**Department of Civil and Environmental Engineering**

**University of Connecticut**

**CE/ENVE-3230 Air Pollution Control**

**Spring 2021**

***Instructor:*** Marina Astitha, PhD

Associate Professor

Associate Department Head for Graduate Education, Equity and Inclusion

Department of Civil & Environmental Engineering

Email: marina.astitha@uconn.edu

Phone: (860)-486-3941

Office: CAST 301

***Teaching Assistant:*** Christina Feng Chang, christina.feng\_chang@uconn.edu

***Class meets:*** 01/19/2021 - 04/28/2021 MoWeFr 1:25-2:15 pm; CHMA120 and online via webex1\*

***TA’s Office Hours:*** Tues 1:30-2:30pm, Thurs 11:15 am -12:15 pm **always via webex2\*\***

**\*webex1: https://uconn-cmr.webex.com/meet/maa13014**

**\*\*webex2: https://uconn-cmr.webex.com/meet/ccf13002**

**Course modalities:**

**ENVE 3230-001 (5476) Hybrid/Blended** (These classes have both in-person and online components. Classes will not meet in person for all scheduled meetings. At least 25% of mandatory instruction for the class will occur in person; more details in the course schedule).

**ENVE 3230-001X (16107) Distance Learning (DL)**

***Website (HuskyCT):*** <http://huskyct.uconn.edu> (all assignments shall be uploaded in HuskyCT at the due dates; students are expected to check the HuskyCT section of the course at least one time between classes; email announcements will be sent out using HuskyCT as a means of direct communication and updates related to the course).

***Textbook:*** Air Pollution control: A design approach, C.D. Cooper and F.C. Alley, 4th edition.

**Course goals and objectives**

The ***goal*** of this course is to provide in-depth understanding of the properties and behavior of atmospheric pollutants and the ability to design appropriate control measures for key classes of pollutants.

***Course Objectives:***

1. Relate main air pollutants with their sources, transport pathways and effects
2. Examine various systems for air pollution control
3. Design control systems for key pollutants

***Learning objectives***

At the end of this course you will be able to:

1. Analyze and evaluate air pollution control techniques (*homework; lectures*)
2. Design air pollution control systems (*homework; in-class activities; exams*)
3. Collaborate with colleagues to compile or create new knowledge about air pollution (*in-class activities;* *final project*)

***METHODS of INSTRUCTION***

Look at the detailed list below to get a better understanding of how we will use our class time:

1. Notes and lecture slides are already available to you in HuskyCT.
2. Quizzes will be available for self-assessment; solutions will also be provided.
3. Homework assignments through HuskyCT.
4. First 2 weeks and last 2 weeks of classes: During our scheduled class time, we will meet at my personal webex room (link *webex1* at the beginning of the syllabus). The class time will be structured as: 10min recap of notes/slides, 10min questions on recorded sessions (from previous class), 30min lecture or problem solving.
5. For those enrolled in the DL section of the course: delivery will be primarily through my personal webex room. When we go to class in-person, I will teach from the video conference capability in the room (more on that closer to the 1st day we’ll go to in-person classes).
6. From 02/01 to 04/09: resume to indicated modality (DL section continues as usual; Hybrid/Blended will be 75% remote and 25% in-person; in-person days are highlighted in red in the schedule).
7. Midterm and Final exam will be open books/open notes; the exam will be provided in HuskyCT at the designated date/time and the solutions should be uploaded by the due time.
8. Final projects. The reports and presentations (slides) must be developed as required. The projects will be presented online via the webex1 platform for Q&A (detailed schedule will be sent out beginning of April).

**Final Projects**

* Term projects will be conducted in **groups of four (4) people**. The instructor will assign group members.
* The topics will be geared around developing an air quality modeling or air quality control system. Topic titles will be provided by the instructor and groups will be able to select on a first-come first-serve basis.
* The written document should be a maximum of 12 pages of double-spaced text (1” page margin, font Times New Roman 12 or Arial 11), including figures, tables and references.
* An oral presentation using PowerPoint will be given during the last week of classes (10min duration).
* Instruction on how to write a term paper and deliver a presentation will be provided in-class during the semester.

I will always be available to guide you through the final project development. All you have to do is ask!

