

SYLLABUS

1. **Number and Name:** 11:117:474 – AIR POLLUTION ENGINEERING

2. **Credits and contact hours:** 3 credits, 2-80 min. lecture periods per week

3. **Instructor:** Robert Miskewitz

4. **Text:** *Air Pollution Control*, Cooper and Alley, Waveland, 2011.

5. **Specific Course Information**

a. **Catalog Description:** *Engineering design techniques for air quality control. Control of particulate and gas emissions from stationary sources. Control of mobile source emissions. Design for indoor air quality and regional air quality control.*

b. **Prerequisites:** 14:180:387 or 14:650:312

c. **Course Type:** Required

6. **Course Goals**

a. **Specific Instructional Outcomes:** Students will understand the fundamental techniques underlying the design of air pollution control equipment. This understanding will be reinforced through homework where they develop design equations from first principles. Student written technical communication and engineering report writing skills will be enhanced through weekly homework formatting requirements. Students will demonstrate their capabilities to perform engineering design and communicate effectively through the use of a team project report which provides their recommended detailed design of air pollution control equipment for a hypothetical client. Midterm and final exams test understanding of principles.

b. **Specific Student Outcomes addressed by the course include:**

c. **Ability to design a system, component or process**

Instructional Activity: Design methods will be included in lectures, homework assignments and the term design project. Air pollution regulations, target collection efficiency, cost calculations, and decision-making will be covered in lectures and applied to the term design project. Feedback will be provided by returning graded homework each week and through internal group review of project progress.

Assessment Activities: Design of air pollution control systems/components in homework (40% of assessment) Design of air pollution control systems/components in the term project (60% of assessment)

e. **Ability to identify and solve engineering problems**

Instructional Activities: Instruction will be given on the identification of particulate and gaseous air pollution and strategies for reducing air emissions. Several air pollution control technologies will be presented. The students will be instructed how to size these control devices and develop cost/benefit analyses to ensure the feasibility of the solutions. The final class project will consist of each group developing a treatment solution to an assigned air pollution problem, the student will evaluate alternative solution and ultimately decide the appropriate technology and treatment strategy including project costs.

Assessment Activities: Identification and solution of engineering problems in homework (40% of assessment) and design of air pollution control systems/components in the term project (60% of assessment)

g. Ability to communicate effectively

Instructional Activity: Instruction will be provided regarding written communication of problem solutions (problem statement, assumptions, decision process, referencing the sources of data used, design, the solution, and discussion of implications). Instruction regarding expectations for written reports will be provided. Feedback will be provided in homework scores and homework comments (returned weekly).

Assessment Activities: Written term design project report (100% of assessment)

k. Ability to use techniques, skills and modern engineering tools

Instructional Activity: Instruction will be provided concerning the fundamental principles of gas and particle collection and examples will be provided regarding the application of mathematical and physical concepts taught in class to a variety of other problems/applications that are not taught in class. Students will practice the skills through homework.

Assessment Activities: Midterm and Final exam (100% of assessment)

7. Topics:

- 1 - 3 Intro to Outdoor Air Pollution (Local and Global), Federal Regulations
- 4 – 5 Particle Behavior
- 6 – 7 Cyclones & Costs
- 8 - 9 Electrostatic Precipitators, Baghouses & Costs
- 10 - 11 Scrubbers (for particle control)
- 12 - 13 Indoor Air Pollution (Overview: particles & gases)
- 14 Midterm Exam
- 15 Gas Behavior/Condensers
- 16 Design Project Team Meetings (internal review of work to date)
- 17 - 19 Absorbers/Scrubbers for gases
- 20 - 21 Adsorbers
- 22 – 25 Combustion for transportation, electricity, and pollution control (incineration), and associated control technology/strategies (combustion modification, catalysis, particle traps). Pollutants covered include NO_x, VOCs, and CO₂
- 26 Knowledge integration, discussion and review

Grading: Homework (30%)
Midterm Exam (25%)
Final (35%)
Term Project (10%)

Prepared by: Robert Miskewitz