

Submit originals (including syllabus) and one copy and electronic copy to the **Faculty Senate Office**  
See <http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures/> for a complete description of the rules governing curriculum & course changes.

*Attach a syllabus, except if dropping a course.*

Department	Civil and Environmental Engineering	College/School	CEM
Prepared by	Srijan Aggarwal	Phone	474.6120
Email Contact	saggarwal@alaska.edu	Faculty Contact	Srijan Aggarwal

Dept	ENVE	Course #	F643	No. of Credits	3
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## Air Pollution Management

Change Course	X	If Change, indicate below what is changing.	Drop Course	
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\*Prerequisites will be *required* before a student is allowed to enroll in the course.

## F443

Stacked course applications are reviewed by the (Undergraduate) Curricular Review Committee and by the Graduate Academic and Advising Committee. Creating two different syllabi—undergraduate and graduate versions—will help emphasize the different qualities of what are supposed to be two different courses. The committees will determine: 1) whether the two versions are sufficiently different (i.e. is there undergraduate and graduate level content being offered); 2) are undergraduates being overtaxed?; 3) are graduate students being undertaxed? In this context, the committees are looking out for the interests of the students taking the course. Typically, if either committee has qualms, they both do. More info online – see URL at top of this page.

Requires approval of both departments and deans involved. Add lines at end of form for additional signatures.

Requires notification of other department(s) and mutual agreement.  
Attach copy of email or memo.

NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council **and** the appropriate Faculty Senate curriculum committee. Furthermore, **any core course compressed to less than six weeks must be approved by the Core Review Committee.**

<b>COURSE FORMAT:</b> (check <u>all</u> that apply)	<input type="checkbox"/>	1	<input type="checkbox"/>	2	<input type="checkbox"/>	3	<input type="checkbox"/>	4	<input type="checkbox"/>	5	<input checked="" type="checkbox"/>	6 weeks to full semester
<b>OTHER FORMAT</b> (specify all that apply)												
<b>Mode of delivery</b> (specify lecture, field trips, labs, etc.)	<b>Lecture</b>											

**4. COURSE CLASSIFICATIONS:** (undergraduate courses only. Use approved criteria found in Chapter 12 of the curriculum manual. If justification is needed, attach separate sheet.)

H = Humanities ☐ S = Social Sciences ☐

Will this course be used to fulfill a requirement for the baccalaureate core?	YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>
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If YES\*, check which core requirements it could be used to fulfill:

O = Oral Intensive, *Format 6 also submitted <input type="checkbox"/>	W = Writing Intensive, *Format 7 submitted <input type="checkbox"/>	X = Baccalaureate Core <input type="checkbox"/>
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**4.A Is course content related to northern, arctic or circumpolar studies? If yes, a "snowflake" symbol will be added in the printed Catalog, and flagged in Banner.**

YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>
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**5. COURSE REPEATABILITY:**

Is this course repeatable for credit?	YES <input type="checkbox"/>	NO <input type="checkbox"/>	X <input checked="" type="checkbox"/>
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Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).	
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How many times may the course be repeated for credit?	<input type="text"/>	TIMES
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If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course?	<input type="text"/>	CREDITS
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**6. COMPLETE CATALOG DESCRIPTION including dept., number, title, credits, credit distribution, cross-listings and/or stacking, clearly showing the changes you want made. (Underline new wording strike through old wording and use complete catalog format including dept., number, title, credits and cross-listed and stacked.)**

**Example of a complete description:**

**PS F450 Comparative ~~Aberiginal~~ Indigenous Rights and Policies (s)**

3 Credits

Offered As Demand Warrants

~~Case study~~ Comparative approach in ~~assessing Aberiginal~~ analyzing Indigenous rights and policies in different nation-state systems. ~~Seven Aberiginal situations~~ Multiple countries and specific policy developments examined for factors promoting or limiting self-determination. Prerequisites: Upper division standing or permission of instructor. (Cross-listed with ANS F450.) (3+0)

