Instructor, Course Information & Objectives

Advanced Academic Programs
Zanvyl Krieger School of Arts and Sciences
Johns Hopkins University

420.632 - Air Quality Management and Policy

Instructor Information
Instructor: Christa Hasenkopf
Telephone Number: (507) (246.2097)
Email Address: hasenkopf@jhu.edu
Office Hours: Mondays and Fridays, 12pm-1pm by Skype (empyrean0001) or arrange in advance for phone/other avenue.

Course Description
Understanding and mitigating air pollution, both indoor and outdoor, is of extreme importance to global health. Underscoring this, the World Health Organization released a statement in 2014 that in 2012, approximately 7 million people died - one in eight of total global deaths around the world – as a result of air pollution exposure. Air pollution also has a strong impact on climate change, in terms of its abilities to both exacerbate and reduce global warming.

This course provides an overview of the principles, effects, and policies regarding outdoor air quality with an emphasis on emerging international air quality issues, public health and environmental impacts of outdoor air pollution, and evolving ways to monitor air quality.

Prerequisite: 420.608 Oceanic and Atmospheric Processes, an equivalent course or experience, or approval of the instructor.

Course Goals & Learning Objectives
The goal of this course is to explore together an incredibly important but basic question: How can we effectively reduce air pollution around the world? We will do this by learning air pollution fundamental, exploring success stories and the many existing challenges around the world.

By the end of this course, you will be able to:
- Describe basics of the atmosphere and common pollutants, including their typical local and global sources and distributions.
- Describe typical and next-generation techniques for monitoring air pollution.
- Describe the impact of various types of air pollution, especially PM2.5 and ozone, on climate change and human health, how this knowledge evolves, and the existing gaps in our scientific understanding.
- Compare and contrast local and national-level 'pollution histories' of countries (e.g. U.S., U.K., Thailand, Mexico) that have successfully reduced air pollution.
- Compare and contrast current and proposed national-level mitigation and regulatory measures in countries experiencing a variety air pollution levels.
- Describe the role of international and non-governmental bodies in providing frameworks and technical assistance to countries' abilities to measure and regulate their air quality.
- Analyze the potential impact of next generation technologies local, national and international-level practices and air pollution policies.
Course Materials

Textbook

Module Readings
These are listed in the Syllabus and will additional pieces will be

Other online resources/references:
- Air quality guidelines and standards:
  - WHO Air Quality Guidelines
  - U.S. EPA National Ambient Air Quality Standards (NAAQS)
- More on air pollution and health:
  - Online reports on air quality and health at the Health Institute
  - Integrated Scientific Assessment of pollutants by the U.S. EPA
- Online air quality data:
  - WHO Outdoor Air Pollution Database - Annual average PM$_{2.5}$ and PM$_{10}$ data by city, global
  - openaq.org – Real-time and historical PM$_{2.5}$, PM$_{10}$, SO$_2$, CO, BC, O$_3$, and NO2 open data from 2015, viewable and downloadable from around the world (Full disclosure: this is my organization)

Specific Technology Requirements & Skills for this Course
Learning online requires some basic knowledge of computer technology. At a minimum, you need to be able to:
- Navigate in and use Blackboard; the Blackboard Student Orientation course on your “My Institution” page
- Create and save MS Word documents; see MS Word training and tutorials for PC users (all versions); Word Help for Mac users
- Find basic resources on the Internet
- Create and organize files & folders on your computer
- Send, receive, and manage email
# About the Course

