Course Syllabus

Course Introduction and Requirements

Welcome to URBAN 563/IPM 505: Climate Change and Infrastructure.

Course Preview

- 10 weekly lessons
- 4 required discussion forums of 9
- 2 short written assignments
- 1 research proposal
- 1 research paper
- 1 summary presentation and discussion
- No exam

This course introduces the science of climate change and examines major infrastructure systems in relationship to climate change phenomena. The course is divided into three units:

> Unit 1: Introduction to the science of climate change and projected effects (weeks 1-3)
>
> Unit 2: Government responses and tools (weeks 4-5)
>
> Unit 3: Specific mitigation and adaptation strategies for major infrastructure systems (weeks 6-9)

Our final week is a course wrap up where we will exchange ideas on the interrelated effects of these topics and cross-cutting solutions or actions to reduce climate change.

The first unit starts with an exploration of climate change scientific studies, including the causes and overall effects of climate change. Students will learn about the driving factors influencing climate change, such as population growth, rising standards of living, and reliance on fossil fuels for energy. Students will also study the effects of climate change in terms of ocean warming and acidification, sea level rise, extreme weather events, water scarcity, desertification, and the spread of disease—and what these effects mean for the essential functioning of infrastructure systems. Over the course of the quarter, we will also examine economic and social equity issues in terms of the uneven distribution of these effects, both geographically and among economic segments of the population.

In the second unit, we will explore what leading countries, cities, utilities, and NGOs (nongovernmental organizations) are doing to address climate change issues from both mitigation and adaptation perspectives and how these relate to infrastructure systems. (In the climate change context, mitigation refers to reducing greenhouse gas emissions, while adaptation refers to adjusting to the changes resulting from climate change.)

In the third unit, we will focus in greater detail on the relationship of climate change to major infrastructure systems that are highlighted in the IPM curriculum: energy, water, food, transportation, public health, and communications. We will examine mitigation and adaptation strategies for addressing climate change for each type of infrastructure, looking at the United States and other countries.

In addition to readings and presentations from the faculty, the course will include guest speakers from the professional community who can provide training on specific tools and techniques for addressing climate change. These tools and techniques will include carbon climate action plans, policy plans, strategic plans, and other tools. The course also includes a series of short videos from TED talks and from other sources that keep us abreast of the latest developments in the field.

Learning Objectives

When you have completed this course, you will be able to

- Explain the scientific basis for climate change and cite the compelling evidence that climate change is occurring;
- Identify and explain the major challenges that climate change poses to critical infrastructure systems;
- Discuss how infrastructure locations and demand will be altered by climate change effects;
- Become familiar with a variety of specific tools that practicing professionals are using to plan for adaptation to climate change relative to critical infrastructure systems; and
- Develop the knowledge and leadership skills to address these issues in your future career.

The Online Environment

Your online course offers several resources including the comprehensive Online Student Handbook, the ability to communicate electronically with students and with your instructor, and links to a rich array of UW Library Services, described further below.

Online Student Handbook

This handbook answers questions about your online learning course, such as how to purchase your text, obtain a transcript, and get technical help if you need it. The handbook also provides additional resources, such as how to order books or journals from the library and how to study for an online course.

Communicating with Your Instructor and Student Peers

Online Discussion Forums allow you to communicate with other currently enrolled students and with your instructor. We encourage you to use the **General Discussion** Forum for various topics of interest and the weekly Discussion Forums to exchange comments about your coursework with other students in this course. Your instructor will monitor these sessions and engage periodically in the discussion.

You can use e-mail to ask the instructor a question. If your question is of a general nature, the response may be posted on the **General Discussion Forum** (along with a response directly to you),

so that other students in the class might benefit from the answer. The instructor will reply to all discussion forum questions on the forum, and to e-mail questions via e-mail. **(Please use e-mail for a prompt response).**

The instructor will respond within 24 hours to e-mails (usually faster).You can also pre-arrange for a conference call or video chat to discuss issues in more depth.

