



ENVIR ST/ATM OCN 355: Introduction to Air Quality

INSTRUCTOR - Professor Tracey Holloway

I am available to meet in-person before class and after class on most days. Feel free to stay after class to chat or email me ahead of time to reserve a personal meeting. I can also meet online at times that work for you. I also respond to personal messages through email.

Email: taholloway@wisc.edu (expect reply within 24 hours or less M-F; 48 hours or less on weekends)

Course Information

CATALOG DETAILS

Course Description

Air pollution is a complex environmental challenge because it links chemistry and meteorology to engineering, law, policy, and public health. This class presents key ideas in air quality, with the goal of providing students from a range of backgrounds with a solid foundation in air quality to support a range of educational and career goals. This class will focus on reactive pollutants in the outdoor environment, especially gas and particle phase chemicals that react with human tissue to cause sickness and death. We will discuss the environmental impacts of these pollutants and regulatory approaches for their control in the U.S. and around the world. Indoor air quality will be included for completeness. Non-reactive pollutants, especially carbon dioxide, will be discussed throughout the class to compare with reactive air pollutants. Students will complete a research-based project to develop skills relevant to air quality analysis.

Requisites *Sophomore standing*

Credits *3 credits*

Course Designations and Attributes

Breadth - Physical Sci. Counts toward the Natural Sci req

Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Specify how Credit Hours are met by the Course

45 Hours Per Credit (135 total Hours) – One credit is the learning that takes place in at least 45 hours of learning activities, which include time in lectures or class meetings, in person or online, exams, presentations, tutorials, reading, writing, studying, preparation for any of these activities, and any other learning activities.

COURSE DETAILS

Instructional Mode: *In-Person with Complementary Online Activities*

Class *Tu/Th 9:30 AM – 10:45 AM*

In-Person in AOSS 811

*Occasional **online** classes will be posted on Canvas and emailed.*

Mid-term and Final will be in person, conditions permitting.

Office Hours After Class

Typically until 12:15

In-Person in AOSS 1403

Please email to schedule alternate time meetings and/or if you plan to come at a time not directly after class.

CANVAS COURSE URL: <https://canvas.wisc.edu/courses/293718>

LEARNING OUTCOMES

1. **Identify** major atmospheric pollutants affecting health, visibility, ecosystems, climate, and the ozone hole;
2. **Relate** major pollutants to human and natural sources (vehicles, power plants, trees, forest fires, etc.);
3. **Analyze** how weather patterns and climate change affect air pollution;
4. **Evaluate** air pollution episodes as an original research-style project;
5. **Present** a final analysis of air pollution research results

GRADING

There will be no teaching assistants (TA's) for this course, however there will be a team of graders to grade assignments.

- **Course grading and relative weights of assessments**
 - 20 points each for graded quizzes (x ~10 total) (20 x 10 = 200)*
 - 200 points for each exam (x 2) (100 x 2 = 400)*
 - 30 points each for research-project deliverables (x 5 total) (30 x 5 = 150)**
 - 50 points for draft poster & in-class peer review (30 + 20 = 50)**
 - 100 points for final poster, abstract, & video presentation 100
 - Occasional other points for class-related activities <100

* Late exams and quizzes will not be accepted. There may be more/fewer quizzes and there will be occasional points for in class activities.

**Deliverables graded as check-plus (95%), check (85%), check-minus (75%). Exceptional work will be graded check-plus-plus (100%). Grades less than check-minus get no credit (0 points).

Some activities require interaction with other students (e.g. peer review, sharing results, discussion results).

Final grades will be based on the percent of total points earned: 93 - 100% = A; 89 - 92% = AB; 83 - 88% = B; 79 - 82% = BC; 70 - 78% = C; 60 - 69% = D; < 60% = F
(Same for graduate and undergraduate students).

REQUIRED COURSE MATERIALS

- All reading materials will be posted on Canvas
- Required software includes Microsoft Excel, software to create posters that may be exported to PDF (e.g. Microsoft PowerPoint, Google Slides)

EXAMS, QUIZZES & OTHER MAJOR GRADED WORK

- Quizzes will be given through Canvas on a weekly basis
 - Covering that weeks' readings and videos, as well as related ideas from prior weeks
 - 15 minutes each, open-book
 - Typically available 5 days before due date
- Mid-term exam during class period
- Final exam during on date/time set by Registrar's Office
- Both exams are cumulative and closed book

Course Policies

PARTICIPATION EXPECTATIONS

Throughout the class, students grow in their air pollution expertise through a research project. Students will be expected to interact with others in the class, including through small groups and partners, to share and discuss their results. Some activities in the pollution projects require interaction with other students (e.g., peer review, sharing results, discussion results).

LATE WORK POLICY

Quizzes: Late quizzes will not be accepted, but the lowest quiz score will be dropped from your quiz average (so you can miss one quiz with no penalty).

Exams: Exams will be administered during class time and/or university-specified final exam periods. If you cannot take the exam at the appointed time, let the professor know well in advance, and an alternate time will be proposed.

Deliverables: Late submission will be penalized as follows: Up to 24 hours late: no grade reduction; After 24 hours: 20% grade reduction for each day late (i.e. 20% penalty for 25-48 hours late; 40% penalty for 49-72 hours; etc.). If students are aware of an extenuating situation that may require late work, they should email Prof. Holloway well in advance to request an extension.