## Course Topics

<table>
<thead>
<tr>
<th>Module</th>
<th>Topics</th>
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</table>
| Module 1 | • Introduction to the course: Motivation and course overview  
• Atmospheric basics (1/2): Make-up, transport and radiative balance |
| Module 2 | • Atmospheric basics (2/2): How to build the perfect setting for an ‘airpocalypse’  
• Common air pollutants: Chemical nature and sources |
| Module 3 | • How do you measure air pollution? Exploring the standard ways.  
• The (complicated) relationship between air pollution and climate change |
| Module 4 | • Health effects of air pollution: Focus on PM2.5 and mortality  
• An overview of seminal air pollution and health studies |
| Module 5 | • Exploring cutting-edge questions in air pollution and health science – where are the gaps?  
• How does new information on air pollution and health affect new health policies in the U.S.? |
| Module 6 | • Rewind back to the Clean Air Act, fast-forward to its impact today  
• Methods of measuring success (or failure) for air pollution mitigation policies |
| Module 7 | • Communicating air pollution to the public: one size doesn’t fit all  
• Case studies of non-U.S. places with pollution success stories from London to Bangkok |
| Module 8 | • Deep dive: China and India |
| Module 9 | • The global air pollution ‘airscape’ and efforts to measure air pollution with satellites, low-cost sensors, and big, open data |
| Module 10 | • Deep dive: Mongolia |
| Module 11 | • Deep dive: Air pollution in sub-Saharan Africa |
| Module 12 | • Transboundary air pollution issues and regional policymaking  
• Deep dive: Malaysian wildfires in 2015 |
| Module 13 | • International treaties on air quality and their impact  
• Air pollution as international development aid |
| Module 14 | • The role of international organizations in shaping global, national and local air pollution policies |
| Module 15 | • Putting all of the pieces together |

## Directions for Students

**Next Steps:** Carefully review the remaining sections of the syllabus before beginning the **Module 1** activities, which are located in the **Lessons** folder in your online course.

- Once you feel that you are ready to dive into the first module’s activities, click on the **Lessons** button on the left-side navigation menu. Then, click on **Module 1** to begin with the Introduction and Objectives.
What To Expect in this Course

This course is 15 weeks in length and includes individual, group, and whole group activities in a weekly/module cycle of instruction. Each module begins on a Monday and ends on the following Sunday. Please review the course syllabus thoroughly to learn about specific course outcomes and requirements.

For this course, there will be 3 synchronous events (Note: These are not required to attend but are highly recommended; links to these sessions will be posted on Blackboard after the event):

- Module 5: Online session with guest speaker (recorded session)
- Module 8: Online session with guest speaker (recorded session)
- Module 11: Online session with guest speaker (recorded session)
- Module 13: Online session with guest speaker (recorded session)

Each module, you will complete readings that may include videos, multimedia presentations, web-based resources, and articles from professional journals. A reading may be integrated within an activity during the module or provide some key information to assist your learning.

In this course, you may also experience online learning activities, which include discussion boards, synchronous sessions, group work, the use of Web 2.0 tools, and online multimedia presentations.

Be sure to refer to the Checklist each module, which provides a module-at-a-glance and shows targeted dates for the completion of activities.

Course Structure

The course is designed to start with concrete facts on air pollution (e.g. what is it, where does it come from, and how does it affect humans) to the complicated ways society has been learning to deal with it – from mitigation policies to public health communication. As the course progresses, guest speakers are brought in from particular subfields for the students to engage with on ‘deep dives’ into particular regions. Students are encouraged throughout the course to follow news on air pollution current events. I regularly post air quality items in the media on social media using the twitter handles: @sciencerely and #airinequality.
## Assessments and Grading Policy