**ENVE F643 Air Pollution Management**

3 Credits

~~Offered Spring of Odd-numbered Years~~ Offered As Demand Warrants

Air pollution topics including the quantity and quality of atmospheric emissions and their effects on the human environment. Identification and location of sources, measurement of quality and conformance with standards. Legal considerations of Clean Air Act and Amendments and local regulations. Evaluation of stationary and moving sources. Meteorology and modeling requirements. Control mechanisms for gases and particulates; ~~and engineering economies~~. ~~Prerequisites~~ Recommended: CHEM 106X or equivalent; Recommended: MATH F201X; graduate standing; or permission of instructor. Stacked with CE F443 (3+0)

CE F443 Air Pollution Management

3 Credits

Offered Spring of Odd-numbered Years

Air pollution topics including the quantity and quality of atmospheric emissions and their effects on the human environment. Identification and location of sources, measurement of quality and conformance with standards. Legal considerations of Clean Air Act and Amendments and local regulations. Evaluation of stationary and moving sources. Meteorology and modeling requirements. Control mechanisms for gases and particulates. Prerequisites: CHEM 106X or equivalent; Recommended: MATH F201X; Stacked with ENVE F643 (3+0)

**7. COMPLETE CATALOG DESCRIPTION AS IT SHOULD APPEAR AFTER ALL CHANGES ARE MADE:**

**ENVE F643 Air Pollution Management**

3 Credits

Offered Spring of Odd-numbered Years

Air pollution topics including the quantity and quality of atmospheric emissions and their effects on the human environment. Identification and location of sources, measurement of quality and conformance with standards. Legal considerations of Clean Air Act and Amendments and local regulations. Evaluation of stationary and moving sources. Meteorology and modeling requirements. Control mechanisms for gases and particulates. Prerequisites: CHEM 106X or equivalent; Recommended: MATH F201X; graduate standing or permission of instructor. Stacked with CE F443 (3+0).

**CE F443 Air Pollution Management**  
**3 Credits**  
**Offered Spring of Odd-numbered Years**

Air pollution topics including the quantity and quality of atmospheric emissions and their effects on the human environment. Identification and location of sources, measurement of quality and conformance with standards. Legal considerations of Clean Air Act and Amendments and local regulations. Evaluation of stationary and moving sources. Meteorology and modeling requirements. Control mechanisms for gases and particulates. Prerequisites: CHEM 106X or equivalent; Recommended: MATH F201X; Stacked with ENVE F643 (3+0).

**8. GRADING SYSTEM:** *Specify only one.*

LETTER: ☒

PASS/FAIL: ☐

**9. ESTIMATED IMPACT**

*WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.*

None

**10. LIBRARY COLLECTIONS**

*Have you contacted the library collection development officer (kljensen@alaska.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.*

No ☐

Yes ☒

9/12/2014

**11. IMPACTS ON PROGRAMS/DEPTS:**

*What programs/departments will be affected by this proposed action?*

*Include information on the Programs/Departments contacted (e.g., email, memo)*

Civil Engineering, Environmental Engineering, Atmospheric Sciences

**12. POSITIVE AND NEGATIVE IMPACTS**

*Please specify **positive and negative** impacts on other courses, programs and departments resulting from the proposed action.*

Will offer opportunity for students in CNSM and CEM to enroll in a semester long dedicated course on air quality issues.

**13. JUSTIFICATION FOR ACTION REQUESTED**

The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. If you ask for a change in # of credits, explain why; are you increasing the amount of material covered in the class? If you drop a prerequisite, is it because the material is covered elsewhere? If course is changing to stacked (400/600), explain higher level of effort and performance required on part of students earning graduate credit. Use as much space as needed to fully justify the proposed change and explain what has been done to ensure that the quality of the course is not compromised as a result.

