Spring 2014

Stony Brook University
School of Marine and Atmospheric Sciences

ATM 397 Air Pollution and its Control
This course satisfies the ATM requirement
This course satisfies the SBC category STEM+, GLO

Course Instructor: Sultan Hameed
Office Hours: Endeavour 125 Thursday 4-5 pm, or by appointment
Sultan.hameed@stonybrook.edu

Teaching Assistant: Ms. Ling Liu, 147 Discovery Hall
Office Hours Tuesday 1:30-2:30 pm
Ling.liu@stonybrook.edu

COURSE DESCRIPTION:
A detailed introduction to the causes, effects, and control of air pollution. The pollutants discussed include carbon monoxide, sulfur oxides, nitrogen oxides, ozone, hydrocarbons, and particulate matter. The emissions of these gases from natural and industrial sources and the principles used for controlling the latter are described. The chemical and physical transformations of the pollutants in the atmosphere are investigated and the phenomena of urban smog and acid rain are discussed.

This information will lead to formulate proper regulatory control mechanisms. The health impact of primary and secondary air pollutants will be assessed. We will discuss the causes and consequences of the stratospheric ozone hole. The natural greenhouse effect will be introduced and our current understanding of global warming will be addressed.

Course Pre/co-requisites
ENS/PHY 119 or PHY 132/134 or 142, or PHY 126 and 127, or PHY 125 and 127; CHE 131 or 141 or 198; MAT 125 or 131 or 141 or AMS 151; U3 or U4 standing

COURSE LEARNING OBJECTIVES:

- Understand the sources, atmospheric reactions and health effects of major pollutants in the atmosphere.
- Detailed study of carbon monoxide, sulfur oxides, nitrogen oxides, ozone, hydrocarbons, and particulate matter
- Learn the physics and chemistry of global stratospheric ozone reduction
- Understand key aspects of the Clean Air Act and international regulation of urban smog.
- Analyze costs-benefits and resource availability for clean energy solutions for air pollution and global warming.

COURSE REQUIREMENTS:

Attendance and Make Up Policy
Weekly homework is collected every Tuesday. 20% of the grade per day will be deducted for late submissions of homework, in the absence of a medical or personal certificate related to illness or emergency.

**Required Text**  

**Exams**  
There will be a midterm exam on March 13.  
The Final Exam will be in the assigned time during the Final Exam week.

**GRADING:**  
There will be weekly homework-assignments. The homework-assignments are collected in class on Tuesday. The instructor or TA should be notified in advance if submission deadline cannot be met due to illness or other serious personal issues.

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Midterm</td>
<td>30%</td>
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<tr>
<td>Final Exam</td>
<td>30%</td>
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<tr>
<td>Weekly Homework</td>
<td>40%</td>
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**Extra Credit**  
Students can earn extra credit by studying one or more of the following books related to the class:

1) The Revenge of Gaia: Earth’s Climate Crisis and the Fate of Humanity by James Lovelock  
2) The Secret Life of dust by Hannah Holmes  
3) Cool It: The Skeptical Environmentalist’s Guide to Global Warming by Bjorn Lomborg

**Extra Credit Rules:**  
1) You will be given a multiple choice exam on the book you read. If you score 70% or better 0.33 will be added to your average. (Example: B=3.0 becomes B+=3.33)  
2) You can take the test twice for a particular book.  
3) You can earn credit for more than one book.  
4) Extra credit exams can be taken after the spring break and before the final exam.  
5) Please make an appointment with one of the TAs to take the extra credit exam.

**CLASS PROTOCOL**  
Cell Phone and electronic devices have to be turned off during classes.

**CLASS SCHEDULE**  
Jan 28: Class 1, Introduction, Chemical kinetics, Sections 1:3-1:6, Vertical structure of the atmosphere Sect 3.1-3.3  
Jan 30: Class 2: Equation of State Sect 3.4, Atmospheric composition Sect 3.5-3.6  
Feb 4: Class 3: Gas phase chemistry of the troposphere. Sect 4.2.  
Feb 6: Class 4: Chemistry of photochemical smog Sect. 4.3  
Feb 11: Class 5: Aerosol size distributions Sect 5.1; particle sources Sect 5.2  
Feb 13: Class 6: Processes affecting particle size Sect 5.3  
Feb 18: Class 7 Health effects of aerosols Sect 5.4; Meteorology and air pollution Sects 6.1-6.2  
Feb 20: Class 8: Vertical pollution transport Sect 6.6  
Feb 25: Class 9: Effects of Local Meteorology Sect 6.7  
Feb 27: Class 10: Solar radiation in the atmosphere Sect. 7.1  
Mar 4: Class 11: Visibility Sect 7.2; Colors in the Atmosphere Sect. 7.3  
Mar 6: Class 12: International Regulation of Urban Smog Chapter 8
Mar 11: Class 13: Indoor Air Pollution Chapter 9
Mar 13: Class 14: Midterm Exam
Mar 18-20: Spring Break
Mar 27: Class 16: Acid Deposition Chapter 10
Apr 1: Class 17: Recent changes in the ozone layer Sect 11.4-11.7
Apr 3: Class 18: Antarctic ozone hole Sect 11.8
Apr 8: Class 19: Natural greenhouse effect Sect 12.1
Apr 10: Class 20: Causes of global warming Sect 12.2
Apr 15: Class 21: Recent and historical temperature trends Sect 12.3
Apr 17: Class 22: Feedback effects in climate Sect 12.4
Apr 22: Class 23: Consequences of global warming Sect 12.5; Regulatory control of global warming Sect 12.6
Apr 24: Class 24 Watch and discuss the movie “Taken for a Ride”.
Apr 29: Class 25 Clean and sustainable energy systems Sect 13.1
May 1: Class 26: Wind, water and sunlight technologies Sect 13.2
May 6: Class 27: Estimation of world’s energy needs Sect 13.4-13.5
May 8: Class 28: Cost and Reliability of clean energy systems Sect 13-6-13.10

Blackboard
You can access class information, documents, and assignments on-line at: http://blackboard.sunysb.edu. You should be sure to consult it at least once a week; ideally, you would log on before every class. Blackboard will be used to post class-related announcements.

DISABILITY SUPPORT SERVICES (DSS) STATEMENT (must be the following language):
If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, room 128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

[In addition, this statement on emergency evacuation is often included, but not required:
Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: http://www.stonybrook.edu/ehs/fire/disabilities]

ACADEMIC INTEGRITY STATEMENT (must be the following language as approved by the undergrad council):
Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

CRITICAL INCIDENT MANAGEMENT (must be the following language as approved by the undergrad council):
Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.