

**CIVE 498/898 Environmental Air Pollution Engineering  
Spring 2019, 3 credits**

**Instructor:**

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Office hour: 1:00-2:00 on Friday

**Text:**

1. Air Pollution Control: A Design Approach. C. David Cooper, F. C. Alley.  
Waveland Pr Inc; 4<sup>th</sup> edition (September 1, 2010)

**Supplemental text:**

1. Air Pollution Control Equipment Calculations. Louis Theodore. 2008 John Wiley & Sons, Inc

**Course Description:**

Environmental engineers are entrusted with protecting human health and the environment. One especially important aspect is protecting air quality. In this class, we will integrate an understanding of science and engineering to explore the relationship between pollutant emissions and environmental impacts. We will also develop an understanding of the impact of regulations and engineering controls. Part of the class will focus on management of air pollution management including permitting and inventories.

**Learning Objectives:**

- Apply knowledge of air pollution history, regulations, and adverse effects to evaluate potential future regulatory needs.
- Solve air quality problems by applying knowledge of math, science, and engineering.
- Analyze and clearly explain the impact of regulations and controls on air quality/climate based on complex factors such as meteorology, chemistry, physics, and emission rates.
- Analyze the emissions of air pollution sources and determine regulatory requirements.
- Communicate technical information concisely and effectively.
- Evaluate and design different air pollution control equipment.

## Grading Policy:

<b>Evaluation Methods</b>	<b>Type</b>	<b>Percentages</b>
Assignment, Homework & Quiz	Group & Individual	20
Midterm Exam - I	Individual	15
Midterm Exam - II	Individual	15
Final Exam	Individual	20
Class Project & Lab Exercise*	Individual	20
Participation and Attendance**	Individual	10
<b>Total</b>		<b>100</b>

\* Students signed up for the class at the 898 level need to complete an additional paper with class presentation

\*\* Automatic F for absences > 6 or for unexcused absences > 3

Final grades will be assigned on the standard scale as follows:

97-100 A+	80-83 B-	63-67 D
93-97 A	77-80 C+	60-63 D-
90-93 A-	73-77 C	<60 F
87-90 B+	70-72 C-	
83-87 B	67-70 D+	

## **Tentative Schedule**

<b><u>Week #</u></b>	<b><u>Major Topic</u></b>	<b><u>Content</u></b>	<b><u>Reading Required</u></b>	<b><u>Assignments</u></b>
Week 1 1/7	<b>Air Pollution Overview</b>	<ul style="list-style-type: none"><li>• Pollutants</li><li>• Sources</li><li>• Effects</li><li>• Trends &amp; Regulations</li></ul>	Chapter 1 and Supplementary Notes	<u>Assigned in class</u>
Week 2 1/14	<b>Fundamentals</b>	<ul style="list-style-type: none"><li>• Chemical Kinetics</li><li>• Mixing</li><li>• Mass &amp; Heat transfer</li><li>• Probability theory</li></ul>	Chapter 2 and Supplementary Notes	<u>Assigned in class</u>
Week 3 1/21	<b>Particulate Matter - I</b>	<ul style="list-style-type: none"><li>• Introduction</li><li>• Characteristics</li><li>• Behavior</li><li>• Cyclones</li></ul>	Chapters 3, 4 & 9, and Supplementary notes	<u>Assigned in class</u>
Week 4 1/28 Mid Term 1	<b>Particulate Matter – II</b>	<ul style="list-style-type: none"><li>• Electrostatic Precipitators</li><li>• Fabric Filters</li></ul>	Chapters 5, 6 & 9, and supplementary materials	<u>Assigned in class</u>
Week 5 2/4	<b>Combustion</b>	<ul style="list-style-type: none"><li>• Fuels</li><li>• Combustion systems</li><li>• Formation of air pollutants</li></ul>	Supplementary materials	<u>To be given in class</u>

