

Course Teaching: Academic Years 2000-2006

- **Environmental Engineering I**
(20 CEE 471, 3 cr. hr., Undergraduate)

Fundamental physical, chemical, and biological mechanisms relevant to understanding and modeling important water and air pollution problems. Introduction to treatment and pollution prevention technologies. Techniques for understanding how these problems impact the environment and the risks they pose.

- **Physical Chemical Process for Water Quality Control**
(20 CEE 654, 4 cr. hr., Dual Level, Winter Quarter)

Process design of physical-chemical systems for drinking water treatment. Includes water quality standards and regulations, coagulation-flocculation, sedimentation, media-filtration, disinfection, adsorption, gas transfer, oxidation, flotation and membranes.
Prerequisite: 20CEE647, 653

- **Advanced Unit Operation for Water and Wastewater Treatment**
(20 CEE 724, 3 cr. hr., Graduate Level, Winter Quarter, Alternate)

This is a graduate level course (3cr.) for students interested in water quality and treatment. Advanced Unit Operations for Water Treatment are considered vital for the purification of water, especially in recent years due to stringent regulations in water quality. The subject is of great interest to environmental engineers, civil engineers, chemical engineers, and chemists specialized in the area of water quality. Most of those technologies are already established as major unit components in industrial scale while others are in the transition between pilot scale and industrialization.

This course will focus on selected advanced unit operations that are not covered extensively in other courses. Those include adsorption, ion-exchange, membranes, and chemical oxidation. The course will cover fundamentals, design and application of these unit operations and will extent to their implementation in large-scale.

- **Fundamentals and Applications of Advanced Oxidation Technologies**
(3 cr. hr., Advanced Level, Winter Quarter, Alternate)

The emphasis of the fourth course is to teach the fundamental mechanisms of AOTs and their application for water treatment. More emphasis is given to technologies that are industrially developed as well as to technologies that are of great interest to faculty and students at the University of Cincinnati. These AOTs include $H_2O_2/UV/O_3$, Fenton's and Photo-Fenton's reagent, TiO_2 Photocatalysis, and Sonolysis. The course covers the mechanisms of the degradation reactions, reactor design and process development. The course also includes case studies for the application of these technologies in pilot and full-scale projects for water treatment and in some cases for air treatment and disinfection.

- **Unit Operations Laboratory and Process Monitoring
(20 CEE 659, 3 cr. hr., Dual Level, Spring Quarter)**

Laboratory course on the theory and practical applications of experimental treatment processes for water and air treatment. The class includes the following Unit Operations: activated carbon adsorption, anaerobic digestion, biofiltration, chemical oxidation, electrochemistry and electrocatalysis, fluidized bed reactors, ion exchange, UV-based advanced oxidation and disinfection, membrane processes and filtration.