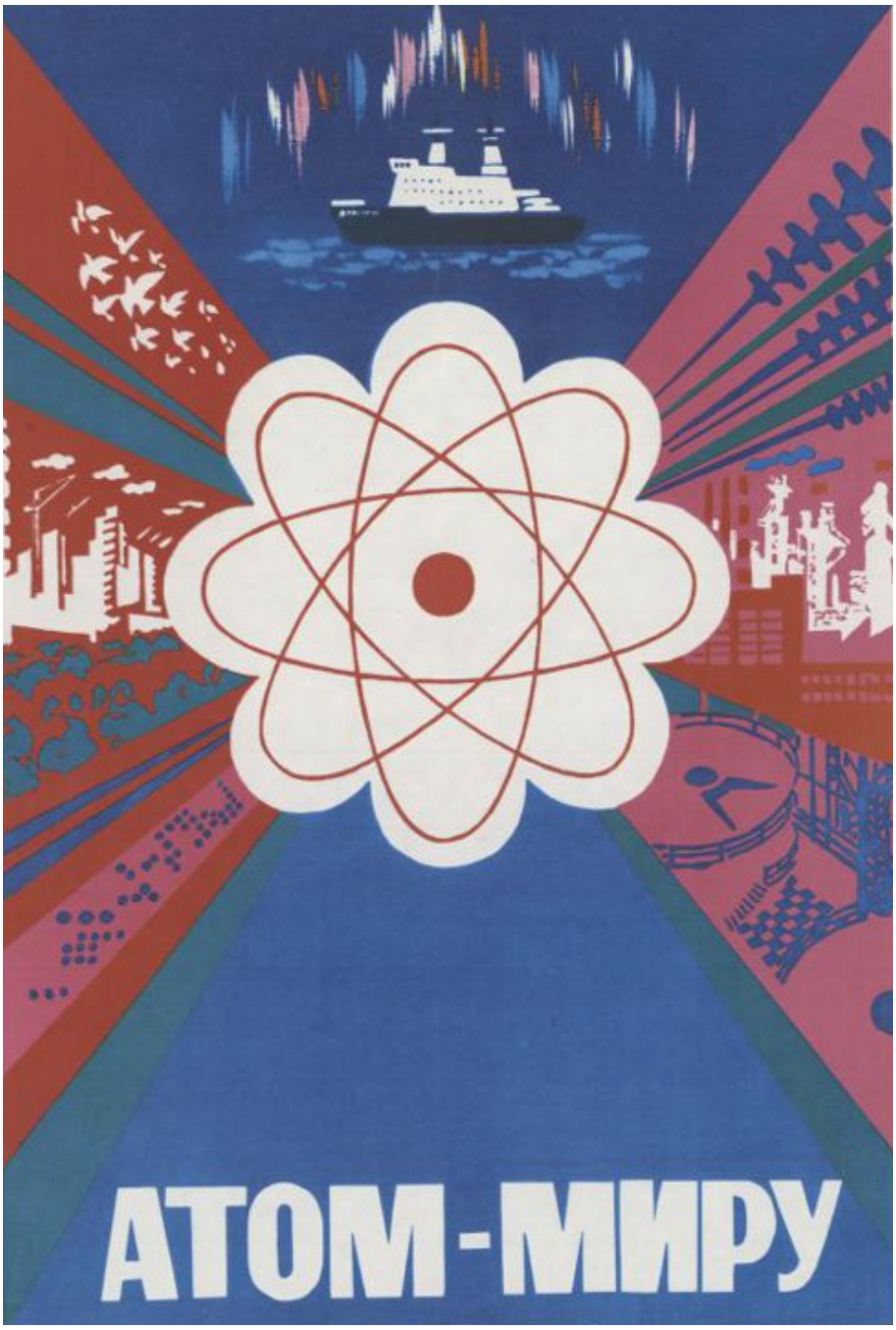
Syllabus subject to change at instructor's discretion. Latest version posted on Canvas.

DUKE UNIVERSITY

ENERGY 89S

Energy & Society



Tom J. Cinq-Mars, Ph.D.

Spring 2025

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Acknowledgements

This syllabus is the product of many conversations with colleagues and former students across multiple institutions. In particular, I wish to thank Kyle Bradbury, Nico Hotz, Evan Hepler-Smith, Charles Irons, Bryan Koen, Luana Lima, Brian Murray, Colleen Nieto, Jackson Ewing, Eric Rohlfing, and Will Niver, among many others.