**Air Pollution topics covered during the semester:**

* Introduction, sources of air pollution, legislation (chapter 1);
* Air pollution and meteorology (chapters 19&20; hmwk#1)
* Particulate matter (chapter 3; hmwk#2)
* Cyclones (chapter 4; hmwk#2)
* Electrostatic precipitators (chapter 5; hmwk#3)
* Filters and baghouses (chapter 6; hmwk#4)
* Scrubbers (chapter 7; hmwk#5)
* Volatile Organic Compounds (VOCs) Incinerators (chapter 11; hmwk#6)
* Gas Absorption/ Gas Adsorption (chapters 12,13)

**Tentative Course schedule** The course schedule might change in the event of inclement weather or other unforeseeable circumstances. Schedule updates will be available in HuskyCT.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **WEEK** | **DATE** | **TOPIC** | **MATERIAL** | **ASSIGNMENTS\*\*** |
| Week 1 (remote) | 01/20 | Air Pollution Overview | Chap. 1 |  |
| 01/22 | Sources, Impacts & Legislation |  |
| Week 2  (remote) | 01/25 | Sources, Impacts & Legislation |  |  |
| 01/27 | Quiz1/Air pollution and meteorology | Chap. 19 |  |
| 01/29 | Air pollution and meteorology |  |  |
| Week 3 | 02/01 | Air pollution and meteorology |  |  |
| 02/03 | Final Projects/Problem solving |  |  |
| 02/05 | Quiz2/Air Dispersion modeling | Chap. 20 | Hw#1(Ch19) |
| Week 4 | 02/08 | Air Pollution modeling |  |  |
| 02/10 | Problem solving Chap20 |  |  |
| 02/12 | Problem solving Chap20 | Chap. 3 | Hw#2(Ch20) |
| Week 5 | 02/15 | Particulate Matter |  |  |
| 02/17 | PM efficiency Examples |  |  |
| 02/19\* | Problem Solving Chap3 |  | Hw#3(Ch3) |
| Week 6 | 02/22 | Cyclones | Chap. 4 |  |
| 02/24 | Cyclones |  |  |
| 02/26\* | Problem solving Chap4 |  | Hw#4 (Ch4) |
| Week 7 | 03/01 | Quiz3-ESP | Chap. 5 |  |
| 03/03 | ESP |  |  |
| 03/05\* | Problem solving Chap5 |  | Hw#5 (Ch5) |
| Week 8 | 03/08 | Midterm review |  |  |
| 03/10 | **MIDTERM EXAM** |  |  |
| 03/12\* | Filters and baghouses | Chap. 6 |  |
| Week 9 | 03/15 | Filters and baghouses |  |  |
| 03/17 | Survey/Problem solving Chap6 |  |  |
| 03/19\* | Quiz4(5&6)/Scrubbers | Chap. 7 | Hw#6 (Ch6) |
| Week 10 | 03/22  03/24  03/26\* | Scrubbers  Scrubbers/venturi  Problem solving Chap7 |  |  |
|  |
| Hw#7 (Ch7) |
| Week 11 | 03/29 | VOCs incinerators | Chap. 11 |  |
| 03/31 | VOCs incinerators |  |  |
| 04/02\* | Problem solving Chap11 |  | Hw#8 (Ch11) |
| Week 12 | 04/05 | Gas Adsorption/Absorption | Chaps 12,13 |  |
| 04/07 | Gas Adsorption/Absorption |  |  |
| 04/09\* | Quiz6(12&13)/Problem solving |  |  |
| ***SPRING BREAK*** | | ***Sun, Apr 11-Sat, Apr 17*** |  |  |
| Week 13  (remote) | 04/19 | NOx emissions, prevention &control |  |  |
| 04/21 | SOx emissions, prevention &control |  |  |
| 04/23 | Final Exam Review |  |  |
| Week 14  (remote) | 04/26 | Final Projects |  |  |
| 04/28 | Final Projects |  | Project Reports Due |
| 04/30 | Reading Days (NO CLASS) |  |  |
| **Finals Week** | | **Mon, May 3-Sat, May 8** |  |  |

\*\*These are not due dates! Due dates are shown in the HuskyCT assignments.

\*In-person (CHM A120)

**Assessment**

The assessment will be based on class participation, homework assignments, projects, midterm and final exams. I will provide feedback on your grades continuously throughout the semester.

|  |  |  |  |
| --- | --- | --- | --- |
| **Grade conversion chart** | | | |
| Excellent | A | 4 | 91 - 100 |
|  | A- | 3.7 | 89 - 90 |
| Very Good | B+ | 3.3 | 87 - 88 |
| Good | B | 3 | 81 - 86 |
|  | B- | 2.7 | 79 - 80 |
|  | C+ | 2.3 | 77 - 78 |
| Average | C | 2 | 71 - 76 |
| Fair | C- | 1.7 | 69 - 70 |
| Poor | D+ | 1.3 | 67 - 68 |
|  | D | 1 | 61 - 66 |
| Merely Passing | D- | 0.7 | 59 - 60 |
| Failure | F | 0 | <59 |

*Weighting of course requirements:*

Homework: 30%

Final Project: 20%

Midterm Exam: 25%

Final Exam: 25%

**Resources**

College can be tough and you might find yourself struggling at some point in the semester. I am always available to discuss any concerns you have regarding your academic performance; together we can find a solution. The earlier in the semester, the better!

Please, also remember that the University of Connecticut offers a lot of resources to help you cope (Student Health and Wellness, https://studenthealth.uconn.edu/; Center for Students with Disabilities, https://csd.uconn.edu/).