UW Library Services

As an online student, you have access to a wealth of resources compiled to provide fast, easy access to information that supports your online learning experience. Organized by subject, UW Library Services links you to sites with help for writing and research, study skills, language learning, and library reference materials. All links have been assessed for credibility and reliability, and they are regularly monitored to ensure their usability.

Technology Requirements and Skills

In addition to the technology requirements and skills noted in the Online Student Handbook, for this course you will need Adobe Reader.

About This Course

Course Prerequisites

There are no prerequisites for this course.

Required Texts

Note: All of the course texts are available as an eBook through the UW Library.

1. Rosenzweig, Cynthia, William D. Solecki, Patricia Romero-Lankao, Shagun Mehrotra, Shobhakar Dhakal, and Somayya Ali Ibrahim. *Climate Change and Cities: Second Assessment Report of the Urban Climate Change Research Network*. Cambridge: Cambridge University Press, 2018. ISBN: 978316603338.
2. McGregor, Alisdair, Cole Robers, and Fiona Cousins, 2013. *Two Degrees: The Built Environment and our Changing Climate.* New York: Routledge.
3. Brown, Marilyn A., and Benjamin K. Sovacool, 2011. *Climate change and global energy security: technology and policy options*. Cambridge, The MIT Press. ISBN 978-0-262-51631-0

Other Readings

Other required and recommended readings, as well as sources for additional information, are available online and listed in the relevant lessons.

Course Organization

This course is organized into 10 lessons. Each includes readings from online sources and/or the required texts and most lessons have a discussion forum. Some lessons also include an assignment such as a short analytical written response or a product related to the major course research paper.

About the Lessons

Lesson 1: Introduction to Climate Change Science and Sustainability

In the first lesson, we will review the course as a whole and begin to study the science of climate change. Our readings will include observations that demonstrate recent changes in the global climate, as well as a review of the scenarios developed by the United Nations' Intergovernmental Panel on Climate Change (IPCC) in projecting the future of climate change, based on differing levels of carbon dioxide in our atmosphere.

Lesson 2: Causes and Effects of Climate Change

In Lesson 2, we will examine the specific effects of climate change as these occur at a global level and at a local level. The effects include changing weather patterns, increased frequency and intensity of flooding, spread of disease, ocean acidification, sea level rise and others. For the State of Washington, we will examine the impacts of these on water supplies, agriculture, human health, and on resource-based sectors of state's economy, such as salmon and timber

Lesson 3: Mitigation and Adaptation Approaches

In Lesson 3, we will continue to examine causes and impacts of climate change, with a focus on urban development (a topic we will return to in lesson 6). We will also consider responses to climate change in terms of approaches to reduce greenhouse gas pollution (mitigation) and to increase resilience and recovery capacity of communities in the face of hazards triggered by changing climate (adaptation). Be sure to check our posted Searchable Glossary of Climate Change Terms for these terms if you are not familiar with how they are used with climate change.

Lesson 4: Governmental Responses to Climate Change

In this lesson, we will focus on governmental responses to climate change and sustainability issues. We will compare various city and county responses to climate change, including King County's *Planning for Climate Change*, the New York City plan, and other city examples. We will also look at state and national approaches to controlling carbon emissions, including State legislation. At a global level, we will examine efforts by the United Nations to reach an international agreement, starting with the Stockholm Conference in 1972 and concluding with the recent agreements reached in Paris.

Lesson 5: Carbon Accounting and Policy Approaches

In Lesson 5, we will we will continue our look at mitigation efforts with a particular focus on how cities are evaluating carbon impacts, both at the city-wide level and for individual projects. We will also look at international agreements.

