University of Wisconsin-Madison
HIST SCI 160: Engineering Inequality
Technology and Inequity Throughout History

Instructor: Daniel Williford, PhD / daniel.williford@wisc.edu
Office Hours: Thursday 2-4 pm, On Zoom, https://uwmadison.zoom.us/j/97607658612

Course Description

What is the relationship between technology and social inequality today? As climate change, pandemics, and economic transformations threaten to intensify both global and localized disparities, arguments play out in media, the STEM community, and policy circles that single out new technologies as both a cause of and a potential solution to the present crisis. This course offers a critical perspective on the place of technology in history is essential for grasping the stakes of these debates in the contemporary world.

History of Science 160 offers an introduction to the history of technology, centered around the relationship between technology and various forms of social inequality. It addresses: 1) how gendered, racial, and class-based disparities have shaped the history of technology; 2) how forms of engineered inequity have intersected with state-building, colonial projects, environmental degradation, and revolutionary programs; 3) how technology has been implicated in attempts to imagine a more just society.

This course is designed to introduce students to central themes and concepts in the histories of science, medicine, and especially technology. The course is organized into four sections or modules that build on one another through case studies. These are transnational in scope and move chronologically from the 17th century to the present. The course also gives significant attention to histories of technology that originated outside of the U.S. and Europe.

Lecture Time and Place: MWF 9:55-10:45, Engineering Hall 1213

Course Requisite: None

Course Designations, Attributes, and Mode of Instruction:
    Level – Elementary
    Breadth – Humanities or Social Science
    Mode – Face-to-Face (In-Person)

Credit Policy

This 3-credit course meets as a group for 3 hours per week (according to UW-Madison's credit hour policy, each lecture counts as 1.5 hours and each discussion counts as an hour). The course also carries the expectation that you will spend an average of at least 2 hours outside of class for every hour in the classroom. In other words, in addition to class time, plan to allot an average of at least 8 hours per week for reading, writing, preparing for discussions, and/or studying for quizzes and exams for this course.

Regular and Substantive Interaction

This course provides for regular and substantive interaction between students and the instructor through participation in regularly scheduled lectures and discussions lead by the instructor and personalized comments on students' assignments and exams.

Course Learning Outcomes

- Identify and summarize key concepts in the history of technology
- Utilize historical methods and techniques and apply these to analyze primary sources including print media, visual art, film, web-based content, and technical materials
- Apply concepts from the history of technology to relevant present-day issues in engineering and technology policy
- Produce original arguments that demonstrate critical thinking skills and draw on course concepts, arguments specifically about the role of technology—as a collection of material, social, and political practices—and technological change in the contemporary world

Grade Distribution and Assignments

A	AB	B	BC	C	D	F
93.0–100%	88.0–92.99%	83.0–87.99%	78.0–82.99%	78.0–82.99%	60.0–69.99%	0–59.99%

Discussion Participation Rubric

Excellent (90-100)	Good (80-90)	Competent (70-80)	Inadequate (60-70)	Fail (0-60)
-Mastery over readings and previous discussion -Explores questions rigorously -Comes to class with interpretations and questions -Engages others	-Knows readings well -Consistent preparation and involvement -Offers analysis of texts in class	-Basic grasp of reading -Mostly offers facts or surface-level interpretations -Contributes when called upon but not actively engaged	-Insufficient command of reading -Attempts to contribute facts or interpretations when called but unable to offer substance	-Uninvolved -Unexcused -Disruptive

Participation: 20%
Participation grades will be earned based on active contributions to discussions and activities. Thoughtful, regular, and relevant participation during synchronous class discussions will help you earn full points. Contributions to asynchronous parts of the course (responding to other students' reading responses) will also help you earn points.