Cover Image: L. Beliskii and V. Potapov, artists, *Atom–miry* [*The Peaceful Atom to the World*], 1982, lithographic print, 39.7 × 53 cm (15.6 × 20.9 in), State Historical Museum, Moscow, Russia, https://catalog.shm.ru/entity/OBJECT/3002940.

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1. Overview

1.1. Purpose

Although controversial, nuclear energy promises to contribute to the stability and security of a low-carbon power system.[1] To acquaint you with that key technology, this course explores the history and sociology of commercial nuclear power plants through guided discussions, hand-on activities, and collaborative research. Broadly speaking, it will impart to you three new skills. First, you will learn to explain energy as not only the ability to "make us go" but also a set of dynamic relationships between people. Second, you will learn to interpret large technical systems as not only engineering feats but also social constructs, or creations bound by shared ideas. Third, you will learn to analyze the failures of high-risk technologies as not only individual but also organizational events–that is, the results of culture. Taken altogether, these skills will equip you for meaningful pursuits ranging from advanced social science courses here at Duke to highly sought-after internships abroad.

1.2. Cost of Enrollment

To participate in this seminar, you must obtain your own paper copies of four texts. (See Section 2.4. Textbooks below.) As of January 2025, the total cost of these materials ranges from $120 to $180 depending on format (hardcover or paperback), condition (new or used), and your purchase arrangement (rent or buy). Anyone whose circumstances may prevent them from acquiring these materials should reach out to the instructor as soon as possible. Do not drop the course because of cost concerns!

1.3. Important Due Dates

This table includes deadlines for only the most heavily weighted assignments. For more information, see Section 4.2. Assignments & Grade Weights.

#	DELIVERABLE(S)	DUE DATE
1	Bluebook Test 1	Thursday, February 6
2	Prospectus & Pitch	Tuesday, February 11
3	Bluebook Test 2	Tuesday, March 4
4	Rough Backgrounder & Slide Deck	Thursday, March 6
5	Bluebook Test 3	Thursday, April 3
6	Polished Backgrounder & Slide Deck	Thursday, April 10
7	Presentation	Thursday, April 17

[1] International Energy Agency (IEA), *Nuclear Power in a Clean Energy System* (Paris: IEA, May 2019), https://www.iea.org/reports/nuclear-power-in-a-clean-energy-system.

1.4. Detailed Description

In the last months of 1920, the Bolsheviks launched a crash program to electrify their new socialist state. Named the Plan of the State Commission for the Electrification of Russia, or GOELRO for short, this program called for the construction of more than one hundred new power plants before the decade was out. The thirty highest-priority plants would quintuple Russia's peak generating capacity. And together with the remaining eighty-two, they would also catapult Russia to the forefront of electrical economics and engineering.[2] Indeed, few Bolshevik programs ultimately proved more consequential. Lenin's rallying cry "Communism is Soviet power plus the electrification of the entire country!" echoed in Soviet propaganda right up to the collapse of Soviet power itself.[3] More important, GOELRO enabled Russia to build one of human history's most energy-intensive societies.[4] By the early 1970s, the fully Sovietized republic boasted not only the world's first but also the world's largest civilian nuclear reactor.[5] The latter, called the RBMK, later became infamous at Chernobyl.[6]

