Emerging Technologies and Sustainability

EVS 489 / 589
Spring 2021, 3 credits
EVS 489LEC – Course number 23638
EVS589LEC – Course number 23651

Mode: traditional (in person)
Tuesday and Thursday 9:35 – 10:50, Natural Science Complex 205

Instructor

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Course description

Emerging technologies and sustainability

How are advances in information technology, biotechnology, automation, and digital sensing reshaping our environments? In what ways do they contribute to environmental problems, and how can they contribute to solutions? We'll look at big-picture trends in emerging technologies (genetics, robotics, information technology and machine learning, nanotechnology) and assess how they **are** being applied, and **could** be applied, to the environment, including land use, agriculture, energy, climate response, biodiversity loss, and more. Students will be able to (1) understand the past and present trajectories and scientific advancements behind emerging technologies, (2) assess the potential effects of emerging technologies, and (3) identify levers for policy change.

What are we going to learn?

Learning Outcomes

By the end of this course, you will be able to...

Learning outcome	This will be assessed by…
1. Holistically assess the potential effects of emerging technologies on particular environments and societies.	Assignment 1
2. Explain some of the ways contemporary society thinks about technology, and some of the critiques that thinkers who deal with the social dimensions and ethics of technology have about this (i.e., learn the landscape of this field of study).	Assignments 1, 2, and 3; weekly reading reflections
3. Generate and articulate your own ideas and theories about how and why emerging technologies are applied to environmental challenges (i.e., make your own contribution to this landscape).	Assignment 3; Weekly reading reflections
4. Produce a piece of creative and critical work that explores course concepts; present ideas and work to a target audience.	Assignment 1

Course schedule

You only have to read two articles listed for each week. Choose whichever look most interesting.

Part One: History and background on emerging technologies

Week 1: February 2, 4 What are emerging technologies?

- Sheila Jasanoff (2016) , *The Ethics of Invention: Technology and the Human Future*, ch. 1, "The Power of Technology"
- Nature 4 Climate (2020), "Nature-Positive Recovery for People, Economy and Climate", 3.9 "New Nature-Tech", pages 44-46

Week 2: February 9, 11 Where do our ideas about technology come from?

- Lee Vinsel and Andrew L. Russell (2020), *The Innovation Delusion*, ch. 2 (p. 19-36)
- Langdon Winner, "Do Artifacts have Politics?"
- David Edgerton (2007), The Shock of the Old, ch. 8, "Invention"
- Adrian Daub, What Tech Calls Thinking, Introduction and ch. 6, "Disruption"

Week 3: February 16, 18 Who gets to shape technology?

- Ruha Benjamin (2020), "The New Jim Code"
- Judy Wajcman (2010), "Feminist theories of technology", in *Cambridge Journal of Economics*
- Fred Turner (2017), "Don't' Be Evil: Fred Turner on Utopias, Frontiers, and Brogrammers", *Logic* no. 3
- Peter Dauvergne (2020), *AI in the Wild*, ch. 8, "Deepening Inequity and Injustice"

Week 4: February 23, 25 Where is the Internet going — and what does it mean for environmental action?

- Tim Hwang (2020), *Subprime Attention Crisis*, chapter 1
- Tim Hwang (2020), *Subprime Attention Crisis*, chapter 2
- Jaron Lanier (2020), *Ten Reasons to Delete Your Social Media Accounts Right Now*, excerpt at https://abcnews.go.com/Technology/book-excerpt-jaron-laniers-ten-arguments-deleting-social/story?id=56009512
- Zeynep Tufekci (2018), "How social media took us from Tahrir Square to Donald Trump", *MIT Tech Review*

Week 5: March 2, 4 What are machine learning, blockchain, and the Internet of Things, and how can we explain them to our friends and family?

- Peter Dauvergne (2020), *AI in the Wild*, pages 1-11 and chapter 4, "Conserving and Rewilding the Earth"
- Adam Greenfield (2017), *Radical Technologies* ch. 5, "Cryptocurrency"
- Kate Crawford and Vladan Joler (2018), "Anatomy of an AI System: The Amazon Echo as an Anatomical Map of Human Labor, Data, and Planetary Resources", *AI Now Institute and Share Lab*, https://anatomyof.ai
- Jennifer Gabrys (2020), "Smart forests and data practices: From the Internet of Trees to planetary governance." *Big Data & Society*

Week 6: March 9, 11 What is synthetic biology?

- Christopher Preston (2018), *The Synthetic Age*, chapters 3 and 4
- Christina Agapakis and Natsai Audrey Chieza, "The Factory Is Alive", *Logic* no. 4
- "Lab Cultures: An Interview with an Anonymous Biologist", *Logic* no. 9
- Michael Specter, "A Life of Its Own", *The New Yorker* (2009), https://www.newyorker.com/magazine/2009/09/28/a-life-of-its-own

Part Two: Emerging Technologies Applied to Environmental Challenges

Week 7: March 16, 18 How can emerging technologies help with the biodiversity crisis?

- Christopher Preston (2018), *The Synthetic Age*, ch. 5
- Christopher Preston (2018), *The Synthetic Age*, ch. 6
- Bram Büscher, *The Truth About Nature: Environmentalism in the Era of Post-Truth Politics and Platform Capitalism*, ch.5, "Elephant 2.0."
- Irus Braverman (2020), "Robotic Life in the Deep Sea", in *Blue Legalities: The Life and Laws of the Sea*, edited by Irus Braverman and Elizabeth R. Johnson.

Week 8: March 23, 25 How can emerging technologies help with sustainable food?
Proposal for Assignment 1 due Mar. 25

- Xiaowai Wang, "Behind China's 'pork miracle': how technology is transforming rural hog farming," https://www.theguardian.com/environment/2020/oct/08/behind-chinas-pork-miracle-how-technology-is-transforming-rural-hog-farming
- Peter Dauvergne (2020), *AI in the Wild*, ch. 7, "Smart cities and farms"
- Saloni Shah, "Can alternative proteins scale?" https://thebreakthrough.org/issues/food/alternative-proteins-scale

Week 9: March 30, Apr. 1 How can emerging technologies help with clean energy?

- Jesse Goldstein (2018), *Planetary Improvement: Cleantech Entrepreneurship and the Contradictions of Green Capitalism*, chapter 1
- Jesse Goldstein (2018), *Planetary Improvement: Cleantech Entrepreneurship and the Contradictions of Green Capitalism*, chapter 2
- Zero Cool (2019), "Oil is The New Data", in *Logic* no. 9
- Shannon Elizabeth Bell, Cara Dagget, and Christine Labuski (2020), "Toward feminist energy systems: Why adding women and solar panels is not enough", *Energy Research and Social Science*

Week 10: Apr. 6, 8 How can emerging technologies help with the climate crisis?

- Peter Dauvergne (2020), *AI in the Wild*, ch. 9, "Accelerating Extraction and Consumption"
- Michael Bloomberg (2020), "When Data Drives Decisions"
- Kyle Powys Whyte (2020), "Geoengineering and Indigenous Climate Justice: A Conversation with Kyle Powys Whyte"

Part Three: Lines of Action

Week 11: Apr. 13, 15 *No readings: Presentations* **Assignment 1 due Apr. 16**

Week 12: Apr. 20, 22 Civil society and social movements

- Jaron Lanier (2020), "Restructuring the Tech Economy"
- Ben Tarnoff (2018) "The Data is Ours", in *Logic* no. 4
- David Hess, Steve Breyman, Nancy Campbell, and Brian Martin (2008), "Science, Technology, and Social Movements," in *The Handbook of Science and Technology Studies (3rd edition),* p. 473-489

Week 13: Apr. 27, 29 Labor and tech
Assignment 2 Due Apr. 30

- Safiya Umoja Nobel and Sarah T. Roberts (2017), "Engine Failure", in Logic no .3
- Ellen Pao (2020), "Tech, Heal Thyself"
- K. Sabeel Rahman (2018), "The New Octopus", in *Logic* no. 4

Week 14 May 4, 6 Science policy; responsible research and innovation
Assignment 3 Due May 7

- Xiaowei Wang (2020), *Blockchain Chicken Farm*, Chapter 5, "Made in China"
- David Guston (2014), "Understanding Anticipatory Governance", *Social Studies of Science*
- Kahled Hosseini (2020), "Technology for Global Good"

Why do the parts of the course come in the order that they do?

This course is divided into three units. First, we begin with the questions: What is technology? What's our mental model of how it develops? We get familiar with key ideas about how innovation works, and some of the key problems that scholars have had with how technology is going. At the same time, in order to talk about the prospects of emerging technologies, we have to have some basic background about them. This first unit is a crash course in key technological forms. You're not expected to know technical details about these technologies, but by the end of these first weeks, you should be able to explain the basic ideas of how machine learning, blockchain, or CRISPR work to a friend.

In the second unit, we're going to look at how these technological trends intersect particular environmental challenges. We'll get into when these technologies are applied to environmental problems, when they're not, and why.

The third unit focuses on how we can make tech serve our needs better, via social movements, worker action, and policy. We'll talk about how people working in science and technology policy, and related fields, have thought about this problem, as well as discuss our own ideas.

What does a typical class session look like?

This is a discussion-based seminar course. Short lectures of 15-20 minutes will build on the readings, and most classes will feature a few short videos, but the majority of class time will be spent in both small-group and whole-class discussions.

This course meets in person.
If it becomes necessary to transition to online, everything will be the same, but on Zoom — you will still need to attend discussions at the appointed time.

How is this course graded?

Weekly Reflections + Discussion questions	40%
Assignment 1 – Tech briefing (proposal, final, and presentation)	40%
Assignment 2 – Virtual event reflection	5%
Assignment 3 – Final reflection paper	15%

Letter Grade	Points	Letter Grade	Points	Letter Grade	Points
A	94-100 points	B-	80-82 points	D+	65-69 points
A-	90-93 points	C+	77-79 points	D	60-64 points
B+	87-89 points	C	73-76 points	F	< 60 points
B	83-86 points	C-	70-72 points		

Please also remember you are responsible for participating in the course evaluation process.

What are the weekly reflections?

For each week, you'll write a 1 page / ~4 paragraph reflection on the readings and post it in the discussion board. These reflections should

- summarize the arguments or main ideas of the articles (but ideally in one sentence - not more than a paragraph), or talk about your main takeaway from them.

AND do at least one of the following other things:

- link them to something else that you've read (in this class or others)
- link them to something going on in the world right now
- critique the articles — not "I liked it" or "I didn't like it", but what are its weak points, where is it lacking in evidence or failing to consider something, what could strengthen it, etc.
- respond to a point someone else made on an article.

Please at least mention both articles if there are multiple articles assigned on a week, though it's okay if you want to mainly focus on one in more detail.

You will also write two discussion questions for the week. Writing a good discussion question is actually an art. We will talk more about this.

You only have to do this for ten weeks: the first week won't have one due; and you can choose other weeks over the semester to have "off" depending on your workload for other classes, etc.

Reflections will be due Mondays at midnight. This means you must read ahead for the entire week, and not do the reading an hour before class. This can admittedly be a pain if your customary rhythm is to read at the last minute. However, there is a collective benefit in that the class discussions will be richer.

What are the assignments?

Assignment 1: Tech briefing. **Proposal due March 15. Paper due April 16.**

What is it? You'll choose an emerging technology and give us a briefing about what environmental challenges it could help respond to. This won't simply be a report of what other people have said, and the controversies or hype around this technology, though: you'll give us your own assessment of the future prospects of its use under different scenarios, and what social or policy action could shape its development. Imagine you're a consultant or analyst who's not just getting us up to speed on this technology or practice, but really advising us on where it's going. This assignment has three graded components: a proposal (10 points), the presentation (10 points), and the work itself, which would be a relatively short, 4-6 page briefing paper (20 points).

What is the purpose of it? The purpose is (1) to take a deeper dive into a particular topic and share what you've learned, (2) to practice assessing the future of a technology from multiple standpoints that incorporate ideas about society, (3) to reflect more on future environments, (4) to practice presentation skills.

Assignment 2: Event reflection. **Due April 30.**

What is it? A brief (2 page) reflection paper on an event you attend (virtual is fine - there are lots of options these days) relating to emerging technologies and sustainability. We will have a running list of events you can attend. It could be anything from a webinar to a Congressional hearing.
This can be turned in any time — it's suggested to do it sooner rather than later.

What is the purpose of it? To participate in real-world debates; to analyze the representations, narratives and strategies actors in those debates are using.

Assignment 3: Final reflection. **Due May 7.**

What is it? This is a 3-4 page essay that tackles the key questions of the course: how can emerging technologies be applied to environmental challenges, and why are they often not? You can refer to thinkers you've read, and/or offer your own take on this question.