Lesson 6: Climate Resilient Infrastructure

Lesson 6 will explore the vulnerabilities of infrastructure systems to extreme weather events driven by climate change, and explore tools for infrastructure planners and managers to improve system resilience. The lesson will focus on the most important risks to water and energy infrastructure, as well as design strategies to develop less 'brittle' infrastructure -- systems that are less vulnerable to catastrophic failure than conventional, and that recover to restore service more quickly in the event of disruption.

Lesson 7: Applying Adaptation and Mitigation to Energy Systems

With Lesson 7, we consider how climate change affects our planning and management of energy systems, both for mitigation and adaptation. For mitigation, we examine programs to reduce city-wide energy use, such as ICLEI's Cities for Climate Protection Campaign. We also examine climate related changes in energy demand across various energy types, including coal, oil, gas, nuclear, hydro, biomass, and other renewables. For adaptation, we look at energy supply chains and operations risks and vulnerabilities. We also examine climate change mitigation strategies related to alternative sources of energy.

Lesson 8: Applying Adaptation and Mitigation to Transportation and Urban Form

With Lesson 8, we shift our focus to consider how climate change may affect planning and management of infrastructure systems, both for mitigation and adaptation. This lesson will provide an overview of inter-related systems in urban settings, especially urban form and transportation. In particular, we look at adaptation measures related to planning the locations of transportation systems, based on climate change hazards and associated risk management. We also examine climate change mitigation strategies related to alternative types of transportation and alternatives to fossil-fuel-based transport.

Lesson 9: Applying Adaptation to Water Systems

In this lesson, we continue to consider the effects of climate on infrastructure planning and management with a focus on water and food systems. Water is an important cross-cutting theme in urban settings that also affects other sectors including: energy, health, and transportation. As an introduction to water systems we look at the formal and informal water supply sectors and then examine risks in terms of vulnerabilities and impacts. In particular, we look at water-related effects of climate change, such as sea-level rise, and the increased intensity and frequency of flooding as well as the long-term depletion and degradation of water supplies. We also examine climate change

effects on food supplies, potential approaches to adaptation, and the interrelated effects of changes in water supply affecting food systems including desertification, changes in temperature and growing season, and alternatives to current food systems.

Lesson 10: What's Next? – Actions and Solutions

For the final week of class, students will explore how the various infrastructure systems are integrated and inter-dependent and discuss the range of actions and innovative approaches that are being taken to address climate change.

Approach to Teaching and Learning

The course will use a combination of lectures, readings, assignments, and online discussion forums. The online discussions will use the class discussion forum to have students actively involved in discussions among their peers and faculty. In this format, students learn to formulate and express their opinions, respect the opinions of others, and gain a higher level of synthesis, since engaging in the discussion requires them to reflect upon the ways in which disparate ideas are related to each other.

Media

The instructor and other experts provide lectures and other content through a variety of recorded and live media, including:

- Streaming video recordings;
- Recorded online presentations; and
- National experts via video recordings posted on the Internet.

About the Assignments

There are three types of assignments in this course:

1. Research Paper consisting of three deliverables: a research proposal (outline, problem statement, and annotated bibliography) (due week 3), the completed research paper and a summary presentation of the research paper (due week 9).
2. Two short analytical written assignments (due weeks 4 and 6/7 (the second assignment is 2 parts)); and
3. Postings to at least 4 of the 9 weekly discussion forums over the course of the quarter.

These are listed in the table below:

Activity	Percent/ Weight	Assignment Summary
Class Participation (discussion forums)	20%	Active, thoughtful and meaningful participation in 4 of the 9 discussion forums (5% each)
Written Assignments (2)	40%	Two written assignments: 3 pages (800-1,000 words) each, focused on an exercise or professional product (Due in Weeks 4 (15%) and a 2-part assignment on weeks 6 & 7 (25%))
Research Project	40%	The research project consists of 3 components: 1. A Research Proposal (Due in Lesson 3) – 10% 2. The final Research Paper (Due in Lesson 9) – 25% 3. A Summary in presentation form (also due in Lesson 9) – 5%

Discussion Forums

The instructor will define a topic for a discussion forum 9 weeks of the quarter. You are required to participate in 4 of the 9 discussions forums in this course. To participate in the discussion forum, you will respond to the topic question with a posting that presents a thoughtful consideration of your view on the topic question and/or offers additional readings or resources for others to consider.

