### Civ Env 395: Indoor Air Quality

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# Course Description

Indoor environments ideally protect us from harm. But what happens when buildings actually make us sick? This course covers general concerns around indoor air quality and what can be done about them. The goal of this course is to provide students with an understanding of where indoor air quality problems originate, strategies for improving indoor air quality, and regulation surrounding these issues. At the end of the course, students will be able to identify indoor air contaminants, related human health issues, and appropriate interventions. Evaluation for the course is based on online assignments, in-class presentations, and a final paper.

**Objectives**

* Identify chemical and biological indoor air contaminants.
  + Inorganic contaminants (e.g., radon, CO2)
  + Organic contaminants (e.g., volatile organic chemicals)
  + Biological contaminants (e.g., fungi/mold)
* Differentiate between acute and chronic health issues linked to indoor air quality.
* Describe how in inequities in indoor air quality contribute to structural bias in public health.
* List relevant regulations and building standards that address indoor air quality.
* Evaluate strengths and weaknesses of engineering-based approaches to controlling indoor air quality.

**Outcomes\*** - Upon successful completion of this course, students have:

* an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (ABET 1)
* an ability to communicate effectively with a range of audiences (ABET 3)
* an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts (ABET 4)

\* Outcomes correspond to Environmental Engineering Outcomes which are adopted from the ABET 1-7.

**Recommended Text**

* *Healthy Buildings: How Indoor Spaces Can Make You Sick―or Keep You Well*(2022), Harvard University Press
* Course packet of selected readings (links or PDFs on Canvas)

**Assessment**

* Assignments (problems, short answer) (30%)
* Student-led discussion (50%)
* Final paper (20%)

Late work will be accepted at the professor’s discretion.

**Participation:** This class is interactive. Students are expected to ask questions and offer responses during class. Class time devoted to doing assignments will require students to work independently and in groups.

**Student-led discussions (group activity):** Each student will present and lead a discussion on 1-3 topics. Grades will be based on demonstrated preparation, comprehension and/or informed questioning of the topic, and ability to communicate with and engage the class.

**Final paper:** Students will answer a series of questions based on topics discussed in class. Grading criteria will reflect the learning objectives and include both academic rigor and creativity. Details will be provided before the end of the term, and a rubric will be provided.

**Schedule of Topics**

**Week 1: Intro to biology and chemistry**

**Week 2: Indoor air problems**

# Week 3: Toxicology

# Week 4: Health impacts of acute exposure to indoor air contaminants

# Week 5: Immunology

# Week 6: Health impacts of chronic exposure to indoor air contaminants

# Week 7: Ventilation strategies and air cleaning technologies

# Weeks 8-9: Introduction to regulations (ASHRAE) and other standards (LEED, WELL)

# Week 10: The future of indoor air quality

**Course Policies**

**Academic Integrity**

Students in this course are expected to comply with the policies found in the booklet, "Academic Integrity at Northwestern University: A Basic Guide."   All papers submitted for credit in this course must be sent through Canvas.  Your written work may be electronically tested for plagiarized content.  For details regarding academic integrity at Northwestern, visit: <http://www.northwestern.edu/uacc/>.

**AccessibleNU**

In compliance with Section 504 of the 1973 Rehabilitation Act and the Americans with Disabilities Act, Northwestern University is committed to providing equal access to all programming. Any student requesting accommodations related to a disability or other condition is required to register with AccessibleNU (847-467-5530) and provide professors with an accommodation notification from AccessibleNU, preferably within the first two weeks of class. All information will remain confidential.