**This class has been on “no print” status since no faculty member was available to teach the course. With recent hire of new faculty, this class shall be offered again, in the Spring of odd numbered years, and it shall be listed in the catalogue again.**

**As for the need for stacking: Air Quality is an important issue and a topic of increasing concern and involvement for environmental engineers. Many schools routinely offer an introductory course on air quality issues for undergraduates in “Civil and Environmental Engineering”. Currently none exists in the Civil and Environmental Engineering curriculum here at UAF and this stacked course will fill this important need for the undergraduate students. This course could also be used as a required technical elective for the UG curriculum.**

**While the overall topics for the class remain common for undergraduate and graduate student, for the students earning graduate credit, the course will primarily differ in following three ways.**

- 1. Graduate students would be required to do a course-project on the topic of air pollution, demonstrating graduate level understanding and application of concepts learnt in the class. Course project will *not* be a requirement for the Undergraduate students.**

2. Graduate students will be leading the journal article discussion (as assigned) along with presenting a critical summary to the entire class.
3. The homework assignments and exams will be handed out in two categories: requiring demonstration of deeper understanding of the concepts for the graduate students.

SEE ATTACHED SIGNATURES NEXT PAGE

**APPROVALS: (Forms with missing signatures will be returned. Additional signature blocks may be added as necessary.)**

	Date	
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Signature, Chair, Program/Department of:

	Date	
--	------	--

Signature, Chair, College/School Curriculum Council for:

	Date	
--	------	--

Signature, Dean, College/School of:

Offerings above the level of approved programs must be approved in advance by the Provost (e.g., non-graduate level program offering of a 600-level course):

	Date	
--	------	--

Signature of Provost (if applicable)

**ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE.**

	Date	
--	------	--

Signature, Chair

Faculty Senate Review Committee: \_\_\_Curriculum Review \_\_\_GAAC

\_\_\_Core Review \_\_\_SADAC

**ADDITIONAL SIGNATURES: (As needed for cross-listing and/or stacking; add more blocks as necessary.)**

	Date	
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Signature, Chair, Program/Department of:

	Date	
--	------	--

Signature, Chair, College/School Curriculum Council for:

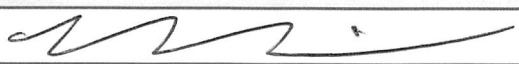
	Date	
--	------	--


Signature, Dean, College/School of:

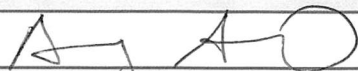
Note: If removing a cross-listing, you may attach copy of email or memo to indicate mutual agreement of this action by the affected department(s).

If degree programs are affected, a Format 5 program change form must also be submitted.

**APPROVALS:** (Forms with missing signatures will be returned. Additional signature blocks may be added as necessary.)

 Date 9-12-14  
Signature, Chair, Program/Department of: CEE

 Date 9-25-14  
Signature, Chair, College/School Curriculum Council for: CEM

 Date 10/22/14  
Signature, Dean, College/School of: CEM

Offerings above the level of approved programs must be approved in advance by the Provost (e.g., non-graduate level program offering of a 600-level course):

Signature of Provost (if applicable) \_\_\_\_\_ Date \_\_\_\_\_

**ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE.**

\_\_\_\_\_  
Signature, Chair \_\_\_\_\_ Date \_\_\_\_\_

Faculty Senate Review Committee: ☐ Curriculum Review ☐ GAAC

☐ Core Review ☐ SADAC

**ADDITIONAL SIGNATURES:** (As needed for cross-listing and/or stacking; add more blocks as necessary.)

\_\_\_\_\_  
Signature, Chair, Program/Department of: \_\_\_\_\_ Date \_\_\_\_\_

\_\_\_\_\_  
Signature, Chair, College/School Curriculum Council for: \_\_\_\_\_ Date \_\_\_\_\_

\_\_\_\_\_  
Signature, Dean, College/School of: \_\_\_\_\_ Date \_\_\_\_\_

Note: If removing a cross-listing, you may attach copy of email or memo to indicate mutual agreement of this action by the affected department(s).

If degree programs are affected, a Format 5 program change form must also be submitted.

RECEIVED

SEP 25 2014

10/22/14

10/22/14

**ATTACH COMPLETE SYLLABUS (as part of this application).** This list is online at:  
<http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/uaf-syllabus-requirements/>

The Faculty Senate curriculum committees will review the syllabus to ensure that each of the items listed below are included. If items are missing or unclear, the proposed course (or changes to it) may be denied.