<table>
<thead>
<tr>
<th>Assignments</th>
<th>Due Dates</th>
<th>Percentage of Total Grade</th>
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</thead>
<tbody>
<tr>
<td><strong>Module Re-Cap Quizzes</strong>&lt;br&gt;For Modules 3-12, there will be a short quiz each on the previous module’s material.</td>
<td>End of each module</td>
<td>10% total (1% each)</td>
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<tr>
<td><strong>Memo: Introducing You and Your Goals for Class</strong>&lt;br&gt;A brief memo introducing yourself and describing your motivation to take the course and personal goals you wish to obtain from the course. This will be posted on the Discussion Board as a regular post or video.</td>
<td>End of first module</td>
<td>5%</td>
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<td><strong>Air Pollution Basics Problem Set</strong>&lt;br&gt;A brief problem set applying fundamental concepts learned from the first two modules.</td>
<td>End of module 2</td>
<td>10%</td>
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<td><strong>Deep-Dive Memo: Part I</strong>&lt;br&gt;You will be selecting a location in which to do a ‘deep-dive’ on researching its existing air pollution levels, issues and mitigations strategies. You may pick a ‘success story’ or a place currently experiencing air pollution challenges.</td>
<td>End of module 5</td>
<td>15%</td>
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<td><strong>Deep-Dive Memo: Part II</strong>&lt;br&gt;You will take your deep-dive location and analyze its current (or past, if a ‘success’ story), ‘air pollution trajectory’, the factors influencing it, and make policy recommendations based on your analysis. Your results will be shared with the class.</td>
<td>End of module 9</td>
<td>15%</td>
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<td><strong>Final Project: Synthesis Paper</strong>&lt;br&gt;This project can focus on one on of two themes:&lt;br&gt;1) Synthesizing the previous ‘Deep-Dive’ projects of the class, develop a theory of common themes facing pollution-prone places, over-arching successful mitigations strategies and ‘conditions of success’.&lt;br&gt;2) Pick a topic of choice that explores the potential impact of new approaches on improving global air quality (e.g. international development, technologies or multilateral engagement).</td>
<td>End of module 14</td>
<td>20%</td>
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**Course Engagement**<br>You are expected to have an active presence in course discussions, and complete course activities as noted in the assignment guidelines to maximize your learning. Participation in activities should be consistent, of high quality, and reflect both a high level of academic thinking and your own personal perspectives, opinion, and ideas.  

**Total** | Continuous | 100%
Assessment Schedule:

- Initial Discussion Posts due by 11:59 PM Eastern Time on Wednesdays
- Module Quiz due by 11:59 PM Eastern Time on Wednesdays
- Response Discussion Posts due by 11:59 PM Eastern Time on Fridays
- Problem Sets, Memos, Deep Dive and Final Synthesis Papers due by 11:59 PM Eastern Time on Sundays

Grading

- **Quizzes and the Problem Set:** These will be multiple choice and short answer, and graded simply on correct/incorrect answers, with partial credit offered when applicable.
- **Memos and Synthesis Paper:** These will be graded according to a rubric shared with students in the module during which the assignment is introduced.
- **Late Policy:** Work received late will be reduced by 50% of the total score.
- **Extra Credit:** No extra credit will be given in this course.

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<tr>
<th>Letter Grade</th>
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<td>A+</td>
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<td>94% and less than 98%</td>
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<td>A-</td>
<td>90% and less than 94%</td>
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<td>B+</td>
<td>88% and less than 90%</td>
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<td>B</td>
<td>84% and less than 88%</td>
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<td>B-</td>
<td>80% and less than 84%</td>
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<tr>
<td>C</td>
<td>70% and less than 80%</td>
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<tr>
<td>F</td>
<td>0% and less than 70%</td>
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Assignment Guidelines

**How should assignments be submitted?**

Each module’s directions will indicate where assignments will be posted (e.g. to an assignment submission link within the Lessons area) and any other special requirements. If submitting documents for an assignment or discussion forum, please specify the assignment name in the document title and/or the discussion thread. When creating files, include your name and the name of the assignment in the file title. Also, please be sure to only include one period in file names. The period should be between the file name and the extension. For example: CHasenkopf_assignment1.doc

**When will assignments be due?**

Assignment and activity due dates are listed in this syllabus and the module checklists. The instructor via an announcement in your online classroom will announce changes. Some larger assignments will be completed over several modules. In these cases, you will be prompted to complete portions of the assignment each module.
When will completed assignments be returned?
The instructor will aim to return assignments to you within 5-7 days following the due date, depending on the length of the assignment. You will receive feedback under the My Grades link in the left-hand menu of your course.

What is the policy for late assignments?
You are expected to contact your instructor in advance if you think you cannot meet an assignment deadline. However, if an assignment is late and prior arrangements have not been made with the instructor, the assignment score will be reduced by 50%.

What happens if I cannot participate in a synchronous session?
If you cannot attend a synchronous session, you will be responsible for watching the recording at a later time.

