ENE 429 Air Pollution Control 3 Units

USC | SONNY ASTANI DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

ABET Course Syllabus

Course Information, Textbook and Supplementary Materials

Course Description: Emission surveys; engineering controls of aerosols and gaseous contaminants at emission sources, disposition of contaminants. Field trips. Senior standing

Required for: BSCE Environmental, and BSENE

Prerequisites: ENE 428; CE 309 or ENE 410 **Co-Requisite:** None

Required Textbook: C. D. Cooper and F. C. Aley, *Air Pollution Control*, Third Ed. 2002

Reference: None

Topics Covered	Learning Outcomes
Introduction to particle control	1. Determine drag force on a particle 2. Calculate Reynolds numbers 3. Understand importance of particle size
Particle aerodynamics	4. Determine its final settling velocity 5. Understand different definitions of particle size (aerodynamic, Stokes, equivalent volume diameter) 6. Understand particle relaxation time, stopping distance, mobility 7. Distinguish between external and internal forces
Impactors	8. Learn about Stokes number 9. Design an impactor with a given cut point 10. Learn about cascade impactors 11. Learn about virtual impactors
Cyclones	12. Design a cyclone with a given collection efficiency for a given particle size 13. Determine the pressure drop and energy requirement for the operation of a cyclone
Electrostatic precipitators, ESP	14. Determine particle charges as a function of size 15. Calculate electrical velocity 16. Design an ESP with given collection efficiency for any particle size
Fabric filters	17. Determine pressure drop across unloaded and loaded filters 18. Determine collection efficiency vs. particle size 19. Design large scale fabric bag house filters
Particle wet scrubbers	20. Determine pressure drop across scrubbers 21. Determine collection efficiency vs. particle size 22. Design scrubbers for industrial large scale applications
Relevant properties of gasses and vapors	23. Understand ideal gas low 24. Learn the difference between partial and saturator vapor pressure 25. Understand reaction kinetics
VOC incinerators	26. Learn about reaction kinetics of incineration 27. Determine time and temperature required for destruction of a given VOC pollutant 28. Determine energy requirement for effective incineration of a VOC 29. Learn about catalytic combustions 30. Design industrial scale incinerator
Adsorption	31. Learn about the kinetics of adsorption and understand the mechanism of the process

	32. Design an adsorption bed, taking into account pressure drop, adsorption capacity and energy 33. Design an industrial scale adsorption bed
Control of nitrogen oxides	34. Become familiar with state-of-the-art control mechanisms of NOx 35. Design control technologies for NOx 36. Learn about the formation mechanism of nitrogen oxides (NOx)

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Lecture and Lab Schedule			
Lecture		**Lab**	
Sessions per Week	Duration per Session	Sessions per Week	Duration per Session
2	1.5 hours	n/a	

Relation of Course Objectives to Program Outcomes

The Civil Engineering program is designed to teach beyond the technical content of the curriculum and prepare the students to utilize what they learn in a professional setting.

This course contributes to the program outcomes as outlined in the adjacent table.

Course Contribution to Program Outcomes *(a-k)*	✓ Key
a. An ability to apply knowledge of mathematics, science, and engineering	✓
c. An ability to design a system component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	✓
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	✓

Prepared by: Dr. Ronald Henry
Professor of Civil and Environmental Engineering

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