You will also be expected to respond to the postings of others by:

- Asking questions,
- Summarizing a series of postings, or
- Highlighting where you agree or disagree with others.

Students will be expected to participate in the discussion forum by offering their opinions and insights based on the assigned readings, video, and PowerPoint recordings, their own work experience, and/or outside readings.

We aspire to create a classroom environment that encourages and welcomes different perspectives. We encourage robust engagement with ideas and perspectives that differ – as long as individuals are treated with respect and dignity.

Note: If you have questions that you do not want to discuss with the entire class, you may e-mail your instructor directly. Your instructor reserves the right to post your direct questions—anonymously—on the discussion board if the questions seem important or representative enough that the entire class would benefit from them.

Written Analytical Assignments

For each of the three short analytical writing assignments, you will be expected to write a 3-page paper (800-1000 words). A summary of the assignments follows:

- **Lessons 4:** Students will prepare a work program for developing a Climate Action Plan for a sample city.
- **Lessons 6 & 7:** (this assignment is in 2 parts): Part A; Students will work in teams to prioritize actions according to an interest group's perspective. Part B: students will work individually to choose among the prioritized items to create a final list of actions for the sample city.

Research Project

The research project for this class is structured to help you develop and articulate persuasive research-oriented arguments related to climate change and infrastructure. The instructor will review the proposed topic and your approach in the Research Proposal assignment and will offer suggestions for refining the topic and/or possible research materials to assist you. The Research Paper (due week 9) should be about 2,000 words long, supported by a minimum of five citations, including peer-reviewed materials.

You will also prepare a brief summary of your research and conclusion (no more than 6 slides in powerpoint or 2 pages of text). This summary should include both text and visuals (maps, photos, charts, etc.) appropriate to your topic. You will post your summary on the discussion board to share your results with your classmates.

Overall, the research paper assignment will have these components:

- Research Proposal
- Final Research Paper
- Summary Presentation

Sample research papers from students in previous classes are provided in the links below:

SamplePaper_StormwaterInfrastructure.pdf

SamplePaper_FreightInfrastrucure.pdf

Research Proposal (Due Week 3)

1. Provide a 2 to 3 page paper that includes:
    1. A clear definition of the problem, issues, or question you plan to address. The specifics of the topic are your choice, based on your interest area – but should relate to the subject of the course in terms of climate change and infrastructure. The instructor will review the proposed topic and your approach in the Research Proposal assignment and will offer suggestions for refining the topic and/or possible research materials to assist you.
    2. A brief outline of the paper listing major points you plan to cover,

3. A listing of at least three sources (articles, books, journals, etc.) that you plan to use. These sources should include at least one source that is not within our current reading list and at least one source from a peer-reviewed publication (the final list of sources is likely to be much longer and should include multiple peer-reviewed publications).
4. A brief description (one sentence) of each source in your bibliography to indicate how the source will relate to your topic.
5. NOTE: This is due early in the quarter (week 3), to allow time for the instructor to give feedback to help in your research. You are welcome to refine your ideas or even propose a change later in the quarter, with approval by your instructor.