University of Wisconsin-Madison Policies

RULES, RIGHTS & RESPONSIBILITIES

- See: <https://guide.wisc.edu/undergraduate/#rulesrightsandresponsibilitiestext>

ACADEMIC CALENDAR & RELIGIOUS OBSERVANCES

- See: <https://secfac.wisc.edu/academic-calendar/#religious-observances>

ACADEMIC INTEGRITY

By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin-Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples of disciplinary action include, but is not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion. (Source: <https://conduct.students.wisc.edu/syllabus-statement/>)

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA. (Source: <https://mcburney.wisc.edu/instructor/>)

COURSE EVALUATIONS

Students will be provided with an opportunity to evaluate their enrolled courses and their learning experience. Most instructors use AEFIS a [digital course evaluation](#) survey tool. In most instances, students receive an official email two weeks prior to the end of the semester, notifying them that anonymous course evaluations are available. Student participation is an integral component of course development, and confidential feedback is important. UW-Madison strongly encourages student participation in course evaluations.

MENTAL HEALTH AND WELL-BEING

Students often experience stressors that can impact both their academic experience and personal well-being. These may include mental health concerns, substance misuse, sexual or relationship violence, family circumstances, campus climate, financial matters, among others.

Students are encouraged to learn about and utilize UW-Madison's mental health services and/or other resources as needed. Visit uhs.wisc.edu or call University Health Services at (608) 265-5600 to learn more.

DIVERSITY & INCLUSION

Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world. (Source: <https://diversity.wisc.edu/>)

PRIVACY OF STUDENT RECORDS & USE OF AUDIO RECORDED LECTURES

- See: <https://registrar.wisc.edu/ferpa/>

TEACHING & LEARNING DATA TRANSPARENCY

- See: <https://teachlearn.wisc.edu/teaching-and-learning-data-transparency-statement/>

USE OF GENERATIVE AI TOOLS AND APPLICATIONS

You are welcome to use artificial intelligence (AI) tools and applications (such as ChatGPT, DALL-E, etc.) in this class as they support the learning objectives of this course. Please be aware you are responsible for the information you submit based on an AI query (i.e. ensure Professor Holloway has allowed you to publicly post course content such as assignment or assessment prompts and that the AI generated results do not contain misinformation or unethical content). Your use of AI tools must be documented and cited to conform to this course's expectations.

If you choose to use AI, it is important to document it and follow the correct citation model. This class follows [AGU citation style](#) which uses APA format. Additionally, please retain your chat transcripts for records. Please contact Professor Holloway with any questions or concerns.

Course Schedule

Module 1: Air Quality Basics

Class overview

Quiz 1a

Your research project

Online class – guest lecture

Quiz 1b

Intro to ozone and PM

Environmental justice

Deliverable 1

Thursday 9/7/23

Monday (5 pm)

Tuesday 9/12/23

Thursday 9/14/23

Monday (5 pm)

Tuesday 9/19/23

Thursday 9/21/23

Friday (5 pm)

See readings,
videos, etc. in
“Module 1” on
Canvas

Module 2: Impacts of Air Quality

Quiz 2a

Health and air quality - overview

Health and air quality - continued

Quiz 2b

Working with peer-reviewed literature

Environmental impacts beyond health

Deliverable 2 (Plotting in Excel)

Monday (5 pm)

Tuesday 9/26/23

Thursday 9/28/23

Monday (5 pm)

Tuesday 10/3/23

Thursday 10/5/23

Friday (5 pm)

See readings,
videos, etc. in
“Module 2” on
Canvas

Module 3: Weather and Air Pollution

Quiz 3a

Weather impacting air quality

Working with weather data

Overview of data for air quality analysis

Online class – HAQAST meeting

Deliverable 3 (Literature Review)

Midterm review

Midterm exam

Monday (5 pm)

Tuesday 10/10/23

Thursday 10/12/23

Tuesday 10/17/23

Thursday 10/19/23

Friday (5 pm)

Tuesday 10/24/23

Thursday 10/26/23

See readings,
videos, etc. in
“Module 3” on
Canvas

Module 4: Emissions and Dispersion

Quiz 4a

Calculating emissions

Multi-pollutant emissions Control

Quiz 4b

Atmospheric dispersion

Modeling impacts across scales

Deliverable 4 (Weather and emissions)

Monday (5 pm)

Tuesday 10/31/23

Thursday 11/2/23

Monday (5 pm)

Tuesday 11/7/23

Thursday 11/9/23

Friday (5 pm)

See readings,
videos, etc. in
“Module 4” on
Canvas

Module 5: Atmospheric Chemistry

Quiz 5a - Ozone hole

The ozone hole

Chemistry of ozone

Deliverable 5 (Hypotheses)

Monday (5 pm)

Tuesday 11/14/23

Thursday 11/16/23

Friday (5 pm)

See readings,
videos, etc. in
“Module 5” on
Canvas

Quiz 5b – Urban AQ
Air pollution across borders

Monday (5 pm)
Tuesday 11/21/23

Thanksgiving Recess

11/23-11/26

Module 6: Climate and Energy

Quiz 6a - Chem & climate

Urban air pollution
Air quality co-benefits

Monday (5 pm)
Tuesday 11/28/23
Thursday 11/30/23

Draft Poster

Monday (5 pm)

Poster Peer review

Tuesday 12/5/23

Exam Review

Thursday 12/7/23

Final Poster Due

Monday (5 pm) 12/11/23

Class TBD

Tuesday 12/12/23

Class TBD

Thursday 12/14/23

Final Exam (2 hrs)

Monday 12/18/23

Room TBD

(2:45 – 4:45 pm)

See readings,
videos, etc. in
“Module 6” on
Canvas