Reading Responses/Skill-Based Assignments: 20%
8 weeks out of the semester students will be required to post a written response to the readings for that week on the course website or a short skills-based writing activity. Responses will vary in length depending on the assignment but will be between approximately 250 words and 350 words. The responses should be analytical in nature (rather than just summaries) and should connect to the readings from that week. Skill-based assignments will help students develop their writing abilities and prepare them for the final paper. The prompt or question for each week will be posted by 5pm on Sunday and all responses should be posted by Thursday at 5pm that week. They will be posted in the public Discussions section of Canvas, and you are strongly encouraged to respond and reference other students' posts. All posts will be graded 0 (for incomplete), 1.5 (for a post that does not respond to or fulfil the prompt), or 2.5 (for a complete and thoughtful response) for a total of 20 points.

In-Class Primary Source Analysis: 10%
Students will complete 5 in-class primary sources analysis activities during the course of the semester. Students should spend time before class familiarizing themselves with the source in question. In class, students will be placed in groups and given a prompt or a series of questions about the source to respond to. You will have ten minutes to discuss the source in groups and then half an hour to

individually compose a short analysis of the text. (Students who are absent the day of the activity may complete and submit it by Monday of the next week)

Midterm Exam: 10%
Essay and short answer exam designed to assess comprehension of readings and lectures for the first half of the course. **October 22**

Putting Theory to Work (Final) Paper: 20%

Building on themes and concepts introduced in this course, students will produce an essay on a contemporary issue involving technology and inequality. The paper should focus on a particular technical object, institution, practice, or event— situated in time and place. It should draw on both course readings and additional secondary material of your choosing while making use of the analytic and argumentative skills developed over the course of the semester.

The first task is to identify an intriguing current issue. This current issue should be something you are genuinely interested in and care about. It can be a particular technology, a debate, an event, or any other discrete, and well-defined topic related to technology and inequality. Picking a controversial subject will likely enrich the paper. It should also be prominent in contemporary public discourse because you will need to find three substantive treatments of the topic in credible popular media. These should be "feature length" stories from sources like *Slate*, *The Atlantic*, *The Economist, The New Yorker*, *Wired*, *Esquire, The New York Times Magazine*, *The National Review*, a major newspaper, NPR, a national television news investigative story, etc. These sources should *not* be academic scholarship, since the purpose of this assignment is to use concepts discussed during the course to clarify, complicate, and illuminate an important public debate. This paper should showcase your ability to use concepts drawn from the history of technology to analyze the issue of your choosing.

Your analysis should draw on **at least three readings from the course**, in addition to relevant class lectures and discussions. There is no need to cite sources other than the articles you are analyzing and materials presented in course. Indeed, because **the purpose of this essay is to demonstrate your mastery of the ideas and content of this course and your ability to apply them to new cases**, we discourage you from doing so.

Thesis and Bibliography (1 page) (2 points on the total 20): Including a paragraph describing your topic; a preliminary statement of your thesis or argument; a list of

the articles you have identified and the course readings you plan to use. Due: **Monday, November 15**

Final Draft (6-8 pages double-spaced) Due: **Friday, December 10**

Final Exam: 20%
The Final Exam is comprised of two sections. Part 1: short answer questions focused on material from readings and lectures from the second part of the semester. Part 2: a synthetic essay question (choose between 3) that will cover themes addressed in the course as a whole.

Course Requirements & Policies

Communication: You are encouraged to communicate your questions and concerns to the instructor, and it is strongly preferred **that you use the Canvas course site to communicate**.

Course Canvas Site: Please consult the HISCI 160 Canvas website frequently. All announcements will be posted there, as will important handouts and links to other sites. **Reading Responses should be posted in the "Discussion" tab of the course website.**

Attendance: **Attendance at all course meetings is mandatory**. Active participation in discussions will be an important component of the overall course grade. **Attendance is not the same as participation**. Participation grades will be earned based on active contributions to discussions and activities, not passive attendance. Tardiness, leaving early, etc. will negatively affect your participation grade. You may miss one lecture or discussion section (unexcused) without it negatively impacting your grade. After that, a pattern of absences will result in a significant lowering of your grade. If a chronic illness or other emergency prevents attendance**, it is your responsibility to talk to the instructor as soon as possible to arrange an accommodation. That said, I understand the complexities of this new learning environment and my inclination will be to be flexible, but it is up to you to communicate about attendance.**

Accommodations: The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for

students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty will work either directly with the student or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.