2. **Research Paper (Due Week 9)**
    1. **Structure of the argument**: To be successful in crafting your argument, you will need to open your paper with a clear definition of the problem you would like to address. The body of your paper should present examples, theories, and cases, and the closing of your paper should summarize or highlight the salient points from those examples, theories, and cases that you find comprise a plausible solution to the problem. To be successful, you will need to develop a chain of logic, and support each link in the chain with either peer-reviewed literature or personal observations.
    2. **Specifications:** All papers should be about 6-7 pages (2,000 words) in length, supported by a minimum of five citations, including peer-reviewed materials. They should be in Times New Roman or similar readable, serif font, 11 or 12-point, with one-inch margins, double-spaced. Use footnotes for concept clarification where needed, citations in text (author, date), and a complete bibliography, based on an accepted style. Style refers to your method of citing sources, grammar, punctuation, and related issues. I urge you all to refer to a manual such as the *Chicago Manual of Style* (15th Edition, University of Chicago Press) as you compose and edit your work. A quick guide to citations in this style is available at: http://www.chicagomanualofstyle.org/tools_citationguide.html Do not use hot links as a replacement for a full citation, See this site for more information: https://guides.lib.uw.edu/research/citations.
3. **Presentation Summary** (**Due Week 9**)
    1. Prepare a brief summary (text, PowerPoint, video, or other format) summarizing your research and conclusion. This summary should include both text and visuals (maps, photos, charts, etc.) appropriate to your topic
    2. Post your presentation on the discussion board to share your results with your classmates.

Grading

Graded activities are weighted as shown in the following table:

Grades

Class participation (4 discussion forums) (5% each)	20%
Written assignments (2) (20% each)	40%
Research project • Research Proposal (10%) • Research Paper (25%) • Summary Presentation (5%)	40%
Total	100%

Extra Credit

Students may gain extra credit in the course by completing any of the following tasks.

Option A: Extra Discussion Forum from Assigned Topics

> Complete one extra Discussion Forum beyond the 4 required and respond substantively to 2 postings by other students. The extra Discussion will count as 5 points. This Discussion must be posted in the week that it was assigned in order to be counted.

Post to the Discussion Forum in the week that it was due, so that other students can discuss it.

Option B: News Article or Journal

> There are many resources on-line for sources of information on climate change, including NOAA, EPA, The World Bank, ICLEI, and others. Explore some of the sites or locate a news article in a credible news source or journal that you find interesting on climate change science or impacts. This can be an article on one of the websites that you are asked to explore or a recent article in a reputable on-line news source or journal. Write a 250-word paper, including:

- A summary of the article,
- An explanation of why you found it compelling or convincing or, explain why you would dispute the information it provides,
- What credentials the site or author provides, and
- Include a link to the website for the article.

The purpose of this Option is to help you get familiar with the sources of materials available on this topic and to think critically about both the validity of the information and the credibility of the source.

Option C: Art & Literature

There is a growing body of art and literature that explores issues related to climate change. Some examples include: A Song of Our Warming Planet (music), poetry by Kathy Jetnil-Kijiner (eco-poetry, “The Years of Living Dangerously” (TV and film), work for the American Museum of Natural History (dance), and works by Maya Lin or Naziha Mestaoui (visual arts). Write a 250word paper, including:

- A summary of the artistic work,
- An explanation of why you found it compelling or convincing or, critique the information or art form used,
- What credentials the site or creator provides, and
- Include a link to the web site for the piece itself or to the description of the piece.

The purpose of this Option is to help you get familiar with the creative materials available on this topic and to think critically or express your emotions about the materials.

Post your Discussion (Option B or C) to the **Extra Credit (Option B & C)** discussion forum. You may do 2 of these (Option B or C) for 3 points each or a total of 6 points. The extra credit is due by the last week of the quarter.

Grading Criteria: Written Analytical Assignments and Research Paper

Grades on the written assignments and research paper will be based on

- Addressing all parts of each assignment;
- Providing adequate treatment of each part of the assignment (for example, if an item calls for an explanation of factors involved, an answer that lists factors without explaining them would be inadequate);
- Relating your work on the assignments to course readings, lessons, discussions, or supplementary readings as appropriate; and
- Documenting your sources (that is, providing citations to published material, government documents, personal interviews).