#### **SYLLABUS CHECKLIST FOR ALL UAF COURSES**

During the first week of class, instructors will distribute a course syllabus. Although modifications may be made throughout the semester, this document will contain the following information (as applicable to the discipline):

##### **1. Course information:**

☐ Title, ☐ number, ☐ credits, ☐ prerequisites, ☐ location, ☐ meeting time  
(make sure that contact hours are in line with credits).

##### **2. Instructor (and if applicable, Teaching Assistant) information:**

☐ Name, ☐ office location, ☐ office hours, ☐ telephone, ☐ email address.

##### **3. Course readings/materials:**

☐ Course textbook title, ☐ author, ☐ edition/publisher.  
☐ Supplementary readings (indicate whether ☐ required or ☐ recommended) and  
☐ any supplies required.

##### **4. Course description:**

☐ Content of the course and how it fits into the broader curriculum;  
☐ Expected proficiencies required to undertake the course, if applicable.  
☐ Inclusion of catalog description is *strongly* recommended, and  
☐ Description in syllabus must be consistent with catalog course description.

##### **5. ☐ Course Goals (general), and (see #6)**

##### **6. ☐ Student Learning Outcomes (more specific)**

##### **7. Instructional methods:**

☐ Describe the teaching techniques (eg: lecture, case study, small group discussion, private instruction, studio instruction, values clarification, games, journal writing, use of Blackboard, audio/video conferencing, etc.).

##### **8. Course calendar:**

☐ A schedule of class topics and assignments must be included. Be specific so that it is clear that the instructor has thought this through and will not be making it up on the fly (e.g. it is not adequate to say "lab". Instead, give each lab a title that describes its content). You may call the outline Tentative or Work in Progress to allow for modifications during the semester.

##### **9. Course policies:**

☐ Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.

##### **10. Evaluation:**

☐ Specify how students will be evaluated, ☐ what factors will be included, ☐ their relative value, and ☐ how they will be tabulated into grades (on a curve, absolute scores, etc.) ☐ Publicize UAF regulations with regard to the grades of "C" and below as applicable to this course. (Not required in the syllabus, but is a convenient way to publicize this.) Link to PDF summary of grading policy for "C":

[http://www.uaf.edu/files/uafgov/Info-to-Publicize-C\\_Grading-Policy-UPDATED-May-2013.pdf](http://www.uaf.edu/files/uafgov/Info-to-Publicize-C_Grading-Policy-UPDATED-May-2013.pdf)

##### **11. Support Services:**

☐ Describe the student support services such as tutoring (local and/or regional) appropriate for the course.

**12. Disabilities Services:** Note that the phone# and location have been **updated**. <http://www.uaf.edu/disability/> The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials.

☐ State that you will work with the Office of Disabilities Services (208 WHITAKER BLDG, 474-5655) to provide reasonable accommodation to students with disabilities.