Religious observances: The University of Wisconsin-Madison supports accommodation of religious observances that might conflict with the course schedule. Students must notify the instructor within the first two weeks of class of the specific days or dates on which they request relief. Make-ups may be scheduled before or after the regularly scheduled requirements. It is understood that instructors may set reasonable limits on the total number of days claimed.

Academic Integrity: All students are expected to adhere to the University of Wisconsin—Madison's core values regarding academic integrity. Students should utilize the Chicago Manual of Style Online for all issues of source citation, along with any specific guidelines provided in the course assignments. Clarifying the disciplinary standards of research ethics and source citation is part of the educational mission of this course, and students should consult the faculty instructor regarding any questions. Plagiarism or other academic misconduct may result in a zero on the assignment or exam, a lower grade in the course, or failure in the course. See the Dean of Students Office for more information about the academic misconduct process (http://students. wisc.edu/doso/acadintegrity.html). *When in doubt, be sure to cite carefully and completely all sources from which you obtain information*. This includes books, articles, documents, internet sites, encyclopedias, and periodicals. You must provide a citation if you exactly quote a source, paraphrase it, or extract information from it.

Privacy and Use of Audio/Video Recordings: Lecture materials and recordings for HISCI 160 are protected intellectual property at UW-Madison. Students in this course may use the materials and recordings for their personal use related to participation in this class. Students may also take notes solely for their personal use. If a lecture is not already recorded, you are not authorized to record my lectures without my permission unless you are considered by the university to be a qualified student with a disability requiring accommodation. [Regent Policy Document 4-1] Students may not copy or have lecture materials and recordings outside of class, including posting on internet sites or selling to commercial

entities. Students are also prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted lecture materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct.

Diversity and Inclusion: Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.

Student Health and Well-being: As a student you may experience a range of issues that can cause barriers to learning. These might include strained relationships, anxiety, high levels of stress, alcohol/drug problems, feeling down, or loss of motivation. University Health Services can help with these or other issues you may experience. Help is always available. You can learn about free, confidential mental health services available to you; call 608-265-6600 (option 2) or visit uhs.wisc.edu.

Grading Policies: Late assignments will be **docked half a letter** and another half for each 24 hour period after that. If you know you will have trouble meeting a deadline for any reason, please speak to the instructor in advance (or as soon as possible) to arrange an extension. To appeal a grade, you must submit a written explanation to the instructor explaining why you deserve a better grade. The instructor's decision, however, will be final, and may be to raise, lower, or keep the grade

Readings: Keeping up with daily reading assignments is an *essential* part of this course. All readings are subject to change, and students will be notified of any changes via email or the course website.

Course Schedule

<u>Part I: Foundations</u>

Week 1: What is a technology?

Wed, Sept 8: Course Introduction

Fri, Sept 10: Discussion: What is technology?

> <u>Reading</u>: Eric Schatzberg, "Introduction," *Technology: Critical History of a Concept* (Chicago: University of Chicago, 2018), 1-15.

Week 2: Foundations: Political Technologies

Mon, Sept 13: Technological Determinism

> <u>Reading</u>: "Does Technology Control Us?" in David E Nye, *Technology Matters: Questions to Live With* (Cambridge, Mass.: MIT Press, 2007).

Wed, Sept 15: Political Technologies and Nuclear Families

> <u>Reading</u>: Langdon Winner, "Do Artifacts Have Politics?" in *The Whale and the Reactor: A Search for Limits in an Age of High Technology* (Chicago: University of Chicago Press, 1988), 19-39.

Fri, Sept 17: Discussion: What does it mean to describe technologies as political?

Week 3: Foundations: Users/Designers

Mon, Sept 20: Users and Designers

> <u>Reading</u>: Ronald Kline and Trevor Pinch, "Users as Agents of Technological Change: The Social Construction of the Automobile in the Rural United States," *Technology and Culture* 37, no. 4 (1996): 763–95.

Wed, Sept 22: The Myth of Technological Supremacy

Reading: Clapperton Chakanetsa Mavhunga, "Introduction," in *Transient Workspaces: Technologies of Everyday Innovation in Zimbabwe* (Cambridge, Mass.: MIT Press, 2014).