What is the purpose of it? It's an opportunity to bring together the ideas we've talked about in the course, and articulate your own view on the key questions.

What if I can't turn them in on time?

If you have a reason for not being able to complete assignments on time, let me know. Late work without a reason will still be accepted, but will receive 10% off per day that it is late.

What books and equipment do I need?

Readings can all be found on UBLearns, including excerpts from books.

To effectively participate in this course, regardless of mode of instruction, the University recommends you have access to a Windows or Mac computer with webcam and
broadband. Your best opportunity for success in the blended UB course delivery environment (in-person, hybrid, and remote) will require these minimum capabilities listed on the following website: buffalo.edu/ubit/service-guides/hardware/getting-started-withhardware/purchasing-or-using-an-existing-computer.html

Academic Integrity

Academic integrity is critical to the learning process. It is your responsibility as a student to complete your work in an honest fashion, upholding the expectations your individual instructors have for you in this regard. The ultimate goal is to ensure that you learn the content in your courses in accordance with UB's academic integrity principles, regardless of whether instruction is in-person or remote. Thank you for upholding your own personal integrity and ensuring UB's tradition of academic excellence. The academic integrity policy is available at buffalo.edu/academic-integrity.

Accessibility Resources

If you have any disability which requires reasonable accommodations to enable you to participate in this course, please contact the Office of Accessibility Resources in 60 Capen Hall, 716-645-2608 and also the instructor of this course during the first week of class. The office will provide you with information and review appropriate arrangements for reasonable accommodations, which can be found on the web
at: http://www.buffalo.edu/studentlife/who-we-are/departments/accessibility.html

Health and wellness

While your attendance and participation are essential components of this course, it is critical that you follow public health guidelines. As such, any student exhibiting COVID-19 symptoms should not come to campus to participate in coursework. If you need to miss class due to illness, isolation or quarantine must notify the instructor by email as soon as possible and no later than 24-hours after missing class. At that time, you are also expected to make arrangements to complete missed work.

As indicated in the Student Compliance Policy for COVID-19 Public Health Behavior Expectations, in our classroom you are required to:

1. Obtain and wear masks/face coverings in campus public spaces, including campus outdoor spaces.
2. Maintain proper physical distancing in public spaces and must stay 6 feet apart from one another.
3. Stay home if you are sick.
4. Abide by New York State, federal and Center for Disease Control and Prevention (CDC) travel restrictions and precautionary quarantines.
5. Follow campus and public health directives for isolation or quarantine.
6. Should you need to miss class due to illness, isolation or quarantine, you are required to notify the course instructor and make arrangements to complete missed work.
7. You are responsible for following any additional directives in settings such as labs, clinical environments etc.

Students who are not complying with the public health behavior expectations will be asked to comply. Should the non-compliant behavior continue, course instructors are authorized to ask the student to leave the classroom. Non-compliant students may also be referred to the Office of Health Promotion to participate in an online public health class to better educate them on the importance of these public health directives for the entire community.

Critical Campus Resources

Sexual Violence

UB is committed to providing a safe learning environment free of all forms of discrimination and sexual harassment, including sexual assault, domestic and dating violence and stalking. If you have experienced gender-based violence (intimate partner violence, attempted or completed sexual assault, harassment, coercion, stalking, etc.), UB has resources to help. This includes academic accommodations, health and counseling services, housing accommodations, helping with legal protective orders, and assistance with reporting the incident to police or other UB officials if you so choose. Please contact UB's Title IX
Coordinator at 716-645-2266 for more information. For confidential assistance, you may also contact a Crisis Services Campus Advocate at 716-796-4399.

Mental Health

As a student you may experience a range of issues that can cause barriers to learning or reduce your ability to participate in daily activities. These might include strained relationships, anxiety, high levels of stress, alcohol/drug problems, feeling down, health concerns, or unwanted sexual experiences. Counseling, Health Services, and Health
Promotion are here to help with these or other issues you may experience. You can learn more about these programs and services by contacting:

Counseling Services:
120 Richmond Quad (North Campus), 716-645-2720
202 Michael Hall (South Campus), 716-829-5800

Health Services: Michael Hall (South Campus), 716-829-3316

Health Promotion: 114 Student Union (North Campus), 716-645-2837