Time Management Expectations
What is the time demand and schedule of the course?
Because this is a graduate-level course that is offered in a condensed format, the rigor and time commitment is higher than a traditional 15-week semester course. It is expected that you look ahead to schedule your time. Plan to complete coursework across several days of the week rather than all in one day. Be sure to consider how group activities impact your schedule as well.

Some assignments require that you work on them for multiple modules. Be sure to review the assignment directions at the beginning of the course so that you can plan your time accordingly. Please seek help before becoming frustrated and spending a significant amount of time to resolve an issue.

Course Participation & Communication Policy
Participation
What are the participation requirements?
You are expected to log into the Blackboard at least three times a week, though a daily check-in is recommended. It is your responsibility to read all announcements and discussion postings within your assigned forums. You should revisit the discussion multiple times over the week/module to contribute to the dialogue.

Network Etiquette (i.e. “Netiquette”)
In this course, online discussion will be primarily take place in our online discussion board. In all textual online communication it’s important to follow proper rules of netiquette.

What is netiquette? Simply stated, it's network etiquette -- that is, the etiquette of cyberspace. And "etiquette" means the social and cultural norms of communicating with others in a proper and respectful way. In other words, netiquette is a set of rules for behaving and interacting properly online.
The Netiquette “Core Rules” linked below are a set of general guidelines for cyberspace behavior. They probably won't cover all situations, but they should give you some basic principles to use in communicating online.

For Netiquette Core Rules visit The Core Rules of Netiquette web page.

Contacting the Instructor

The instructor for this course is Christa Hasenkopf (chasenk1@jhmi.edu). Feel free to contact your instructor via email with comments, questions, and concerns. You will receive a response within 48 hours. Also, please see the office hours listed at the beginning of this document.

Course Protocols

How will I know about changes to the course?

Frequently, you will find new announcements posted in the Announcements, which contain information about current course activities that you are working on and any changes to the course. Please check announcements every time that you log into your online course.

How should I communicate with others in this course?

You should communicate often with your classmates and with your instructor. The majority of communication will take place within the Discussion forums. When you have a question about an assignment or a question about the course, please contact your instructor, or post your question in the course’s “Syllabus & Assignment Question” forum.

Are there any requirements for sending e-mail messages?

When you send an e-mail message to the instructor or to another participant in the course, please observe the following guidelines:

- Include the title of the course in the subject field (e.g., JHU Air Quality Management and Policy).
- Keep messages concise, and check spelling and grammar.
- Send longer messages as attachments.
- Sign your full name (the sender's email is not always obvious).
## Tentative Course Schedule

**Important Note:** This schedule is tentative and is subject to change with fair notice via Announcements. Activity and assignment details will be explained in detail within each week’s corresponding module. If you have any questions, please contact your instructor.

