Course Syllabus
CEE 446: Air Quality Engineering
Department of Civil and Environmental Engineering
Newmark Civil Engineering Laboratory, Rm. 2312, Fall Semester 2018
http://aqes.cee.illinois.edu/classes/CEE446/index.html

Background Information

- Introduction, definitions and units ................................................................. (pp. i-xi, 1-15)
- Typical concentrations of air contaminants in ambient air and stack gases ................................ (pp. 7)
- Evaluation of closure between two sets of independent results ..............
- Aerosol particle size distributions ................................................................. (pp. 11, 202-207)
- Aerosol mechanics ....................................................................................... (pp. 208-212)
- Scattering and absorption of light, global issues ........................................ (pp. 16-23, 47-53)
- Air quality regulations ................................................................................ (pp. 61-104)
- Internet access related to air quality ............................................................ (pp. 53-55)

Sources of Industrial Air Pollution ........................................................................ (pp. 188-193)

General Methods to Control the Generation and Emission of Contaminants into the Atmosphere ................................................................. (pp. 193-195)

- (Modify process, modify feed stream, shutdown source, modify social norms, and demand side management)
- Ancillary air pollution control devices
  - Duct and fan considerations ................................................................. (pp. 215-218)
  - Collection efficiency ....................................................................... (pp. 195-202)

Particulate Contaminant Control

- Mechanisms to remove particulate contaminants from gas streams ........ (pp. 218-219)
- Gravitational settling chambers ............................................................... (pp. 220-225)
- Centrifugal separators ........................................................................... (pp. 225-232)
- Wet scrubbers ......................................................................................... (pp. 232-248)
- Fabric filters .......................................................................................... (pp. 248-260)
- Electrostatic precipitators ...................................................................... (pp. 260-275)
- Summary ............................................................................................... (pp. 276-278)

Gaseous Contaminant Control

- Mechanisms to remove gaseous contaminants from gas streams .......... (pp. 294-295)
- Combustion stoichiometry .................................................................... (pp. 341-350)
- Adsorption ............................................................................................ (pp. 294-314)
- Absorption ............................................................................................ (pp. 314-341)
- Summary ............................................................................................... (pp. 314-341)

Meteorological Considerations

- Dependence of pressure on height .......................................................... (pp. 109-117)
- Dependence of temperature on height .................................................. (pp. 117-127)
  - Dry and wet adiabatic lapse rates
  - Potential temperature and its gradient
- Dependence of wind speed on height ...................................................... (pp. 127-129)
- Maximum mixing depth ........................................................................ (pp. 130-132)
- Wind rose .............................................................................................. (pp. 133-135)
- General characteristics of elevated point sources ................................ (pp. 135-139)
Dispersion of Air Contaminants

- Point source ................................................................. (pp. 143-171, 177-181, 212-215)
- Line source ................................................................... (pp. 171-173)
- Puff source .................................................................... (pp. 173-176)
- Multiple sources ............................................................. (pp. 176-177)

Current Topic Project and Possible Field Trip

Required Materials

Rood, M.J. “Class Notes” for CEE 446: Air Quality Engineering is available at http://aqes.cee.illinois.edu/classes/CEE446/Coursenotes/Coursenotes.pdf

Periodic table of chemical elements and calculator for use with assignments and exams

Recommend, but not Required


Supplemental Materials -- (Background information that is not required for the course)

American Chemical Society (ACS), preparation and submission of manuscripts to ACS: http://pubs.acs.org/page/publish-research/index.html

British Broadcasting System, Killer Smog, parts 1-6: http://www.youtube.com/watch?v=eUQ9tPc8YbM


Weast, R.C. Editor, CRC Handbook of Chemistry and Physics, CRC Press, Inc., Boca Raton, Florida (available in Grainger Library).

Wikipedia, Background information about air quality: http://en.wikipedia.org/wiki/Air_pollution

Suggested Peer Reviewed Journals


Course Prerequisites and Credit

CEE 330: Environmental Engineering and TAM 335: Introductory Fluid Mechanics (or concurrent registration), or approval by instructor. Credit for CEE 446 is 4 hr.
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http://aqes.cee.illinois.edu/ (website)

Instructors’ Office Hours
Office hours will be determined during the beginning of the semester. E-mail and telephone access are available throughout the semester.