Grading will be based on content, organization, and measures of style appropriate to writing at the graduate level, as highlighted below:

Assignment Rubric

Responsiveness/ Substance (40%)	Clear definition of the problem. Covers question well, shows understanding of materials, well executed, references used are relevant and used appropriately to support the argument.
Conceptual/analytical personal viewpoint (40%)	Clear concept, good analysis, includes point of view and reaches a supportable conclusion. Clear chain of logic supporting the argument.
Style, Structure and Grammar (20%)	Clear organization and form: correct grammar, spelling, punctuation, well organized, good writing style, appropriate grammar and punctuations, citations used correctly and follow an accepted style.

Note: Assignments that are partially completed will not be graded. Deductions will be made for late assignments.

Grading for the Course

Below are descriptions of the criteria for your performance in this class. If you meet these criteria for all your work, you will be graded appropriately. Instructors may interpolate grades between these standards.

4.0	Excellent and exceptional work for a graduate student. Work at this level is consistently creative (where appropriate), thorough, well-reasoned, insightful, well written and shows clear recognition and incisive understanding of the important materials and issues. All assignments submitted are of good professional quality. The value of individual contributions to this course is considerable and positively affects the learning of all participants.
3.7	Strong work for a graduate student. Work at this level sometimes shows signs of creativity, is thorough and well reasoned, and demonstrates clear recognition and good understanding of the important materials and issues. Assignments submitted lack professional quality but demonstrate effort and concern for quality. The value of individual contributions to the course is strong and occasionally significant.

3.3	Competent and sound work for a graduate student. Work is well reasoned and thorough but not especially creative or insightful. The student shows adequate understanding of the important materials and issues although that understanding may be somewhat incomplete. Work submitted is competent but not remarkable. The value of individual contributions to the course is such that they do not influence the quality of the course one way or the other. This grade indicates neither exceptional strengths nor exceptional weaknesses, but is the grade for "average" graduate performance.
3.0	Adequate work for a graduate student. Work is moderately thorough and well reasoned, but with some indications that some of the important materials and issues is less than complete and perhaps inadequate for graduate study. The value of individual contributions to the course is minimal. However, the work is above the minimal expectations for the course.
2.7	Borderline work for a graduate student. Work barely meets the minimal expectations for the course and may occasionally fall below them. Understanding of the important materials and issues is incomplete or has not been demonstrated. There is little positive value in the individual contributions to the course and there may even be negative effects on the overall learning. Consistent overall performance at this level would be below that of adequate graduate student performance.

Study Tips

Exercises in this course are open-book, so no memorization is involved in the course. The course is designed for you to learn from readings and from completing the assignments. Some tips:

- Set aside time each week that is dedicated exclusively to the course.
- Do the readings and explore the topic using the link(s) in the lesson.
- Begin assignments as soon as possible after completing the readings. Make use of all available resources, including your fellow classmates.
- For the assignments, select an infrastructure system and/or location that you have a real interest in. Systems close to home may be easier in terms of obtaining information.

Religious Accommodations

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW’s policy, including more information about how to request an accommodation, is available at

Religious Accommodations Policy. Accommodations must be requested within the first two weeks of this course using the **Religious Accommodations Request form** .

About the Course Developer

Jill Brown Sterrett, FAICP

Ms. Sterrett is a certified urban planner with over 30 years of planning experience in consulting for local/state jurisdictions and federal agencies on long range planning and environmental studies. Her recent projects included developing an extensive Sustainability Strategy for the city of Snoqualmie and form-based codes for two commercial centers in Edmonds. She is an affiliate instructor with UW and has taught graduate and undergraduate courses since 2006. Leading a team of 5 editors, she produced a book published in 2015 entitled: *Planning the Pacific Northwest.* She led APA Washington's 2009 *Sustainable Washington: Planning for Climate Change* and their updated Climate Change Discussion Briefs in 2016. She is a past president of the Washington Chapter American Planning Association and a Fellow of the American Institute of Certified Planners. Ms. Sterrett holds a master's degree in Sociology from Ball State University and a master's degree in Urban and Regional Planning from the University of Southern California.