**Code of conduct:**

All students that participate in the class are expected to be respectful towards others and their views. Distracting behavior will not be tolerated and will lead to a deduction of up to 20 points from the final grade. This course requires your active involvement. If you want to learn as much as possible, you are invited to come to class ready to initiate ideas and participate in vivid discussions on the course material. There are no “right” or “wrong” questions and all will be treated with equal respect. Students are expected to conduct themselves in accordance with UConn’s Student Conduct Code (http://community.uconn.edu/the-student-code/).

**Academic Integrity Statement**

This course expects all students to act in accordance with the Guidelines for Academic Integrity at the University of Connecticut. Because questions of intellectual property are important to the field of this course, we will discuss academic honesty as a topic and not just a policy. If you have questions about academic integrity or intellectual property, you should consult with your instructor. Additionally, consult UConn’s guidelines for academic integrity.

**Authentication**

The University of Connecticut is required to verify the identity of students who participate in distance learning or online courses and to establish that students who register in these courses are the same students who participate in and complete the course activities and assessments and receive academic credit. Verification and authentication of student identity in this course will be done by using HuskyCT as the primary repository and access point for course content, assessment, and activities, and students use their NetID and password process to securely access course content/ assessments.

**POLICY STATEMENTS**

**Collaboration Policy:**

Students are encouraged to work together (in groups of 2 or 3) on homework assignments in the interest of gaining better understanding of the material. However, any evidence of direct copying will result in a zero homework grade for all involved parties.

Copying from solutions manuals will also result in a zero homework grade. Collaborating on exams will result in an F for the course for all parties involved.

**Final Exam Policy**

In accordance with UConn policy, students are required to be available for their final exam and/or complete any assessment during the time stated. If you have a conflict with this time you must obtain official permission to schedule a make-up exam with the Office of Student Support and Advocacy (OSSA). If permission is granted, OSSA will notify the instructor. Please note that vacations, previously purchased tickets or reservations, graduations, social events, misreading the assessment schedule, and oversleeping are not viable reasons for rescheduling a final.

**Policy Against Discrimination, Harassment and Inappropriate Romantic Relationships**

The University is committed to maintaining an environment free of discrimination or discriminatory harassment directed toward any person or group within its community – students, employees, or visitors. Academic and professional excellence can flourish only when each member of our community is assured an atmosphere of mutual respect. All members of the University community are responsible for the maintenance of an academic and work environment in which people are free to learn and work without fear of discrimination or discriminatory harassment. In addition, inappropriate Romantic relationships can undermine the University’s mission when those in positions of authority abuse or appear to abuse their authority. To that end, and in accordance with federal and state law, the University prohibits discrimination and discriminatory harassment, as well as inappropriate Romantic relationships, and such behavior will be met with appropriate disciplinary action, up to and including dismissal from the University. More information is available at http://policy.uconn.edu/?p=2884.

**Sexual Assault Reporting Policy**

To protect the campus community, all non-confidential University employees (including faculty) are required to report assaults they witness or are told about to the Office of Diversity & Equity under the Sexual Assault Response Policy. The University takes all reports with the utmost seriousness. Please be aware that while the information you provide will remain private, it will not be confidential and will be shared with University officials who can help.

More information is available at http://sexualviolence.uconn.edu/.

**Resources for Students Experiencing Distress**

The University of Connecticut is committed to supporting students in their mental health, their psychological and social well-being, and their connection to their academic experience and overall wellness. The university believes that academic, personal, and professional development can flourish only when each member of our community is assured equitable access to mental health services. The university aims to make access to mental health attainable while fostering a community reflecting equity and diversity and understands that good mental health may lead to personal and professional growth, greater self-awareness, increased social engagement, enhanced academic success, and campus and community involvement.

Students who feel they may benefit from speaking with a mental health professional can find support and resources through the [Student Health and Wellness-Mental Health](https://counseling.uconn.edu/) (SHaW-MH) office. Through SHaW-MH, students can make an appointment with a mental health professional and engage in confidential conversations or seek recommendations or referrals for any mental health or psychological concern.

Mental health services are included as part of the university’s student health insurance plan and also partially funded through university fees. If you do not have UConn’s student health insurance plan, most major insurance plans are also accepted. Students can visit the Student Health and Wellness-Mental Health located in Storrs on the main campus in the Arjona Building, 4th Floor, or contact the office at (860) 486-4705, or <https://studenthealth.uconn.edu> for services or questions.

**Accommodations for Illness or Extended Absences**

Please stay home if you are feeling ill and please go home if you are in class and start to feel ill. If illness prevents you from attending class, it is your responsibility to notify your instructor as soon as possible. You do not need to disclose the nature of your illness, however, you will need to work with your instructor to determine how you will complete coursework during your absence.

If life circumstances are affecting your ability to focus on courses and your UConn experience, students can email the Dean of Students at [dos@uconn.edu](mailto:dos@uconn.edu) to request support. Regional campus students should email the Student Services staff at their home campus to request support and faculty notification.