

Technical Elective: Air Pollution Engineering and Management

Course 312224030

Fall 2026

Lecture:	Monday 1:50pm-4:25pm	Instructor:	Sophia Zuoqiu, D. Sc.
Classroom:	N209	Office:	N423
Office Hours:	Monday and Wednesday 9am-12pm	Email:	yqiu@scai-ji.cn

Recitation: Not applicable

Textbook: None specified. Readings, cases, and technical materials are provided through the course.

Prerequisite: None

Course Description

Air pollution is an engineering, human exposure, and systems-design problem. This course introduces the sources, properties, transformation, transport, measurement, health effects, and control of major air pollutants. Students will work with authentic air-quality data, evaluate monitoring technologies, interpret models, examine indoor and outdoor environments, and connect pollution control with energy and climate decisions. Current cases from China and other regions, a field visit, a guest practitioner, a team design project, and a culminating mock United Nations assembly connect scientific principles to professional practice.

Course Objectives

The course advances students' previous learning by connecting engineering concepts with real-world decisions.

Learning Outcomes

- Explain the sources, properties, atmospheric behavior, and health relevance of major pollutants.
- Apply engineering calculations to emissions, mass balance, transport, exposure, and control performance.
- Design a fit-for-purpose monitoring plan and evaluate data limitations.
- Compare interventions using effectiveness, cost, energy, equity, and implementation constraints.
- Integrate measurement, atmospheric processes, exposure, engineering controls, policy, human development, and climate adaptation in a multilateral decision.
- Communicate and defend an evidence-based clean-air recommendation.

Assessments

Assessment Type	Percentage	Classification
Class attendance	10%	Open-ended coursework
Class participation (field visit)	10%	Performance / open-ended
In-class quiz	10%	Fixed-answer / standard key
Group project	20%	Open-ended coursework
Midterm exam	20%	Fixed-answer / standard key
Final exam	30%	Fixed-answer / standard key

Class letter grade is given within the following score ranges:

90.00 – 100.00 A 85.00 – 89.99 A- 80.00 – 84.99 B+ 76.00 – 79.99 B 73.00 – 75.99 B-
70.00 – 72.99 C+ 66.00 – 69.99 C 63.00 – 65.99 C- 60.00 – 62.99 D 0.00 – 59.99 F

GPA grades will be further determined based on the given letter grades to show on your transcripts.

Recording and AI Policy

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion, and activities without the advance written permission of the instructor. Any recording properly approved in advance should be used solely for the student's private academic use. AI use is explicitly specified by the instructor. Failure to properly disclose AI contribution will result in loss of credit and/or fail in class.

Make-up Policy

Refer to SCAI academic regulations and the instructor's written course announcements.

Academic Integrity

Students must complete all work with appropriate attribution and comply with SCAI academic-integrity regulations. Unacknowledged copying or close paraphrasing of another person's work constitutes plagiarism and is not acceptable.

Material Covered

Module I: Measure the Air

Lecture 1: Why Air Quality Is an Engineering Problem

Lecture 2: Particles in Motion

Lecture 3: Invisible Gases and Atmospheric Chemistry

Lecture 4: Combustion, VOCs, and Source Fingerprints

Lecture 5: AQI, Standards, and Misleading Claims

Lecture 6: Indoor Air as a Design Problem

Lecture 7: How Do We Know? Monitoring, Sensor Siting, Calibration, and Validation

Module II: Explain Patterns and Exposure

Lecture 8: Weather, Transport, and Dispersion

Lecture 9: From Measurements to Maps

Lecture 10: Midterm Exam

Lecture 11: Air Quality in Practice

Lecture 12: The City as an Exposure System

Lecture 13: From Concentration to Health Burden

Module III: Design Solutions

Lecture 14: Air Quality in a Changing Climate

Lecture 15: Engineering Controls, Policy, Markets, and China's Pollution-Carbon Transition

Lecture 16: Design solutions; Course review I;

Lecture 17: Mock United Nations Assembly on Air Pollution and Human Development; Course review II

Lecture 18: Final Exam