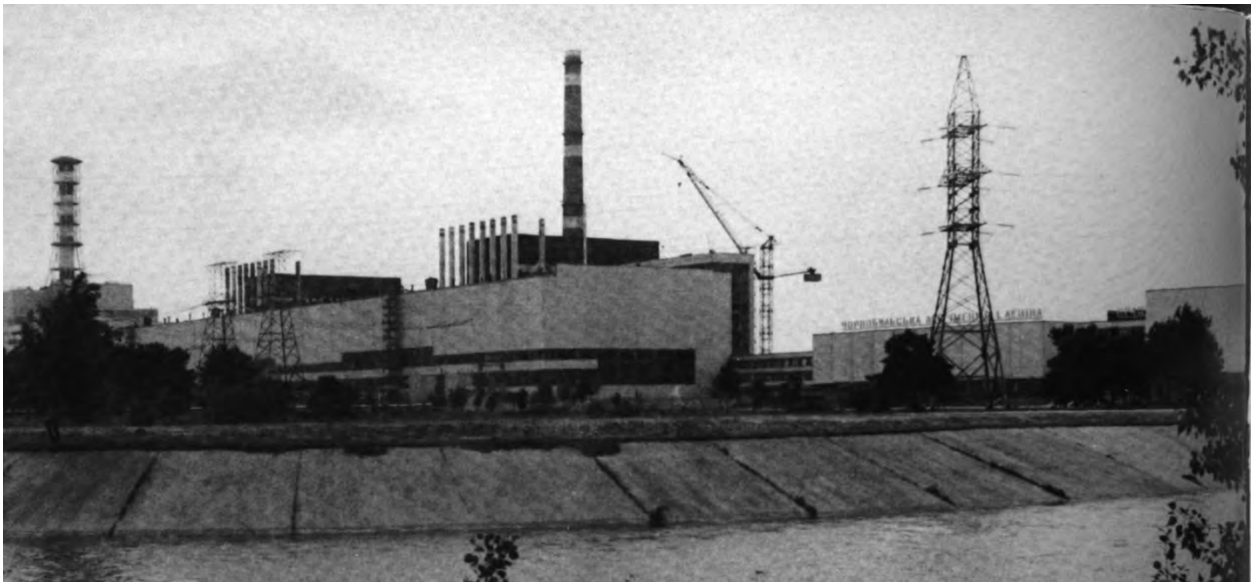


Figure 1: View of the Chernobyl Nuclear Plant from the Southeast Two Months before the Accident
Source: Soviet Life, No. 2 (353) (February 1986), 10, https://hdl.handle.net/2027/inu.30000108554068.

[2] Jonathan Coopersmith, *The Electrification of Russia, 1880-1926* (Ithaca, NY: Cornell University Press, 1992), 167–74. For a portion of the plan, see *Plan Elektrifikatsiia RSFSR: Vvedenie k doklady 8-mu Sezdu Sovetov* [*Electrification Plan for the Russian Soviet Federative Socialist Republic: Foreword of the Report to the 8th Congress of Soviets*] (Moscow: Gos. tekh. izd., 1920), https://search.rsl.ru/ru/record/01008270148.
[3] V. I. Lenin, *Polnoe sobranie sochinenii* [*Complete Works*], vol. 42, 5th ed. (Moscow: Izd. Politicheskoi literatury, 1970), 30. See also P. Voevodin, *Elektrichestvo–Vazhneishii rychag v stroilstve sotsialisticheskogo khoziaistva (k 10-letiyu plana GOELRO)* [*Electricity–The Most Important Lever in the Construction of a Socialist Economy, On the 10th Anniversary of GOELRO*] (Moscow: Tip. im. Vorovskogo, 1931), 21.
[4] Nuno Luis Madureira, "Energy Intensity," chap. 8 in *Key Concepts in Energy* (Cham, Switzerland: Springer International Publishing, 2014), 153–80, https://doi.org/10.1007/978-3-319-04978-6_8.
[5] I. Ia. Sykenik, ed., *Leninskii plan elektrofikatsii v deistvii* (Moscow: GUGK, 1975), 10–11.
[6] Adam Higginbotham, *Midnight in Chernobyl: The Untold Story of the World's Greatest Nuclear Disaster* (New York: Simon & Schuster, 2019), esp. chap. 7.

Taking the history of GOELRO and similar efforts as analytical points of departure, this first-year seminar investigates energy as a form of social relations. Thematically, it focuses on nuclear power and pivots around questions of organizational behavior. Geographically, it zooms in on North America, Eurasia, and East Asia. Chronologically, it covers the period beginning in the 1940s and continuing through to the present day.
s
Although anchored in history, this course engages with a multitude of disciplinary perspectives. The chemistry of fissile material, the engineering of reactors, and the political economy of electric utility regulation are all covered at introductory levels. In addition, special emphasis is placed on honing the transdisciplinary skills of research, writing, data visualization, public speaking, and teamwork. Thus, the course ultimately serves as a gateway to the study of energy in the very broadest sense.

1.5. Duke's Own Energy History

Nearly two decades before Lenin and GOELRO, James B. Duke launched an ambitious electrification campaign all his own right here in the Carolinas. Establishing the Southern Power Company, Duke and his associates dammed portions of the Catawba River to electrify a growing business empire of tobacco warehouses, cotton mills, and furniture factories. The company's goal, as Duke himself declared, was to industrialize the southeastern United States with "white coal," or underutilized hydropower.[7] And from that perspective, the venture initially succeeded in spectacular fashion. By 1912, it boasted a total generating capacity of 84,000 horsepower; and by 1924, a capacity of more than 700,000 horsepower, the largest in the region. Simultaneously, Southern Power even became multinational, leading the construction of Canada's *Ile Maligne* Hydroelectric Station, then the largest in the world.[8]

Figure 2: Directors of the Southern Power Company, Great Falls Station, Catawba River, S.C., 1905
Source: Rubenstein Library, Doris Duke Photographs, https://idn.duke.edu/ark:/87924/r4028sq54.