5/21/2013



**CE 443**  
**Air Pollution Management (3 credits)**

<b>Instructor</b>	Dr. Srijan Aggarwal, Ph.D., Assistant Professor Department of Civil and Environmental Engineering Email: <a href="mailto:saggarwal@alaska.edu">saggarwal@alaska.edu</a> Office: Duckering 271, Tel: 907-747-6120
<b>Class meeting time</b>	Tuesday and Thursday 11:30 am – 1 pm
<b>Class location</b>	<b>Duckering 345</b>
<b>Office hours</b>	M, W, F: 2:00 PM -3:00 PM
<b>Prerequisites</b>	Required: CHEM 106X or equivalent; Recommended: MATH F201X; graduate standing or permission of instructor.
<b>Textbook</b>	<b>Required Text</b> <i>Atmospheric Pollution: History, Science and Regulation</i> , M.Z. Jacobson. Cambridge University Press, 2002. (Required textbook).  <b>Recommended Texts</b> <i>Atmospheric Chemistry and Physics: From Air Pollution to Climate Change</i> (2 <sup>nd</sup> ed), J. H. Seinfeld and S. N. Pandis. Wiley-Interscience, 2006. A detailed, scholarly text and reference manual.  <i>Air Pollution Engineering Manual</i> (2 <sup>nd</sup> ed), W.T. Davis (editor). Wiley-Interscience, 2000. Useful overview for practitioners; discusses issues and controls for many sectors.  Other reading material in the form of <b>scientific journal articles</b> , which will be electronically made available through UAF library and provided on Blackboard.
<b>Course description</b>	<i>...In December 1952, a cold fog descended upon London. Because of the cold, Londoners began to burn more coal than usual. The resulting air pollution was trapped by the inversion layer formed by the dense mass of cold air. Concentrations of pollutants, coal smoke in particular, built up dramatically... The "fog", or smog, was so thick that driving became difficult or impossible. During the 4-day period of fog, at least 4,000 people died as a direct result of the weather [and air pollution].</i> [From: <a href="http://en.wikipedia.org/wiki/Air_pollution_in_the_United_Kingdom">http://en.wikipedia.org/wiki/Air_pollution_in_the_United_Kingdom</a> , accessed 3Mar2015].  As the events in London almost 60 years ago show, implementing proper pollution controls and understanding pollutant dispersion are keys to protecting both the health and welfare of the world's people. This course will aim to give an introduction to the concepts of Air Pollution Management and impart the importance of air quality in everyday life.  <b>Catalog description.</b> Air pollution topics including the quantity and quality of atmospheric emissions and their effects on the human environment. Identification and location of sources, measurement of quality and conformance with standards.

Legal considerations of Clean Air Act and Amendments and local regulations. Evaluation of stationary and moving sources. Meteorology and modeling requirements. Control mechanisms for gases and particulates.

### Course Goals

This course helps the students with :

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to identify, formulate, and solve engineering problems.
- A recognition of the need for, and an ability to engage in life-long learning.
- An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

### Student Learning Outcomes

- Understand the chemistry and physics behind air pollution
- Apply mathematical principles to air pollution modeling
- Become familiar with regulations in air quality field
- Learn techniques for air quality assessment and control
- Develop skills in reading and criticism of primary scientific literature
- Develop literature research, writing and oral presentation skills

### Instructional methods

Lectures with supporting reading from textbooks and primary scientific literature will form the knowledge base of the course. Relevant journal articles will be assigned for critical group discussion.

### Evaluation/Grading Policy

Homeworks.....	25%
Quizzes and Class Participation.....	15%
Midterm Exam .....	30%
Final Exam .....	30%

Final grades will be awarded according to the following scale:

95-100 **A**; 90- <95 **A-**; 85 - <90 **B+**; 80 - <85 **B**; 75-<80 **B-**;  
70 - <75 **C+**; 65 - <70 **C**; 55-<65 **D**; <55 **F**

Either the weighted percentages or a curve maybe used, whichever gives best grades.

### Course Policies

1. **Academic integrity.** Each student must become aware of UAF's policy on academic integrity as detailed in the *Student Code of Conduct*, p. 50 of the 2014-2015 catalog. The **FIRST** violation of the student code will result in immediate failure of the course and/or disciplinary action as per UAF policy.
2. **Communication.** Outside of scheduled lectures and office hours, email is the official form of communication. When sending a message to the instructor, please use CE443 in the subject line. Students are expected to check their UAF email accounts for course updates. In addition, UAF Blackboard will be used for general announcements, distribution of course materials and posting of grades.