Week 6 2/11	<b>Air Pollution Management - I</b>	<ul style="list-style-type: none"> <li>• Air Permitting</li> </ul>	Supplementary materials	-
Week 7 2/18	<b>Air Pollution Management - II</b>	<ul style="list-style-type: none"> <li>• Ambient Emission Monitoring</li> <li>• Emission Inventory</li> <li>• NESHAPS/ NSPS</li> </ul>	Supplementary materials	<u>Class Project</u>
Week 8 2/25	<b>Emission Polluter Sources</b>	<ul style="list-style-type: none"> <li>• Selected industries by presenters</li> </ul>	<u>Literature review</u>	<u>Class Presentations</u>
Week 9 3/4 Mid Term 2	<b>Gases &amp; Vapors - I</b>	<ul style="list-style-type: none"> <li>• Properties</li> <li>• VOC Incinerators</li> </ul>	Chapter 10, 11 & 17, and supplementary materials	<u>Assigned in class</u>
Week 10 3/11	<b>Gases &amp; Vapors - II</b>	<ul style="list-style-type: none"> <li>• Gas Adsorption</li> <li>• Gas Absorption</li> </ul>	Chapter 12, 13 & 17, and supplementary materials	<u>Assigned in class</u>
Week 11 3/18 Spring Break	<u>SAFELY ENJOY THE SPRING BREAK</u>			
Week 12 3/25	<b>Gases &amp; Vapors - III</b>	<ul style="list-style-type: none"> <li>• Biological Control</li> <li>• Control of Sulfur Oxides</li> </ul>	Chapters 14, 15 & 17, and Supplementary materials	<u>To be given in class</u>
Week 13 4/1	<b>Gases &amp; Vapors - IV</b>	<ul style="list-style-type: none"> <li>• Control of Nitrogen Oxides</li> </ul>	Chapters 16 & 17, and Supplementary materials	<u>Assigned in class</u>
Week 14 4/8	<b>Air Pollution Modelling</b>	<ul style="list-style-type: none"> <li>• Air Pollution Models</li> </ul>	Chapters 19 & 20, and Supplementary materials	<u>Lab Exercise</u>
Week 15 4/15	<b>Odors</b>	<ul style="list-style-type: none"> <li>• Pollutants</li> <li>• Generation</li> <li>• Measurements</li> <li>• Treatment</li> </ul>	Supplementary materials	<u>To be given in class</u>
Week 16 4/22	<b>Measurement</b>	<ul style="list-style-type: none"> <li>• Laboratory Instrumentation</li> <li>• CEMS/COMS/PEMS</li> <li>• Stack Testing &amp; EPA Methods</li> </ul>	Laboratory Manuals and Supplementary materials	<u>To be given in class</u>
Week 17 4/29	<b>Final Exam</b>			

**General Notes:**

1. I reserve the right to make any changes to the course including removing/adding topics.
2. Late assignments will be deducted 10% per day, unless you have a valid excuse. You must show your work clearly to obtain credit.
3. Two midterms will be given at scheduled times during class.
4. Final exam is scheduled on April 30<sup>th</sup>.
5. Class project will involve emission calculations of actual applications submitted for permitting at the local air agency. Project will be performed in groups of three.
6. Class presentations (15 minutes presentation and 10 minutes questions) and associated report are expected by individual graduate students only and will be presented to the entire class. Students will choose the sources they will research by week 3.
7. Air pollution modelling exercise will be conducted individually but the report will be submitted by groups of three students.

**Expectations:**

1. I expect you to learn from each other. Thus, I have no objections to students working together, *provided it is a mutual learning experience for all involved*. Direct copying of another's work is not allowed. If one person has already solved a problem, and you have put in a good-faith effort on it but still cannot solve it, it is acceptable for that person to teach you how to solve it. However, it is not acceptable for him/her to simply give you their calculation/report/spreadsheet as a guide.
2. Academic honesty is each student's responsibility. You are responsible for not cheating and not allowing anyone to cheat from you. Academic dishonesty is described in Section 4.2 of the Student Code of Conduct and Disciplinary Procedures. If there is evidence of cheating on exams, the minimum penalty will be a zero for all parties involved. Evidence of cheating also may be reported to the Vice Chancellor for Student Affairs in accordance with University guidelines for dealing with academic dishonesty.