Fri, Sept 24: Primary Source Analysis

Reading: "Tractor Manual," Ford Motor Company (1920).

Week 4: Technologies and Social Order: Between Equality and Inequality

Mon, Sept 27: The Myth of Autonomous Technology

Reading: Noel Perrin, *Giving Up the Gun: Japan's Reversion to the Sword, 1543-1879* (Boston: D. R. Godine, 1979), ix-xii, 3-45.

Wed, Sept 29: Technologies of Social Order

Fri, Oct 1: Discussion Activity: If technologies do not always develop in a linear fashion what other factors lead to their adoption?

Part II: Technology and the Modern Project

Week 5: Engineering the State and Colonial Engineering

Mon, Oct 4: Engineering the State

Wed, Oct 6: Colonial Engineering

Reading: John Law, "Technology and Heterogeneous Engineering: The Case of Portuguese Expansion" in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology,* edited by Trevor Pinch, 105-127 (MIT Press, 2012).

Fri, Oct 8: Primary Source Analysis

Reading: Collected Maps from the Academia das Ciências de Lisboa, Biblioteca Nacional, http://purl.pt/162/1/index.html.

Week 6: Revolutionary Engineering and Machine-breaking

Mon, Oct 11: Industrial Revolutions?

Reading: Ken Alder, "Innovation and Amnesia: Engineering Rationality and the Fate of Interchangeable Parts Manufacturing in France," *Technology and Culture* 38, no. 2 (1997): 273–311.

Wed, Oct 13: Machine-Breaking

Reading: Jeff Horn, "Machine-Breaking in England and France during the Age of Revolution," *Labour / Le Travail* 55 (2005): 143–66.

Fri, Oct 15: Primary Source Analysis

Reading: G. Beaumont, "Some Observations on the Conduct of the Luddites," [1812] in *The Luddites: Three Pamphlets, 1812-1839*, British Labour Struggles: Contemporary Pamphlets 1727-1850 (New York: Arno Press, 1972).

Week 7: Medical Technologies / Technologies of Racecraft

Mon, Oct 18: Technologies of Racialization

Reading: Lundy Braun, *Breathing Race into the Machine: The Surprising Career of the Spirometer from Plantation to Genetics*, (Minneapolis: University of Minnesota Press, 2014). Introduction (xiii-xxiv) and Chapter 2, "Black Lungs and White Lungs" (27-54).

Reading: CDC, "Coronavirus Disease 2019 (COVID-19)," Centers for Disease Control and Prevention, April 19 2021, https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/race-ethnicity.html

Wed, Oct 20: Discussion Activity and Mid-Term Review

Fri, Oct 22: <mark>Mid-Term Exam</mark>

Part III: Who does technology work for?

Week 8: Engineering Racial Inequality

Mon, Oct 25: Agriculture and Indigenous Knowledge Systems

>Reading: Abena Dove Osseo-Asare, *Bitter Roots: The Search for Healing Plants in Africa* (Chicago: University of Chicago Press, 2014), Intro (pg. 1-7); Chapter 2 "Take Grains of Paradise for Love"

Wed, Oct 27: Industry, Slavery, and Technological Labor

>Reading: Daniel B. Rood, *The Reinvention of Atlantic Slavery: Technology, Labor, Race, and Capitalism in the Greater Caribbean*, *The Reinvention of Atlantic Slavery* (New York: Oxford University Press, 2017), Ch. 4 "Wrought Iron-Politics," 94-120.

Fri, Oct 29: Discussion Activity: Technology and Racial Inequality

Week 9: Spatial and Temporal Technologies of Colonialism

Mon, Nov 1: Temporality, Technology, and Colonialism

Wed, Nov 3: Techno-Giantism

>Reading: Meredith McKittrick, "An Empire of Rivers: The Scheme to Flood the Kalahari, 1919–1945," *Journal of Southern African Studies* 41, no. 3 (May 4, 2015): 485–504.