3. **Exams.** One mid-term exam and a final will be given during the semester. Each will be designed to test your understanding of critical concepts and your ability to solve problems. Exams are closed book/closed notes, however you may use a **single** 8.5" by 11" cheat sheet of your own creation.
4. **Quizzes.** Six to eight quizzes (open book and notes) will be conducted during the course of the semester. Best five quizzes will be considered for the final grade. No make-up quizzes.
5. **Homeworks.** Regular homework problems will be assigned throughout the semester (see course calendar). Homework assignments are due at the 5:00 PM on the due date. Late homework will **NOT** be accepted without prior approval from the professor.
6. **Make up exams:** Exams must be taken on the scheduled dates (see the course schedule in the end) and in general there will be no makeup exams. Makeups will be given only under extreme circumstances. It is expected that the student will contact the instructor sufficiently in advance of an exam or have sufficient reason that they could not do so. Valid reasons include severe sickness (attested by physician's certificate), bereavement, or travel on university business (a letter in advance from the supervisor or responsible official).
7. **Absence.** If you are absent from any class it is your responsibility to inform yourself about the class material or any announcements. If you miss a quiz or homework you receive a "zero grade", except when you have made arrangements beforehand for reasons as stated above.
8. **Attendance.** Class attendance at all lectures is **required** and will be monitored. The professor reserves the right to adjust final grades up or down based on a student's course participation. You are welcome to ask questions in class or during office hours. Class participation and discussion makes the course lively and interesting for everyone.
9. **Homework Format:** It is imperative that engineering work be well organized and neatly presented in order to convey the desired information to peers, clients, and other interested parties in a clear, logical manner. Developing these skills of written communication is critical to career development. Pay close attention to these while submitting homework and exams.
10. **Incomplete.** An "incomplete" will not be given unless severe illness, family tragedy, or a sudden transfer is involved. A written explanation and the completion of the appropriate UAF paperwork must be submitted in all cases..
11. **Disabilities.** If you have specific physical, psychiatric or learning disabilities and require reasonable accommodations, please let me know early in the semester so that your learning needs may be appropriately met. You will need to provide documentation of your disability to 'Disability Services' in room 208 of the Whitaker Building and request a letter of accommodation.

Tentative schedule is as below:

Theme	Lecture	Topics Covered	Readings (APHSR)	Other readings
<b>Introduction</b>	1	Introduction to Air Pollution; Course overview	Preface, 1.1, 1.2, 1.5, 1.6, 2.2; Ch , Ch8.4.1	AQ for GPs. Hardin, <i>Tragedy of the commons</i>
	2	Unit conversions, mass balance, characteristic lifetimes		
	3	Regulation : Clean Air Act (HW#1)		
	4	How are we doing ?		
<b>Air pollution and health</b>	5	Epidemiology & toxicology	Class handouts	Brunekreef and Holgate et al. <i>Air Pollution and Health</i> Pope et al. <i>Lung Cancer ...</i>
	6	Epidemiology & toxicology		
	7	Intake fraction (HW#2)		
<b>Combustion</b>	8	Stoichiometry	Ch 1.3	Smith, <i>In prise of petroleum ?</i>
	9	Fuels		
	10	Emissions: classifications and controls		
	11	Emission controls (HW#3)		
<b>Particulate matter</b>	12	PM :Size distributions	Ch 5	Pope and Dockery, <i>Health effects of fine particulate air pollution: lines that connect</i>
	13	Secondary formation; Cogaulation & deposition		
	14	Particle removal technologies (HW#4)		
	15	<b>Midterm Examination</b>		
<b>Atmospheric chemistry : Ozone</b>	16	Chemical kinetics	1.4; 4.2-4.5	
	17	Ozone reduction (EKMA)		
	18	Ozone reduction (EKMA) (HW#5)		
<b>Modeling</b>	19	Meteorology; stability	6.6-6.8	
	20	Gaussian plume		
	21	Urban airshed models (HW#6)		
<b>Measurement methods</b>	22	Particulate matter		
	23	Other Pollutants		
	24	Source apportionment (HW#7)		
<b>Global warming</b>	25	Science of warming	2.2, Ch12.	IPCC, Summary for Policymakers Pacala & Socolow, <i>Stabilization Wedges</i>
	26	IPCC; Wedges		
	27	Prediction; impulse response (HW#8)		
	28	Student presentations		
		<b>Final Examination - 2 hrs.</b>		

**ENVE 643**  
**Air Pollution Management (3 credits)**

<b>Instructor</b>	Dr. Srijan Aggarwal, Ph.D., Assistant Professor Department of Civil and Environmental Engineering Email: saggarwal@alaska.edu Office: Duckering 271, Tel: 907-747-6120
<b>Class meeting time</b>	Tuesday and Thursday 11:30 am – 1 pm
<b>Class location</b>	<b>Duckering 345</b>
<b>Office hours</b>	M, W, F: 2:00 PM -3:00 PM
<b>Prerequisites</b>	Required: CHEM 106X or equivalent; Recommended: MATH F201X; graduate standing or permission of instructor.
<b>Textbook</b>	<b>Required Text</b> <i>Atmospheric Pollution: History, Science and Regulation</i> , M.Z. Jacobson. Cambridge University Press, 2002. (Required textbook).  <b>Recommended Texts</b> <i>Atmospheric Chemistry and Physics: From Air Pollution to Climate Change</i> (2 <sup>nd</sup> ed), J. H. Seinfeld and S. N. Pandis. Wiley-Interscience, 2006. A detailed, scholarly text and reference manual.  <i>Air Pollution Engineering Manual</i> (2 <sup>nd</sup> ed), W.T. Davis (editor). Wiley-Interscience, 2000. Useful overview for practitioners; discusses issues and controls for many sectors.  Other reading material in the form of <b>scientific journal articles</b> , which will be electronically made available through UAF library and provided on Blackboard.
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### Course Goals

This course helps the students with :

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to identify, formulate, and solve engineering problems.
- A recognition of the need for, and an ability to engage in life-long learning.
- An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

### Student Learning Outcomes

- Understand the chemistry and physics behind air pollution
- Apply mathematical principles to air pollution modeling
- Become familiar with regulations in air quality field
- Learn techniques for air quality assessment and control
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- Develop literature research, writing and oral presentation skills

### Instructional methods

Lectures with supporting reading from textbooks and primary scientific literature will form the knowledge base of the course. Relevant journal articles will be assigned for critical group discussion.

### Evaluation/Grading Policy

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Quizzes and Class Participation.....	10%
Journal article discussion.....	10%
Midterm Exam .....	20%
Course project.....	20%
Final Exam .....	20%

Final grades will be awarded according to the following scale:

95-100 **A**; 90- <95 **A-**; 85 - <90 **B+**; 80 - <85 **B**; 75-<80 **B-**;  
70 - <75 **C+**; 65 - <70 **C**; 55-<65 **D**; <55 **F**

Either the weighted percentages or a curve maybe used, whichever gives best grades.

### Course Policies

1. **Academic integrity.** Each student must become aware of UAF's policy on academic integrity as detailed in the *Student Code of Conduct*, p. 50 of the 2014-2015 catalog. The FIRST violation of the student code will result in immediate failure of the course and/or disciplinary action as per UAF policy.
2. **Communication.** Outside of scheduled lectures and office hours, email is the official form of communication. When sending a message to the instructor, please use ENVE643 in the subject line. Students are expected to check their UAF email accounts for course updates. In addition, UAF

Blackboard will be used for general announcements, distribution of course materials and posting of grades.

3. **Exams.** One mid-term exam and a final will be given during the semester (see course calendar). Each will be designed to test your understanding of critical concepts and your ability to solve problems. Exams are closed book/closed notes, however you may use a **single** 8.5" by 11" cheat sheet of your own creation.
4. **Quizzes.** Six to eight quizzes (open book and notes) will be conducted during the course of the semester. Best five quizzes will be considered for the final grade. No make-up quizzes.
5. **Homeworks.** Regular homework problems will be assigned throughout the semester (see course calendar). Homework assignments are due at the 5:00 PM on the due date. Late homework will **NOT** be accepted without prior approval from the professor.
6. **Make up exams:** Exams must be taken on the assigned dates (see course calendar) and in general there will be no makeup exams. Makeups will be given only under extreme circumstances. It is expected that the student will contact the instructor sufficiently in advance of an exam or have sufficient reason that they could not do so. Valid reasons include severe sickness (attested by physician's certificate), bereavement, or travel on university business (a letter in advance from the supervisor or responsible official).
7. **Absence.** If you are absent from any class it is your responsibility to inform yourself about the class material or any announcements. If you miss a quiz or homework you receive a "zero grade", except when you have made arrangements beforehand for reasons as stated above.
8. **Attendance.** Class attendance at all lectures is **required** and will be monitored. The professor reserves the right to adjust final grades up or down based on a student's course participation. You are welcome to ask questions in class or during office hours. Class participation and discussion makes the course lively and interesting for everyone.
9. **Homework Format:** It is imperative that engineering work be well organized and neatly presented in order to convey the desired information to peers, clients, and other interested parties in a clear, logical manner. Developing these skills of written communication is critical to career development. Pay close attention to these while submitting homework and exams.
10. **Journal Article Discussion.** Articles from scientific air pollution literature will be assigned to each student, and a class discussion will be led by the student on his/her assigned paper on a pre-decided date.
11. **Course Project.** The course includes a project, evaluated in the form of an oral presentation at the end of the semester. Students may work in groups of up to 2 people. Projects must have a clear research question or problem statement, and then provide quantitative analysis addressing that question. Presentation will approximately be 10 minutes. Each student will provide an evaluation of the contribution of other students in his or her group and of the quality of other group's projects.