<table>
<thead>
<tr>
<th>Module</th>
<th>Dates</th>
<th>Topics</th>
<th>Activities</th>
<th>Assessments</th>
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<tbody>
<tr>
<td>1</td>
<td>29 Aug – 4 Sep</td>
<td>Introduction to the course: Motivation and course overview, Atmospheric basics (1/2): Make-up, transport and radiative balance</td>
<td>Material for review this module: • The connection between cleaner air and longer lives, Michael Greenstone, New York Times, Sep 2015</td>
<td>Review resources for next module. Memo: Goals for Class</td>
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</tbody>
</table>
|        |              |                                                                        | Material for review for upcoming module: • Textbook:  
• Chapter 2, Section I-IV  
• Chapter 3, Section I, II, and IV-VI  
• Chapter 1, Section II  
• London Fog remembered, NPR  
• Videos:  
• How Do Greenhouse Gases Actually Work?  
• Our Atmosphere is Escaping  
• Why Are There Clouds?  
• Rain’s Dirty Little Secret |                                                                                                                                    |
| 2      | 5 Sep – 11 Sep | Atmospheric basics (2/2): How to build the perfect setting for an ‘airpocalypse,’ Common air pollutants: Chemical nature and sources | Readings for upcoming module: • Chapter 4: Section I, II, IV-VII  
• Chapter 5: Section III  
• Air pollution: Clean up our skies, Nature 2014  
• Don’t get caught up in the air pollution hype, Foreign Policy Kate Galbraith, 2015  
• Climate Change is blinding us to the effects of Dirty Air, John Vidal, The Guardian, Jan 2016  
• West et al., Co-benefits of mitigating global greenhouse gas emissions for future air quality and human health, Nature Climate Change, 2013. (Access through EReserves) | Air Pollution Basics Problem Set  
Review resources for next module  
Participate in online discussion (Initial and Response Posts) |
| 3      | 12 Sep – 18 Sep | How do you measure air pollution?, The (complicated) relationship | Review Problem Set answers  
Cover Deep-Dive Memo Part I Assignment parameters | Module Quiz  
Review resources for next module |
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<th>Module</th>
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<td>between air pollution and climate change</td>
<td>Readings for upcoming module:</td>
<td>Participate in online discussion (Initial and Response Posts)</td>
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<td>4</td>
<td>19 Sep – 25 Sep</td>
<td>Health effects of air pollution: Focus on PM2.5 and mortality, An overview of seminal air pollution and health studies</td>
<td>- Textbook:</td>
<td>Module Quiz</td>
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<td>- Chapter 8, Sections I-V</td>
<td>Review resources for next module</td>
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<td>- Chapter 10, I-V</td>
<td>Participate in online discussion (Initial and Response Posts)</td>
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<td>- Chapter 11, Section I</td>
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<td>- Six Cities Study: Dockery et al. (1993)</td>
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<td>- Interview with Doug Dockery on Impact of Six Cities Study</td>
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<td>- Long-term air pollution and cardio-respiratory mortality: Hoek et al. (2013)</td>
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<td>5</td>
<td>26 Sep – 2 Oct</td>
<td>Exploring cutting-edge questions in air pollution and health science – where are the gaps? How does new information on air pollution and health affect new health policies in the U.S.?</td>
<td>Readings for upcoming module:</td>
<td>Module Quiz</td>
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<td>- Textbook: Chapter 6: I-V</td>
<td>Review resources for next module</td>
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<td>- A recent NAAQS change: Ozone: Q&amp;A</td>
<td>Participate in online discussion (Initial and Response Posts)</td>
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<td>- Video/Audio:</td>
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<td>- All Things Considered: Smog Deaths in 1948 Led to Clean Air Laws</td>
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<td>- History of Passing the Clean Air Act</td>
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<td>6</td>
<td>3 Oct – 9 Oct</td>
<td>Rewind back to the Clean Air Act, fast-forward to its impact today, Methods of measuring success (or failure) for air pollution mitigation policies</td>
<td>Cover Deep-Dive Memo Part II Assignment parameters</td>
<td>Module Quiz</td>
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<td>Online discussion of Deep-Dive Memo: Part I</td>
<td>Review resources for next module</td>
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<td>Readings for upcoming module:</td>
<td>Participate in online discussion (Initial and Response Posts)</td>
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<td>- Textbook:</td>
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<td>- Chapter 11, Sections I, VI</td>
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<td>- US EPA AQI Basics</td>
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<td>- India racing ahead of China, when it comes to Pollution, Times of India,</td>
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<tr>
<td>Module</td>
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| 7      | 10 Oct – 16 Oct | Communicating air pollution to the public: one size doesn’t fit all, Case studies of non-U.S. places with pollution success stories from London to Bangkok | Readings for upcoming module:  
- *China’s air pollution in 2014*, South China Morning Post, 2015  
- *Delhi Wakes up to Air Pollution Problem It Can’t Ignore*, Gardiner Harris (Feb 2015)  
- *Yes, Delhi: It Worked*, India Express (Jan 2016)  

