CHE 265—Atmospheric Chemistry
Spring quarter, 2010

Logistics
Dr. Mark Potosnak
McGowan South 203F, Lincoln Park Campus
Office hours: Monday & Wednesday 9:30–10:30 am or by appointment

Textbook (required): Chemistry of the Upper and Lower Atmosphere, Finlayson-Pitts & Pitts, 2000
ISBN: 978-0-12-257060-5 (new style); 0-12-257060-X (old style)

Course overview
Atmospheric chemistry is a fascinating subject that exemplifies the concept of interdisciplinary science. First while of course the topic requires a knowledge of chemistry (physical and organic), crucial insights are provided by physics, meteorology, earth system science and even biology. Of the four great Earth sphere (others are the hydrosphere, lithosphere, and biosphere), the atmosphere is smallest in mass but has the quickest cycling and exchanges of matter and energy. The properties of small mass and rapid mixing lead to the second facet of interdisciplinary science: the atmosphere is the sphere that is most easily polluted by human activities. The course will focus on teaching the basics of atmospheric chemistry, but the concepts of systems and human influences on the environment will be constantly invoked. For example, we will cover the greenhouse effect, which is more properly an aspect of atmospheric physics, but which interacts in multiple ways with the chemistry of the Earth’s atmosphere.

Course philosophy
We will strive to have an interactive discussion on the topics addressed in this class. Science is difficult to learn passively—classroom participation promotes active learning. Student learning is the focus of this class, and I expect student participation and feedback in reaching the objectives of the course. Students will be encouraged to provide both formal and informal feedback throughout the semester on course direction, topics and teaching methodology. Also, helpful criticism is always appreciated via email, office hours and after class.

Policies
Academic Integrity: According to the DePaul University Student Handbook, “Violations of academic integrity include but are not limited to the following categories: cheating; plagiarism; fabrication; falsification or sabotage of research data; destruction or misuse of the university's academic resources, alteration or falsification of academic records; academic misconduct; and complicity.” The Handbook also states that, “If an instructor finds that a student has violated the Academic Integrity Policy, the appropriate initial sanction is at the instructor's discretion.” To support this policy, your assignments may be submitted to the website turnitin.com. For more information, definitions, and examples, see DePaul University's Academic Integrity website at http://academicintegrity.depaul.edu.
**Quizzes:** On Monday, the class will start with a short quiz (approximately 3–4 questions/10 minutes) based on assigned reading (the textbook material being covered that week). Completion of this quiz will also count as attendance for that class.

**Blackboard:** In an effort to reduce paper usage, all class materials and grades will be available on the Blackboard site. I will post all lectures on the Blackboard site within 24 hours after the class.

**Attendance:** Attendance is required for all classes. Students will be allowed to miss two classes without penalty during the quarter. This should cover all ‘routine’ absences such as colds, doctor appointments, competitions, etc. Further excused absences will only be granted in exceptional circumstances with appropriate documentation. After the first two absences, 0.5 points for each missed class will be taken off your final grade. If you miss a Monday quiz, you must email me and I will give you an alternate assignment which is due the following Monday (only for your two excused absences). Exams must be taken at the scheduled time. Any exceptions to this policy must be arranged in advance.

**Late assignments:** All problem sets and the laboratory project are due 5pm in my mail box in Environmental Science (McGowan South 203). Late assignments will receive a 10% per day grade penalty (i.e., within 24 hours = -10%, within 48 hours -20%, etc.).

**Problem sets**
Based on the week’s lecture topics, there will be a problem set due on Friday at 5pm. The problem sets will both reinforce lecture material and also ask you to think creatively to extend your knowledge as scientists.

**Grading**
Grades in this class will be determined on the following scale:

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<tr>
<td>A</td>
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<td>B+</td>
<td>B</td>
<td>B-</td>
<td>C+</td>
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<td>C-</td>
<td>D+</td>
<td>D</td>
<td>F</td>
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I may change these grade boundaries, but this will always be in favor of the students and will be applied uniformly to the entire class. Grades will be determined from the individual components of the course by the following allocation:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Final exam</td>
<td>25%</td>
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<tr>
<td>Midterm exam</td>
<td>20%</td>
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<tr>
<td>Homework</td>
<td>15%</td>
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<tr>
<td>Lab project</td>
<td>25%</td>
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<tr>
<td>Quizzes /Attendance</td>
<td>15%</td>
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**Sources of help**
If you think you may have special learning needs, please feel free to see me as soon as possible, and every effort will be made to reasonably accommodate your needs.

- **PLuS Program:** for students with learning disabilities and/or attention deficit disorders
- **Writing Center:** for students who need help with writing
- **OSD:** for students with physical disabilities
- **Dean of Students:** accommodations with health or family emergencies
Learning objectives
Students will understand:

- The role of the atmosphere as a link between the biosphere, hydrosphere and lithosphere
  - How the evolution of the Earth’s atmosphere was affected by these other spheres and the location of the Earth within our Solar System
  - The complex interactions between the atmosphere and the biosphere, with special attention to the chemically reactive species emitted by plants
  - How human activities (particularly the combustion of fossil fuels) have directly and indirectly perturbed these natural cycles and the concomitant negative consequences

- That atmospheric chemistry depends strongly on physical conditions
  - The physical state of the atmosphere (temperature, pressure and density)
  - Horizontal transport (dynamics) and vertical stability
  - Radiation from the sun (infrared, visible and ultraviolet)

- The basic scientific concepts behind the following environmental problems
  - Carbon monoxide and other direct contaminants
  - Acid rain
  - Tropospheric ozone pollution
  - Stratospheric ozone depletion
  - Global climate change driven by the release of greenhouse gases

- How scientists perform experimental research in the earth sciences
  - Hypothesis testing without controls
  - Technical aspects of experimental design
  - Data mining
# Syllabus

<table>
<thead>
<tr>
<th>Week—Dates</th>
<th>Topic</th>
<th>Reading/quiz (due Mon)</th>
<th>Problem set (due Fri)</th>
<th>Notes</th>
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<tbody>
<tr>
<td>1—Mar 29–31</td>
<td>Intro/overview</td>
<td>Chapter 1</td>
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<td>No quiz</td>
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<td>2—Apr 5–7</td>
<td>Meteorology Vertical motions</td>
<td>Chapter 2</td>
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<td>Problem set due Thu (5pm)</td>
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<td>3—Apr 12–14</td>
<td>Spectroscopy</td>
<td>Chapter 3</td>
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<td>4—Apr 19–21</td>
<td>Photochemistry</td>
<td>Chapter 4</td>
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<td>5—Apr 26–28</td>
<td>Kinetics</td>
<td>Chapter 5</td>
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<td>6—May 3–5</td>
<td>Organic chemistry</td>
<td>Chapter 6</td>
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<td>Midterm (5/3)</td>
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<td>7—May 10–12</td>
<td>Inorganic nitrogen and acid deposition</td>
<td>Chapter 7, 8</td>
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<td>8—May 17–19</td>
<td>Stratospheric ozone</td>
<td>Chapter 12, 13</td>
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<td>9—May 24–26</td>
<td>Global climate change</td>
<td>Chapter 14</td>
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<td>10—May 31–Jun 2</td>
<td>Project presentations</td>
<td>Lab project</td>
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The above schedule is a framework, and changes will be communicated in class and via the Blackboard site.

**Class times**: Monday & Wednesday 8:00–9:30 am  
**Class location**: McGowan South room 107  
**Final exam**: Wednesday, June 9, 8:45–11:00 am