Course Syllabus
ATM5200/CH6800/CH4800: Special Topics in Atmospheric Sciences
The Chemistry of Aerosols and Hydrometeors
College of Science and Arts
Spring 2012

Instructor Information
Instructor: Lynn R. Mazzoleni, Ph.D., Assistant Professor of Chemistry
Office Location: 402d Chemical Sciences Building
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Office Hours: MWR 10:15 to 11:15 OR By Appointment

Course Identification
Course Number: ATM 5200-01; CH 6800-01; and CH 4800-01
Course Name: Special Topics in Atmospheric Sciences: The Chemistry of Aerosols and Hydrometeors
Course Location: Fisher 101
Class Times: MWF 9:05 to 9:55
Prerequisite: Graduate Standing or Instructor Permission

Course Description/Overview
The focus of this special topics course will be the chemistry of atmospheric aerosols and hydrometeors (clouds, fogs, and rain). Students will learn about the sampling and analytical methods for chemical characterization of aerosols and hydrometeors. The chemical composition of primary and secondary aerosol will be discussed, with a special focus on secondary organic aerosol formation. The course includes heterogeneous and aqueous chemical reactions pertinent to secondary aerosol and hydrometeor composition questions.

Course Learning Objectives

- Describe the methods of observation for organic aerosol.
- Differentiate and describe the major types of atmospheric aerosols and their sources.
- Understand the properties of atmospheric aerosol and their role in the global atmosphere.
- Describe the chemistry of the atmospheric aqueous phase.
- Write a formal literature review paper.
- Present a formal presentation of the literature review.
**Course Resources**

**Required Course Textbook**
*Carbonaceous Aerosol*, (c) 2004 by Andras Gelencser – This book is available in PDF format on the Blackboard.

**Recommended Course Textbook**
*Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, (c) 2006 by John H. Seinfeld and Spyros N. Pandis – This book will be held on reserve in the Library.

**Course Website:** [Blackboard](http://www.courses.mtu.edu)

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**Grading**

**Total Available Points**

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm exams (3 @ 50 points each)</td>
<td>150</td>
</tr>
<tr>
<td>Final Exam</td>
<td>100</td>
</tr>
<tr>
<td>Paper/Presentation</td>
<td>100</td>
</tr>
<tr>
<td>Homework/Participation</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total Points</strong></td>
<td>400</td>
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**Late Assignments**

No make-up exams will be given for unexcused absences. Official MTU excused absences are granted by the Office of Student Affairs (OSA). If you know that you will have an excusable absence on an exam day, you are required to make arrangements with me as soon as possible for an alternate exam date.

Late homework assignments will be penalized by 10% per day (5 pm).

**Exam Schedule**

- Midterm Exam #1: Friday, February 3rd
- Midterm Exam #2: Friday, March 2nd
- Midterm Exam #3: Friday, April 6th
- Final Exam: During Finals Week TBA

**Individual Paper/Presentation will be due April 16th**

**Course Schedule**

- **Week 1: Introduction and Background**
  - Syllabus
  - Handouts (Chapman Cycle, \( \text{O}_3/\text{OH}^\cdot \) Sources, Alkane Oxidation, NOx)
- **Week 2: Methods of Observation**
  - Chapter 2 in Carbonaceous Aerosol
- **Week 3-4: Organic Aerosol Composition**
• Chapter 3 in Carbonaceous Aerosol
  o Poschl, Angewandte Chemie Int. Ed., 2005
  o Exam #1

  • **Week 5: Secondary Organic Aerosol from Terpenes**
    o Kroll and Seinfeld, Atmos. Env., 2008

  • **Week 6: Secondary Organic Aerosol from Isoprene**
    o Carlton *et al.*, Atmos. Chem. Phys., 2009
    o Selections from Halliquist *et al.*, Atmos. Chem. Phys., 2009

  • **Week 7: Fundamental Aqueous Chemistry**
    o Selections from Seinfeld and Pandis Chapter 6
      ² Aqueous oxidants (OH·, O₃, H₂O₂)
      ² Sulfur oxidation

  • **Week 8: Aqueous Secondary Organic Aerosol from OH·**
    o Tan *et al.*, Atmos. Env., 2010
    o Liu, Y. *et al.*, Atmos. Chem. Phys., 2009
    o Exam #2

  • **Week 9-10: Aqueous Aerosol Chemistry**
    o Shapiro *et al.*, Atmos. Chem. Phys., 2009
    o Yasmeen *et al.*, Atmos. Chem. Phys., 2010
    o Ervens *et al.*, Atmos. Chem. Phys., 2011

  • **Week 11: Humic-like Substances**
    o Chapter 4 in Carbonaceous Aerosol
    o Graber and Rudich, Atmos. Chem. Phys., 2006

  • **Week 12-13: Aerosol Properties and Aerosol-Cloud Interactions**
    o Chapter 5 in Carbonaceous Aerosol
    o Duplissy *et al.*, Atmos. Chem. Phys., 2011
    o Chang *et al.*, Atmos. Chem. Phys., 2010
    o Exam #3

  • **Week 14: Paper/Presentations**
  • **Week 15: Final Exam**

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**Collaboration/Plagiarism**

Standards of academic conduct are set forth in the MTU Academic Integrity Code [http://www.studentaffairs.mtu.edu/dean/judicial/policies/academic_integrity.html](http://www.studentaffairs.mtu.edu/dean/judicial/policies/academic_integrity.html). When you registered for this course, you acknowledged your awareness of the Academic Integrity Code and you are obliged to become familiar with your rights and responsibilities as defined by this Code. Violations of the Code will result in disciplinary actions. Examples of violations include plagiarism or receiving inappropriate assistance on homework, quizzes, and/or exams.
Plagiarism is an act of theft of intellectual property and thus is a serious offense of the Academic Integrity Code. Using or closely imitating the ideas/concepts of others without proper citation is a form of plagiarism. Another often misunderstood but important form of plagiarism is the use or incorporation of many of the words or concepts from a source(s) that it/they make(s) up the majority of your work, whether or not it/they are cited.

Cheating is a very serious academic offense. Therefore, allegations of cheating will be referred to the Dean of Student Affairs for appropriate action. Please see me if you have any questions about academic violations as described in the Code or as they relate to particular requirements in this course.

Cell phones, Blackberries, iPods, PDAs, Laptops or any other electronic devices are not to be used in the classroom. Please make sure to bring a standard calculator with you to class. Calculators on other electronic devices are strictly prohibited. Information exchanges on these devices during class are also prohibited and violate the Academic Integrity Code of Michigan Tech.

University Policies

If you have a disability that could affect your performance in this class or that requires an accommodation under the Americans with Disabilities Act, please see me as soon as possible so that we can make appropriate arrangements. The Affirmative Action Office has asked that you be made aware of the following:

Michigan Tech complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act of 1990. If you have a disability and need a reasonable accommodation for equal access to education or services at Michigan Tech, please call the Dean of Students Office, at 487-2212. For other concerns about discrimination, you may contact your advisor, department head or the Affirmative Action Office, at 487-3310.

Academic Integrity:
http://www.studentaffairs.mtu.edu/dean/judicial/policies/academic_integrity.html

Affirmative Action:
http://www.admin.mtu.edu/aaoo/

Disability Services:
http://www.admin.mtu.edu/urel/studenthandbook/student_services.html#disability

Equal Opportunity Statement: