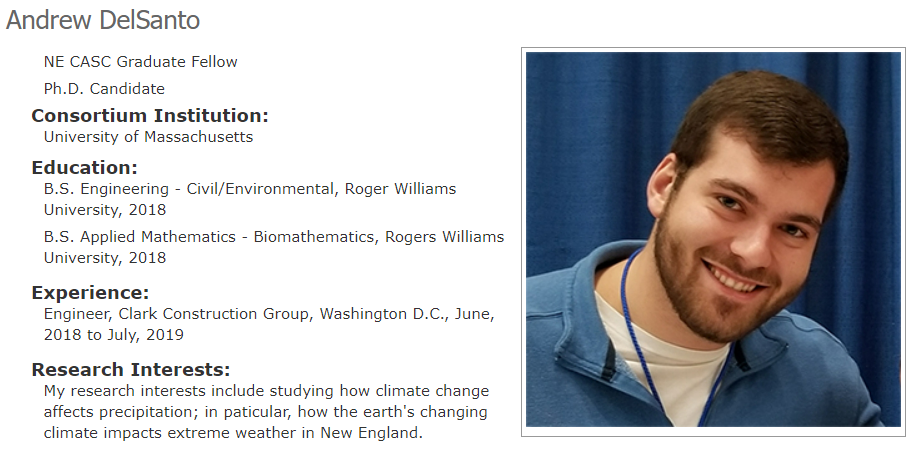
Course Title: Climate Change and Engineering: Designing for an Uncertain Future

Fall 2021: ENGIN 191FY Class Section 29: Wednesday 4 – 4:50pm (Marston Hall room 15)

ENGIN 191FY Class Section 05: Thursday 8:30 – 9:20am (Engineering Laboratory room 325)

Professor: Andrew DelSanto (he/him) – 3rd Year PhD Student – [adelsanto@umass.edu](mailto:adelsanto@umass.edu)

<http://necsc.umass.edu/people/andrew-delsanto>



Office Hours: 9-5 in Marston 42 (Entrance in the stairwell on the street side, closest to Marcus) – Email me if you are going to come by

Course Summary: This course analyzes climate change as it relates to engineering. The course will be split into four pieces:

1. The science behind climate change, and how exactly it relates to engineering.
2. The undeniable relationship between engineering and politics, and how climate change is a perfect example of a scientific issue becoming politicized.
3. The unequal social implications of engineering and climate change, and how designs are failing to adequately prepare certain areas for the future.
4. The morality/ethics involved with designing for the future, and how climate change is a great example of an ethical problem in engineering.

Course Learning Objectives:

1. Students will leave the course with a greater understand of the science behind climate change.
2. Students learn about concrete examples of real-world engineering where politics and engineering are inherently linked.
3. Students begin to see engineering as not a solely technical field, but a field connected to both politics and society.
4. Students will learn about concrete examples of real-world engineering ethics problems, including climate change and how it plays into the newly changing ethics in engineering.

Rough Course Structure (based on 10 weeks- leaving 2 classes for peer mentors, and 1 for the Engineering Librarian):

1. Weeks 1-4: The Science of Climate Change

The first part of the course will focus on introductions and the hard science behind climate change. The material from this section will come from multiple sources, including the fourth national climate assessment, IPCC’s special report from 2018, and a PBS’ documentary titled “Decoding the Weather Machine”. This part of the course will solidify an understanding of the science behind our changing climate, relating to course objective #1.

1. Weeks 5-6: Engineering and Politics

Next, the course will focus on the link between engineering and politics. Engineering has been traditionally de-politized throughout history, but very recently, there has been a push to discuss the political ramifications of engineering within engineering education, which has caused some disagreement among engineers about the overall nature of engineering. Even though engineering is usually driven by capitalism, the analyses performed by engineers often drive political decisions or lead to political intervention. In addition, graduate school funding for engineers usually comes from federal funding, so many engineers argue that engineering is intrinsically linked to politics, while others say it should be strictly scientific and technical. This part of the course will delve into some real-world examples where engineering influenced government/political decisions (i.e. how one water resources engineer jumpstarted the accelerated development of LA). This will circle back to how climate change has been extremely politicized, even though it is (by nature) a scientific issue. This part of the course will target course objective #2.

1. Weeks 7-8: Engineering and Society

The de-politization of engineering will lead nicely into the social impacts of climate change and engineering. Engineering, especially Civil, directly affects the quality of life of communities. Successful engineering can lead to flourishing societies, whereas poor engineering can cause the opposite. Many studies have shown that climate change disproportionately affects low-income communities. These communities are usually more at risk because of their spatial proximity to rivers, overcrowding, and less adequate infrastructure, etc. This part of the course will target course objective #3.

1. Weeks 9-10: Engineering and Ethics

The final topic of the course will be morality/ethics. The course will wrap up with some high-level thoughts about engineering and ethics, which is many times glanced over in technical engineering courses, but nonetheless is very important in engineering (it *is* a topic on the Fundamentals of Engineering exam). In every engineering discipline, people will ultimately use what is designed, and the ethical implications of what is designed must be considered for a thorough design. Even deeper, this course will discuss some intentional engineering ethical issues, like anti-homeless architecture or Robert Moses’ “racist” parkway. Finally, the course will swing back around to climate change and some of the ethical issues that are attributed to it (i.e. climate change was mostly caused by first world countries, but third world countries have had the most deaths because of it). This part of the class will target course objective #4.

Weekly Course Calendar

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| --- | --- | --- | --- |
| **Class Week** | **Class Objective** | **Topic** | **Pre-Class Work/Readings** |
| **Week 1** | Welcome & Syllabus | Introduction | N/A |
| **Week 2** | Science of Climate Change (1) | The Hard Science | Decoding the Weather Machine Pt 1 – PBS (First Hour)  <https://www.pbs.org/wgbh/nova/video/decoding-the-weather-machine/> |
| **Week 3** | Science of Climate Change (1) | Climate Modeling and Uncertainty | Decoding the Weather Machine Pt 2 – PBS (Second Hour) <https://www.pbs.org/wgbh/nova/video/decoding-the-weather-machine/> |
| **Week 4** | Science of Climate Change (1) | Engineering Climate Change Solutions | <https://www.livescience.com/64183-solar-dimming-air-spray-climate-change-cost.html> |
| **Week 5** | Engineering and Politics (2) | The Historic Link – Military, Progress, De-Politization | **Reflection #1 Due – Is Climate Engineering the Solution to Climate Change?**  <https://link.springer.com/chapter/10.1007/978-3-319-16169-3_10> |
| **Week 6** | Engineering and Politics (2) | Climate Change and Politics – Science Becomes Political | <https://www.thefreelibrary.com/The+PR+plot+to+overheat+the+earth.-a020556371>  <https://en.wikipedia.org/wiki/Politicization_of_science> |
| **Week 7** | Engineering and Society (3) | The Intrinsic Link – History and Examples | **Reflection #2 Due – Mini Federal Grant Proposal** |
| **Week 8** | Engineering and Society (3) | Climate Justice is Social Justice | <https://yaleclimateconnections.org/2020/07/what-is-climate-justice/> |
| **Week 9** | Engineering and Ethics (4) | Transition of Traditional Ethics to New Ethics | **Reflection #3 Due – How Does Engineering Propel Society Forward?** |
| **Week 10** | Engineering and Ethics (4) | Climate Change Ethics and Final Thoughts | <https://www.un.org/esa/desa/papers/2017/wp152_2017.pdf>  **Reflection #4 Due on Day of Final – Are We Ethically/Morally Obligated to Fix Climate Change?** |

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| **Topic** | **Topic Information** | **Related Documents** |
| Introduction | Introducing the course, syllabus, and getting to know each other | N/A |
| The Hard Science | We will explore the Fourth National Climate Assessment and a PBS Doc | <https://www.pbs.org/wgbh/nova/video/decoding-the-weather-machine/>  <https://nca2018.globalchange.gov/> |
| Climate Modeling and Uncertainty | We will explore modeling and the layered uncertainty involved | <https://www.ipcc.ch/sr15/>  <https://nca2018.globalchange.gov/> |
| Engineering Climate Change Solutions | We will explore some possible engineering solutions to climate change (aerosols in the atm, removing carbon from the atm, etc.) | <https://earthdata.nasa.gov/learn/sensing-our-planet/volcanoes-and-climate-change>  See PPT for others |
| The Historic Link – Military, Progress, De-Politization | We will explore how engineering is intrinsically linked to politics, the de-politization of engineering, and how there is still debate about it purely being technical vs applied | <https://www.youtube.com/watch?v=hkbebOhnCjA>  <https://www.nae.edu/File.aspx?id=165133&v=568901b0>  <https://ascelibrary.org/doi/full/10.1061/%28ASCE%291052-3928%282005%29131%3A2%28102%29> |
| Climate Change and Politics – Science Becomes Political | We will explore how climate change became politicized and how almost 1/3 of the country believes it is a hoax, despite overwhelming scientific evidence | <https://www.thefreelibrary.com/The+PR+plot+to+overheat+the+earth.-a020556371>  <https://en.wikipedia.org/wiki/Merchants_of_Doubt>  <https://onlinelibrary.wiley.com/doi/10.1111/j.1475-682X.2008.00219.x> |
| The Intrinsic Link – History and Examples | We will explore the deep connection between engineering and society | <https://get-trained.org/latest-news/how-exactly-does-engineering-impact-society>  <https://www.raeng.org.uk/publications/reports/engineering-in-society> |
| Climate Justice is Social Justice | We will explore how climate change disproportionately affects people of color, low-income areas, etc. | <https://yaleclimateconnections.org/2020/07/what-is-climate-justice/>  <https://www.transalt.org/writing/repeal-robert-moses>  <https://www.nrc.gov/docs/ML1310/ML13109A339.pdf> |
| Transition of Traditional Ethics to New Ethics | We will explore how engineering ethics has traditionally been about “not taking bribes” but has changed over time (for example, ABET added DEI to their ethics statement in 2017) | <https://www.abet.org/about-abet/diversity-equity-and-inclusion/>  <https://www.moralmachine.net/>  <http://sites.bsyse.wsu.edu/pitts/be120/Handouts/codes/abet.htm>  <https://www.abet.org/technology-and-the-ethics-gap/> |
| Climate Change Ethics and Final Thoughts | We will explore how climate change was primarily caused by 1st world countries, but 3rd world countries feel the worst impacts. We will also explore examples of unethical design in engineering (i.e. Robert Moses’ “racist” parkway into Long Island) and wrap up the course by discussing the course objectives and some philosophical questions about engineering. | <https://www.transalt.org/writing/repeal-robert-moses>  <https://www.nature.com/scitable/knowledge/library/ethics-and-global-climate-change-84226631/>  <https://www.theguardian.com/society/2015/feb/18/defensive-architecture-keeps-poverty-undeen-and-makes-us-more-hostile>  <https://www.pbs.org/newshour/politics/how-infrastructure-has-historically-promoted-inequality>  <https://nyunews.com/2018/10/03/10-04-ops-stallone/> |

**Course Expectations:**

* **You will show up to every class (besides excused absences)**
* **You will pay attention to the lectures**
* **You will participate in class, including groupwork and activities (if you feel comfortable)**
* **You will voice your opinions and speak up (if you feel comfortable)**
* **You will let me know if you feel uncomfortable about anything (course topics, class atmosphere, etc.)**

**Grades: (74-76 C, 77-79 C+, 80-83 B-, 84-86 B, 87-89 B+, 90-93 A-, 93-100 A)**

* **4 Assignments = 20% each = 80% total**
* **Engagement in the course = 20% total**

**Health and Wellbeing.**

You are not alone at UMass – many people care about your wellbeing and many resources are available to help you thrive and succeed. The College recognizes that coursework is challenging and that classes are not the only demand in your life. Success in this course and the College of Engineering depends heavily on your personal health and wellbeing. Recognize that while stress is an expected part of the college experience, it can be compounded by unexpected setbacks or life changes outside the classroom. Strive to reframe challenges as an unavoidable pathway to success. Reflect on your role in taking care of yourself throughout the term, before the demands of exams and projects reach their peak. Please feel free to reach out to me about any difficulty you may be having that may impact your performance as soon as it occurs and before it becomes too overwhelming.

You can learn about the confidential mental health services available on campus by calling the Center for Counseling and Psychological Health (CCPH) by visiting their website at [umass.edu/counseling](about:blank). There are many other resources on campus for students facing personal, financial or life challenges to find support, stay in school, and graduate ([https://www.umass.edu/studentlife/single-stop](about:blank)). Within the College, you may reach out to myself, your academic advisor, the Office of Student Affairs ([http://engineering.umass.edu/current-students/academics-advising](about:blank)) or the Office of Community Equity and Inclusion (rees@umass.edu). I encourage you to contact support services on campus that stand ready to assist you. Remember that I am here to help you find the resources you need.

**Accessibility Support Services.**

Your success in this class is important to me. We all learn differently and bring different strengths and needs to the class. The University of Massachusetts Amherst is committed to making reasonable, effective and appropriate accommodations to meet the needs of all students and help create a barrier-free campus. If you have a qualifying disability and require accommodations while participating in this course, please work with Disability Services to have an accommodation letter sent to me in a timely manner. If you have a disability but are not yet affiliated with Disability Services, please register with Disability Services ([https://www.umass.edu/disability/students](about:blank)). Information on services and materials for registering are also available on their website [www.umass.edu/disability](about:blank).

If you are eligible for exam accommodations, your exams will be administered by the exam proctoring center. Contact Disability Services immediately, and comply with their exam scheduling policies, including the requirement that you book your exams at least seven days in advance of the exam date. *It is incumbent upon you contact me during the first few weeks of the semester, or shortly following registration with Disability Services, to ensure that your accommodations are being sufficiently met, including extra time and note-taking access, as applicable.*

Finally, beyond disability accommodations, if there are aspects of the course that prevent you from being fully included in the class, please let me know as soon as possible. Together we’ll develop strategies to meet both your needs and the requirements of the course.

**Academic Honesty Statement.**

Maintaining the integrity of scholarship and research within institutions of higher education requires a cultural commitment. All members of the UMass Amherst community are expected to be knowledgeable of and uphold our academic honesty policies ([https://www.umass.edu/honesty/](about:blank)). Academic dishonesty includes but is not limited to cheating, fabrication, plagiarism, and *abetting or* *facilitating* dishonesty. Instructors are requested to take reasonable steps to address academic misconduct, and appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Any person who has reason to believe that a fellow student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor or an alternate, trusted member of the faculty or College administration as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. Community members may fill out the College’s classroom experience form ([https://tinyurl.com/UMassEngineerClassroom](about:blank)) to report academic dishonesty anonymously. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent.

**Cheating and Plagiarism Policy**

The University Academic Honesty Policy Applies in this and all courses. This policy can be found on the University Web Page ([https://www.umass.edu/honesty/](about:blank)). Appendix B covers plagiarism, cheating, fabrication, and facilitating dishonesty. Students are expected to be familiar with the definitions and examples provided.

**Inclusivity.**

Everyone should feel that they are an integral part of the community and that all individuals and their perspectives are respected. A diversity of perspective and experience provides a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your contribution is not being valued or respected for any reason, please speak with me privately. If you wish to communicate with someone else in the College or University, there are several ways to do so anonymously or to provide contact information if you so choose:

1. Notify the University Diversity, Equity, and Inclusion Office through the “Report a Climate Incident” form: https://www.umass.edu/diversity/incident-report-form

Note that this form requires sharing name and contact information.

1. Speak with Assistant Dean Dr. Paula Rees ([rees@umass.edu](about:blank)).
2. Report an incident anonymously to the College of Engineering Diversity, Equity, and Inclusion Office
   * Climate Concerns and Suggestions - [https://tinyurl.com/UMassEngineerClimate](about:blank)
   * Classroom Experience - [https://tinyurl.com/UMassEngineerClassroom](about:blank)
3. Reach out to the departmental DEI Committee
   * Reach out to a member of the BME committee. See member list here: [https://bme.umass.edu/diversity](about:blank)
   * Reach out to a member of the CHE committee. See member list here: [https://che.umass.edu/che-diversity-equity-inclusion](about:blank)
   * Anonymous CEE feedback form: [https://cee.umass.edu/cee-diversity-equity-inclusion/feedback](about:blank)
   * Anonymous ECE feedback form: [https://ece.umass.edu/ece-diversity-equity-inclusion](about:blank) (scroll down for feedback link)

We are all members of an academic community with a shared responsibility to cultivate a climate where all individuals are valued and where both they and their ideas are treated with respect.

**Pronouns and Names.**

Everyone has the right to be addressed by the name and pronouns that they use for themselves. Students can indicate their preferred/chosen first name and pronouns on SPIRE, which appear on class rosters. Please let me know what name and pronouns I should use for you if they are not on the roster. A student’s chosen name and pronouns are to be respected at all times in the classroom. To learn more, please see this resource:

[https://www.umass.edu/stonewall/sites/default/files/pronouns\_intro.pdf](about:blank)

**Gender Respect and Title IX.**

The University of Massachusetts Amherst aspires to be a university environment that is free of discrimination, sexual harassment, and sexual violence. Faculty have the responsibility to inform students of resources and reporting options. If you or someone you know has experienced sexual assault, sexual misconduct, or sexual discrimination please see [https://www.umass.edu/titleix/what-to-do](about:blank) for information about resources and reporting options. A report to the Title IX Coordinator may be made at any time (including during non-business hours) by using the Title IX Coordinator’s email (TitleIXCoordinator@umass.edu), telephone number (413.545.6124) or mail. UMass Amherst is committed to supporting community members who report concerns of prohibited conduct. Please reach out to me if you would like assistance connecting with any of these resources/options.

If you read this syllabus, email me at [adelsanto@umass.edu](mailto:adelsanto@umass.edu) introducing yourself and why you chose to (and are hopefully excited) to take this class.