Current Topic Project
Students will develop current topic projects in groups of three to four students that consist of choosing a current topic that is relevant to air quality engineering that could also have relevancy to climate change and/or sustainability. The project consists of a literature review, preparing a report of a maximum of 12 pages (11 point font, 1.5 line spacing, 2.54 cm margins) excluding the References Cited Section consisting of at least seven very relevant cited peer-reviewed journal references (beyond website references), and giving a 15 minute presentation, including three minutes for questions/discussion, to the class. The presentations are typically scheduled to occur during regularly scheduled lecture hours towards the end of the semester, but could also occur during an evening session if that works better for our class.

Suggested Format/Structure for Current Topic Report: Provide a title for the report, list of authors names, why the report was written (e.g., CEE 446: Current Topic Report), date, and who you are submitting the report to at the top of the report’s first page, possibly using bold text to highlight such text. Provide page numbers, possibly at the bottom right corner of each page. Then provide:

- Abstract (Include: 1) area of air quality that is of concern, 2) what was learned by your team, 3) relevancy to CEE446, and 4) the information’s importance)
- Body of Report (Include: 1) Introduction, 2) Current Information about XXX (topic of interest), 3) Relevancy to CEE446, and 4) Summary and Conclusions sections)
- Reference Section (formatted references, including peer-reviewed journals). See American Chemical Society (ACS) Style Guide: http://pubs.acs.org/isbn/9780841239999 for useful suggestions about effective written communication of scientific information.

Example presentations are provided on the website for CEE446 describing the Current Topic Project. Here are a few points to consider.

- Allow yourself one minute/slide for your presentation. A 15 minute presentation goes quickly, especially when there should be 3 minutes for questions and discussions. Your total presentation is limited to 15 minute.
- Use meaningful titles to the slides that describe the slides main point(s)
- Describe the relevance of your slides (e.g., compare to NAAQS values, reference CEE446 content) during your presentation
- Highlight sections of the slides (e.g., use orange squares or circles or arrows with supportive text) that are important for your audience
- Make sure fonts are large enough for the entire audience to read
- Use slide numbers so that your audience can reference slides easily during questions and discussions
- Project your voice and look at your audience
- Dress professionally (e.g., casual business)
• Present yourself professionally by standing vertically, keeping your hands out of your pockets, stand in front of your audience instead of behind the podium, and do not lean against surfaces during your presentation
• Review, then review, and then review again your slides to provide your final presentation
• Practice, then practice, and then practice again your presentation well in advance of giving your presentation in class
• Face and speak to the audience with only brief viewing of the slides behind you (i.e., don’t read slides)

Assignments
There will be five to seven assignments given during the semester. Completed assignments are to be submitted for intermittent grading by the specified completion dates. Grades are reduced 20% per day after the due date unless late submission is pre-approved or a medical release is provided. Assignments are not accepted for grading after the solutions are posted on the website for the class.

Grading
The overall minimum mean grade for the class will be a 3.0/4.0. Grades for assignments, current topic project, and exams can be re-evaluated up to one week after the grade was provided for that activity. Re-evaluation of your overall grade for the class can occur up to one week after your grade is distributed to the class.

Student Participation
Students are encouraged to participate in class discussions. Please share your experiences/insights, ask questions, and provide comments during lectures. I will gladly ask students to provide questions to improve student participation.

Exams and Grading
All exams are open book. Students should bring their textbook (if available), lecture notes, assignments, past exams for this semester, handouts, calculator and a periodic table of elements to the exams. Students can use their laptop computer to only review lecture notes and solutions to exams and assignments for the current semester. No computational capabilities are to be used with laptop computers. The wireless network connection to all computers shall be off during exams. There is no access to the Internet during exams.

<table>
<thead>
<tr>
<th>Exams and Assignments</th>
<th>Percent of Grade (%)</th>
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</thead>
<tbody>
<tr>
<td>Two (2) 45 min exams</td>
<td>15 each</td>
</tr>
<tr>
<td>Final cumulative exam</td>
<td>25</td>
</tr>
<tr>
<td>Current topic project (50% presentation and 50% report, including participation)</td>
<td>25</td>
</tr>
<tr>
<td>Assignments</td>
<td>20</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
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</tbody>
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Professional Conduct during Lectures
Cell phones are to be off or on vibrate mode if expecting an emergency call. There is no participation with texting or e-mail during lectures, especially during the Current Topic presentations.

Class Attendance
Class attendance is encouraged, especially during Current Topic presentations when attendance is required. However, you are also encouraged to participate with other educational/professional obligations (e.g., job interviews, presentations at professional conferences) that occur during regular lectures. You are also encouraged to obtain missing lecture notes from your colleagues who participated in the lecture that you missed. Lectures and discussions will involve topics that are not always presented in the textbook or in the supplementary course material and these topics may be asked about during exams.