MECH 436: Air Pollution Control

Catalog description: 3.0 units

Analysis and design of components and systems for gaseous and particulate pollution control; gas separation by absorption, adsorption, condensation, and incineration; particulate separation by gravity settlers, cyclones, electrostatic precipitators, fabric filters, and scrubbers; air pollution legislation and regulation.

Prerequisites: CIVL 321 (or faculty permission), CHEM 111, either CHEM 331 or MECH 332

Recommended: CIVL 302, MECH 306

Course objectives: For students to

1. Become familiar with air pollution legislation and regulation in the U.S.
2. Understand the function and limitations of common gaseous and particulate pollution control equipment.
3. Analyze and design selected types of air pollution control equipment

Course outcomes: Students shall be able to

1. Describe the basic framework of federal legislation pertaining to air pollution control
2. Describe the function and limitations of the following gaseous pollution control techniques: incineration, flue-gas desulfurization, fixed-bed adsorption, NO_x control through combustion modification and catalytic reduction
3. Perform mean and variance analyses of particle size distributions
4. Describe the function and limitations of the following particulate pollution control techniques: gravity settlers, cyclone separators, electrostatic precipitators, fabric filtration, wet scrubbers
5. Perform performance-based analysis and design of thermal incinerators for volatile organic compounds (VOC) control, cyclone separators, electrostatic precipitators, and fabric filters (baghouses)

Topics covered

1. Types of air pollutants and their harmful effects
2. Federal air pollution legislation in the U.S.
3. Incineration for control of VOC emissions
4. Fixed-bed adsorption
5. Flue gas desulfurization
6. Control of NO_x emissions from stationary and vehicle sources
7. Particle characterization and size distribution analysis
8. Dynamics of particles in gases
9. Gravity settlers and cyclonic separation of particles
10. Electrostatic precipitation.
11. Fabric filtration (baghouses)
12. Wet scrubbers
13. Economics of pollution control equipment

Class/Laboratory schedule:

One hundred fifty minutes of lecture per week

Contribution of course to meet the professional component

This course contributes to the student's ability to work professionally in the thermal systems area.

Relationship of course to Mechanical Engineering Program Outcomes

This course contributes principally to Program Outcomes A and G.