Online discussion of Memo: Deep-Dive: Part II Memo Assignment progress | Module Quiz  
Review resources for next module.  
Participate in online discussion (Initial and Response Posts) |
| 8      | 17 Oct – 23 Oct | Deep dive: China & India  
Guest Speaker  
Cover Synthesis Paper parameters | Readings for upcoming module:  
- *Where is the world’s most polluted air?* The Guardian, Dec 2015  
- *Global Air Inequality Summed up in two graphs*, OpenAQ | Module Quiz  
Review resources for next module.  
Participate in online discussion (Initial and Response Posts) |
| 9      | 24 Oct – 30 Oct | The global air pollution ‘airscape’ and efforts to measure air pollution with satellites, low-cost sensors, and big, open data  
Guest Speaker  
Readings for upcoming module:  
- *Clearing the Air*, World Policy Journal, Christa Hasenkopf | Module Quiz  
Deep-Dive Memo: Part II  
Review resources for next module  
Participate in online discussion (Initial and Response Posts) |
| 10     | 31 Oct – 6 Nov | Deep dive: Mongolia  
Online discussion of Deep-Dive Memo: Part II  
Readings for upcoming module:  
- *Measuring Africa’s Air Pollution*, NYT, Kate Galbraith  
- *Explosive growth in African combustion emissions from 2005 to* | Module Quiz  
Review resources for next module  
Participate in online discussion |
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<tr>
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<tr>
<td>11</td>
<td>7 Nov – 13</td>
<td>Deep dive: Sub-Saharan Africa</td>
<td>Guest Speaker</td>
<td>Module Quiz</td>
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<td>Nov</td>
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<td>Readings for upcoming module:</td>
<td>Review resources for next module</td>
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<td>• 2030: Liosse et al. (2014) (Click on pdf)</td>
<td>Participate in online discussion (Initial and Response Posts)</td>
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<td>14 Nov – 20</td>
<td>Transboundary air pollution issues and regional policymaking, Deep dive:</td>
<td>Readings for upcoming module:</td>
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<td>12</td>
<td>20 Nov</td>
<td>Indonesian wildfires in 2015</td>
<td>• The Ozone Hole: From Discovery to Recovery, UNEP, 2011 (video)</td>
<td>Review resources for next module</td>
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<td>• LRTAP (see text of convention at bottom of page as pdf)</td>
<td>Participate in online discussion (Initial and Response Posts)</td>
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<td>Online discussion of Synthesis Paper</td>
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<td>Assignment progress</td>
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<td>13</td>
<td>21 Nov – 27</td>
<td>International treaties on air quality and their impact</td>
<td>Guest Speaker</td>
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<td>Readings for upcoming module:</td>
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<td>• UNEP and low cost sensors</td>
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<td>• UNICEF and air pollution in Mongolia</td>
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<td>• World Bank Case Studies of Success</td>
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<td>14</td>
<td>28 Nov – 4</td>
<td>The role of international organizations in shaping global, national and</td>
<td>Optional readings for the following module may be posted later)</td>
<td>Final Project: Synthesis Paper</td>
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<td></td>
<td>Dec</td>
<td>local air pollution policies</td>
<td></td>
<td>Participate in online discussion (Initial and Response Posts)</td>
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<tr>
<td>15</td>
<td>5 Dec – 9</td>
<td>Putting it all the pieces together: What's the recipe for success?</td>
<td>Online class discussion of Synthesis Paper</td>
<td>Participate in online discussion (optional)</td>
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University Policies

General
This course adheres to all University policies described in the academic catalog. Please pay close attention to the following policies:

Students with Disabilities
Johns Hopkins University is committed to providing reasonable and appropriate accommodations to students with disabilities. Students with documented disabilities should contact the coordinator listed on the Disability Accommodations page. Further information and a link to the Student Request for Accommodation form can also be found on the Disability Accommodations page.

Ethics & Plagiarism
JHU Ethics Statement: The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Report any violations you witness to the instructor.

Read and adhere to JHU's Notice on Plagiarism.

Dropping the Course
You are responsible for understanding the university's policies and procedures regarding withdrawing from courses found in the current catalog. You should be aware of the current deadlines according to the Academic Calendar.

Getting Help
You have a variety of methods to get help. Please consult the help listed in the "Blackboard Help" link in the online classroom for important information. If you encounter technical difficulty in completing or submitting any online assessment, please immediately contact the designated help desk listed on the AAP online support page. Also, contact your instructor at the email address listed atop this syllabus.