Fri, Nov 5: <mark>Primary Source Analysis</mark>

Reading: Jules Verne, *Invasion of the Sea* (Wesleyan University Press, 2007). [Saharan Sea]

Week 10: Gendering Technology

Mon, Nov 8: Gendering Technology

Reading: Ruth Schwartz Cowan, "Twentieth-Century Changes in Household Technology," in *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983), 69-101.

Reading: "Solving the Equation: The Variables for Women's Success in Engineering and Computing," *AAUW: Empowering Women Since 1881*, https://cra.org/crn/2015/04/solving_the_equation_the_variables_for_womens_success_in _engineering_a/

Wed, Nov 10: Reproductive Labor and Biocaptial

Reading: Kalindi Vora, "Kalindi Vora: After the Housewife / Radical Philosophy," *Radical Philosophy* (blog), accessed August 10, 2021, https://www.radicalphilosophy.com/article/after-the-housewife.

Fri, Nov 12: Discussion Activity: What does it mean for technology to be gendered?

Week 11: Risk, Technonationalism, Disaster

Mon, Nov 15: Risk and Stratification

==Putting Theory to Work Paper: Thesis and Bibliography Due==

Wed, Nov 17: Technonationalism and Natural Disaster

Reading: Sara B. Pritchard, "An Envirotechnical Disaster: Nature, Technology, and Politics at Fukushima," *Environmental History* 17, no. 2 (April 1, 2012): 219–43.

Fri, November 19: **No in person class, but watch the documentary and post your response on the Discussion Tab**

Film: *Containment,* 2018 Peter Galison and Robb Moss.

Part IV: High-Tech Inequality

Week 12: Histories of Computing

Mon, Nov 22: Social Histories of Computing

Reading: Lisa Nakamura, "Indigenous Circuits: Navajo Women and the Racialization of Early Electronic Manufacture," *American Quarterly* 66, no. 4 (2014): 919–41.

Wed, Nov 24: Environmental Histories of Computing

Reading: Christophe Lécuyer, "From Clean Rooms to Dirty Water: Labor, Semiconductor Firms, and the Struggle over Pollution and Workplace Hazards in Silicon Valley," *Information & Culture: A Journal of History* 52, no. 3 (2017): 304–33.

Web: https://www.epa.gov/smm-electronics

Fri, Nov 26: **No Class Thanksgiving Break**

Week 13: Algorithmic Governance

Mon, Nov 29: Algorithmic Governance

Reading: "The Digital Poorhouse, by Virginia Eubanks," Harper's Magazine, January 1, 2018, https://harpers.org/archive/2018/01/the-digital-poorhouse/

Wed, Dec 1: The New Jim Code

Reading: Ruha Benjamin, "Engineered Inequity," *Race After Technology: Abolitionist Tools for the New Jim Code,* 49-76 (Medford, Mass.: Polity, 2019).

Fri, Dec 3: <mark>Primary Source Activity</mark>:

Explore: https://whitecollar.thenewinquiry.com/

Week 14: Geoengineering

Mon, Dec 6: Geoengineering

Reading: James R. Fleming, *Fixing the Sky: The Checkered History of Weather and Climate Control* (New York: Columbia University Press, 2010), Ch. 8.

Wed, Dec 8: Modeling the Future

Watch: Anthropocene Campus | Modeling Wicked Problems, presented by Paul Edwards https://www.youtube.com/watch?v=Kbfx62CGxm4&ab_channel=HKWAnthropocene

Fri, Dec 10: Final Exam Review

<mark>Putting Theory to Work Paper: Final Due</mark>

Week 15: Engineering other Possible Futures?

Mon, Dec 13: Imaginaries of Repair in a Broken World

Reading: Steven J. Jackson, "Rethinking Repair," in Media Technologies: Essays on Communication, Materiality and Society, ed. Tarleton Gillespie, Pablo Boczkowski, and Kristen Foot (Cambridge, Mass.: MIT Press, 2014).

Reading: Ytasha Womack, *Afrofuturism the World of Black Sci-Fi and Fantasy Culture* (Chicago: Chicago Review Press, 2013), Ch. 12 "Future World."

Wed, Dec 15: Wrap-Up Session