C. Sofuoğlu