University of Utah

CH EN 5305/6305 – Air Pollution Control Engineering

Last Revised 2016 January 10

Semester Spring 2016

Instructor Geoff Silcox (geoff@che.utah.edu)
Room MEB 3290 C
(801)581-8820 (office)
http://www.che.utah.edu/~geoff/air_poll/

Meetings Lecture: M W F 08:35 – 09:25, MEB 2325

Office hours Open door policy or make appointment

Teaching assistant Khalid Rashid
email: khalid.rashid@utah.edu
Tutoring hours: Thursday, 1 – 3 PM, Engineering Tutoring Center, WEB 1622

Prerequisites MATH 2250, PHYS 2220, CH EN 2300, CH EN 2450, CH EN 2800 and major status in Chemical Engineering


Suggested references Fundamentals of Air Pollution Engineering, Richard C. Flagan and John H. Seinfeld, Prentice Hall, 1988. Available online at http://authors.library.caltech.edu/25069/. This is a graduate-level text.

Introduction to Environmental Engineering and Science, Gilbert M. Masters, 2nd or 3rd edition, Prentice Hall, 1998 or 2008. This text is suitable for undergraduate and graduate students.

Course description Air-pollution emission sources, behavior of pollutants in the atmosphere, theory and practice of control of particulate and gaseous air pollutants at their sources.

Learning objectives By the end of this course you will be able to

1. Describe the effects of air pollutants on health, property, and visibility.

2. Make calculations of pollutant concentrations or emission
rates for comparison with the standards of the Clean Air Act.

3. Use material, energy, entropy, and momentum balances in air pollution measurement and control calculations.

4. Critically analyze emission and ambient sampling techniques including placement of monitors and isokinetic conditions in probes.

5. Use basic meteorology to predict the distribution and fate of air pollutants in the atmosphere.

6. Calculate the concentration and dispersion of air pollutants using box and Gaussian plume models.

7. Apply general ideas in air pollution control that allow you to design equipment, calculate efficiency, calculate penetration, perform material balances for complex reacting systems including combustion reactions, and estimate acid dew points.

8. Make calculations relating to the nature of particulate including settling velocity, drag force, particle size distribution, source, and fate in the atmosphere.

9. Estimate the fate of primary particulate in wall and dividing collection devices.

10. Choose a particle collector for a particular application.

11. Evaluate different options for control of volatile organic compounds, sulfur oxides, and nitrogen oxides.

12. Make recommendations to address the motor vehicle problem.

13. Summarize engineering solutions to problems associated with air toxics, indoor air pollution, and radon.

14. (For graduate students in 6305) Produce and deliver an interesting, content-rich lecture or interactive class activity that is related to air pollution. The topic may be based on work or research activities.

Grading

10% homework, 25% first exam, 25% second exam, 40% final exam.

Final grades will be based on the following table. The table represents grade guarantees. The high score in the class will be used
to scale all other scores. For example, if the high score is 95%, all scores will be divided by 0.95. I reserve the right to reevaluate the grades of students who show exceptional performance on the final. I may lower the grading scale and may choose a lower scaling factor than that based on the high score.

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<th>Percentage</th>
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<tr>
<td>95-100</td>
<td>A</td>
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<td>90-95</td>
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<td>&lt; 50</td>
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Homework

Homework is due on Tuesdays by 16:00 and will be submitted as a single pdf file in Canvas. The solutions will be posted in Canvas. Late homework will not be accepted after the solutions have been posted. The neatness, organization, and completeness of your homework solutions will be evaluated in grading.

To receive full credit for your written solutions, you must write out all equations that you use and you must state all values substituted in those equations. You must show all of your work to receive credit.

I encourage you to work with other students on the homework. You are required to turn in individual assignments for grading.

Examinations

The three examinations will be open book but no notes and homework will be permitted. You may write in your book but nothing may be attached to or inserted in your text. Sample exams are available on the class website.

The final, comprehensive exam is scheduled from 08:00 – 10:00 on Friday, April 29, in our regular classroom.

You must show all of your work to receive credit for a solution: write out the equations in symbolic form and provide all numerical values that you use.

Students with Disabilities

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice
needs to be given to the Center for Disability Services, 162 Olpin Union Building, 801-581-5020. CDS will work with you and Prof. Silcox to make arrangements for accommodations.

All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

Addressing Sexual Misconduct
Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran’s status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

Graduate students
Graduate students will be graded separately from undergraduates and may be called upon to address questions that the undergraduate section, 5305, is unable to answer.

Graduate students will develop and deliver a lecture on a topic related to air pollution control engineering. The topic may draw from a student’s research or other employment, if appropriate for the class, and need not be different from a topic that is currently in the schedule. The topic for the lecture and approximate lecture date should be submitted to Prof. Silcox for approval by the end of January.

The talk should be at least 30 but no more than 45 minutes. The most successful talks in the past have included illustrations of industrial applications, demonstrations, show-and-tell (things to be passed around the class), and photos of equipment and processes.

The lecture and its delivery will count toward 10 points of a graduate student’s grade, on a 110-point basis, with the other 100 points being divided per the grading scheme outlined above.