

ME 433 - FUNDAMENTALS OF AIR POLLUTION

GENERAL INFORMATION SPRING 2008

CLASS MEETING: MWF: 12:20-1:10 p.m., 101 Leonhard

INSTRUCTOR: Stephen R. Turns

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OFFICE HOURS: MWF 4-5 p.m.; Tu 4:30-5 p.m.; Th 3-4 p.m. at 114 Research Building East
Other times by appointment: Feel free to call or email to set up a time.

TEXT: *Sources and Control of Air Pollution*, Heinsohn & Kabel, Prentice Hall, 1999.

PREREQUISITES: ME 201 (ME 23) or ME 300 (ME 30) or other thermodynamics course

TENTATIVE EXAMINATION SCHEDULE: In class, February 22nd and April 7th

GRADE DETERMINATION:

Team Homework*	15%	
Class Preparation & Participation	5%	Late drops prior to first exam - WN
Term Writing Project	20%	Late drops after first exam:
In-Class Exam I	20%	With a score $\geq 60\%$ - WP
In-Class Exam II	20%	With a score $< 60\%$ - WF
Final Exam	<u>20%</u>	
	100%	TOTAL
Extra-Credit Assignment (A passing grade is required for this to count.)	Up to 6%	

Final letter grades will generally follow 90-100% for an A, 80-89% for a B, etc. Plusses & minuses will extend up and down 2 percentage points at each major break point, e.g., 90-91.9 = A- and 88-89.9 = B+. The instructor may adjust this scale in the final analysis, but in no case will scores higher than those listed be required to achieve the stated letter grades.

* To pass this course, your average mid-semester exam scores must be 60% or greater. Team homework cannot be used to move from a failing to a passing course grade.

TEAM HOMEWORK: See the separate handout for details. Your lowest score will be dropped.

ATTENDANCE POLICY: Attendance at every class period is expected.

ACADEMIC HONESTY: The work on all exams and the term writing project is to be yours alone. All homework is to be done without reference to a solutions manual, homework solutions from previous ME 433 students, or any other sources. Failure to abide by these rules, or the commission of any other deliberately dishonest act, may result in failure of the course, with no late drop permitted. For University & College policies on academic integrity see <http://www.psu.edu/ufs/policies> and <http://www.engr.psu.edu/CurrentStudents/acadinteg.asp>.

MISSED EXAMS: No make-up exams will be given except as required by University policy. See your instructor *prior* to any anticipated absence.

E-MAIL: Students are encouraged to ask questions, etc., via e-mail. This is a good way to share information with the class.

ANGEL WEB SITE: Please visit the course ANGEL site regularly for important class information. Assignments, solutions, and announcements will be posted there.

Pd.	Date	Topic(s)	H&K Text Reading	Handouts and Selected Readings
Introduction				
1	1/14	Course Overview & Introduction	1-18, Table 3.2	NAAQs Update
Air Pollutant Basics				
2	1/16	Classification of Pollutants and Sources	93, 95, 101-103, 128-30	EPA Trends
3	1/18	Quantifying Emissions & Atmospheric Concentrations	27-33	
No Class - MLK Holiday				
4	1/23	Quantifying Emissions & Atmospheric Concentrations - Cont'd	27-33	
Rhetoric, Opinions & Facts				
5	1/25	Reading the Scientific (& Other) Literature - Gabriel Welsch		Collegian & CDT Articles
6	1/28	Reading Exercise; Combustion Fundamentals - Stoichiometry		Essay - TBD
7	1/30	Emission Indices & Emission Factors	329-37, 652-63	Intro Comb 553-58
CO₂, Other Greenhouse Gases, & Climate Change				
8	2/1	Energy Use, Fuels, & CO ₂ Production		Chow et al.
9	2/4	Greenhouse Gases & Aerosols - Physics of Radiative Forcing	72-81	Hansen Sci. Am. 1-9
10	2/6	Climate Modeling & the Political Situation	33-48	Hansen 10-21; Watson; King
11	2/8	Evidence of Climate Change - IPCC	296-300	Hansen 10-21; Foley; Oerlemans
12	2/11	Predicted Effects of Climate Change - IPCC & Others	296-300	Hansen 22-32
13	2/13	CO ₂ Sequestration & Other Mitigation Strategies		Geo Richards paper - CO ₂ Capture
Searching the Scientific Literature				
14	2/15	Workshop on Computer-Based Literature Searches - Bonnie Osif		
Carbon Monoxide				
15	2/18	CO Sources, Controls, & Health Effects	396-300; 173; 317-18	
16	2/20	CO Sources, Controls, & Health Effects - Cont'd		
17	2/22	EXAMINATION I - In-Class		
Sulfur Oxides				
18	2/25	SO ₂ & SO ₃ Sources, Chemistry, & Measurement	98, 308-12, 652-63	UV Fluorescence
19	2/27	Acid Rain & Related Impacts	187-188	Hubbard Brook 1-10
20	2/29	Acid Rain & Related Impacts	188-198	Hubbard Brook 11-21; USGS Maps
21	3/3	SO ₂ Controls	485-88	
Oxides of Nitrogen				
22	3/5	Nitric Oxide & Nitrogen Dioxide Sources	33-48	
23	3/7	Nitric Oxide: Kinetic Considerations	33-48	

Spring Break - March 10-16 - Relax & return refreshed!				
24	3/17	Simple Reactor Model	296-300	
25	3/19	Simple Reactor Model	296-300	
26	3/21	NO Formation in SI Engines - Zone Model		Heywood Handout
27	3/24	Chemiluminescent Analysis for NO _x		CLA Handout
28	3/26	NO _x Controls	313-19; 319-20	
29	3/28	NO _x Controls - Cont'd	482-85	
Photochemical Smog				
30	3/31	Photochemical Smog - Role of Volatile Organics & NO _x		
31	4/2	Photochemical Smog - Atmospheric Chemistry		
32	4/4	Photochemical Smog - Cont'd		
33	4/7	EXAMINATION II - In-Class		
Particulate Matter				
34	4/9	Particulate Matter Sources	236-40; 516	
35	4/11	Particulate Matter Controls	567-75; 591-602	
36	4/14	Particulate Matter Controls - Cont'd	608-19	
37	4/16	C-R Functions; Respiratory System Physiology & Disease	127-137; 159-178	EPA: Human Health Effects
Mercury				
38	4/18	Mercury Sources & Health Effects	193-95	EPA Website; <i>Science</i> articles
39	4/21	Mercury Controls		
CFCs				
40	4/23	CFCs & the Ozone Hole	244; 252-254	NAS: Ozone Depletion Phenomenon
41	4/25	CFCs & the Ozone Hole		NOAA Website
Air Pollution Legislation				
42	4/28	Clean Air Act & Ammendmments; California Legislation	89-112	EPA: Guide to CAA
43	4/30	Legislation in Europe & Asia		CARB: California's Air Quality History
44	5/2	Review		