**Deadline for group projects:**

1. March 1 – By class time, decide groups and topics.
  2. April 1 – By 5:00 PM, turn in a sheet with project title and a half page summary of proposed research question and analysis approach.
  3. Group presentations will occur approximately during the last two weeks of classes; the exact date will be selected later in the semester.
12. **Incomplete.** An "incomplete" will not be given unless severe illness, family tragedy, or a sudden transfer is involved. A written explanation and the completion of the appropriate UAF paperwork must be submitted in all cases.

**13. Disabilities.** If you have specific physical, psychiatric or learning disabilities and require reasonable accommodations, please let me know early in the semester so that your learning needs may be appropriately met. You will need to provide documentation of your disability to 'Disability Services' in room 208 of the Whitaker Building and request a letter of accommodation.

**Tentative course calendar is as below:**

Theme	Lecture	Topics Covered	Readings (APHSR)	Other readings
<b>Introduction</b>	1	Introduction to Air Pollution; Course overview	Preface, 1.1, 1.2, 1.5, 1.6, 2.2; Ch , Ch8.4.1	AQ for GPs. Hardin, <i>Tragedy of the commons</i>
	2	Unit conversions, mass balance, characteristic lifetimes		
	3	Regulation : Clean Air Act (HW#1)		
	4	How are we doing ?		
<b>Air pollution and health</b>	5	Epidemiology & toxicology	Class handouts	Brunekreef and Holgate et al. <i>Air Pollution and Health</i> Pope et al. <i>Lung Cancer ...</i>
	6	Epidemiology & toxicology		
	7	Intake fraction (HW#2)		
<b>Combustion</b>	8	Stoichiometry	Ch 1.3	Smith, <i>In prise of petroleum ?</i>
	9	Fuels		
	10	Emissions: classifications and controls		
	11	Emission controls (HW#3)		
<b>Particulate matter</b>	12	PM :Size distributions	Ch 5	Pope and Dockery, <i>Health effects of fine particulate air pollution: lines that connect</i>
	13	Secondary formation; Cogaulation & deposition		
	14	Particle removal technologies (HW#4)		
	15	<b>Midterm Examination</b>		
<b>Atmospheric chemistry : Ozone</b>	16	Chemical kinetics	1.4; 4.2-4.5	
	17	Ozone reduction (EKMA)		
	18	Ozone reduction (EKMA) (HW#5)		
<b>Modeling</b>	19	Meteorology; stability	6.6-6.8	
	20	Gaussian plume		
	21	Urban airshed models (HW#6)		
<b>Measurement methods</b>	22	Particulate matter		
	23	Other Pollutants		
	24	Source apportionment (HW#7)		
<b>Global warming</b>	25	Science of warming	2.2, Ch12.	IPCC, Summary for Policymakers Pacala & Socolow, <i>Stabilization Wedges</i>
	26	IPCC; Wedges		
	27	Prediction; impulse response (HW#8)		
	28	Student presentations		
		<b>Final Examination - 2 hrs.</b>		