[7] Christopher J. Manganiello, *Southern Water, Southern Power: How the Politics of Cheap Energy and Water Scarcity Shaped a Region* (Chapel Hill, N.C.: University of North Carolina Press, 2015), 47–49.
[8] David Massell, *Amassing Power: J. B. Duke and the Saguenay River, 1897-1927* (Montreal: McGill-Queen's University Press, 2000), 57.

The achievements of what one influential sociologist later dubbed "the Piedmont Crescent of Industry" came at a cost, however.[9] Although straightjacketed by dams and artificial reservoirs, North Carolina's rivers receded and overflowed with frustrating irregularity, casting doubts over white coal's potential to fuel the Southeast's modernization. The debate came to a head in 1925 when drought-induced blackouts compelled Southern Power to adopt a new operating strategy. For the next seventy years, the company and its successors, including Duke Energy Corporation, built a fleet of thermal power plants along the very same reservoirs originally engineered for hydroelectric generation.[10] Ironically, the shift led James Duke's brainchild to become synonymous with ordinary black coal. In 1976, director Barbara Kopple released *Harlan County, USA*, a documentary about a grueling coal miners' strike against the company's subsidiaries in Kentucky.[11] The film later won an Academy Award.

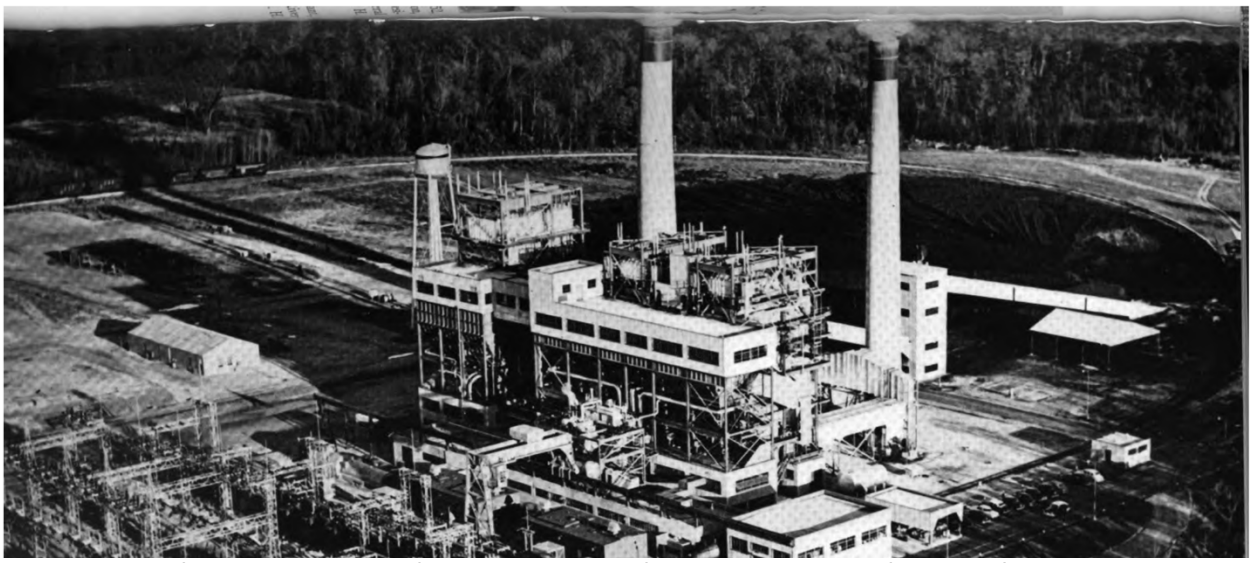


Figure 3: Aerial View of W.H. Weatherspoon Steam-Electric Generating Plant, Lumber River, N.C., 1958
Source: J. Riley, *Carolina Power & Light Company*, (Raleigh: Edwards & Broughton Co., 1959), 232–33ff, https://hdl.handle.net/2027/nyp.33433038457267.

As participants in this seminar, we have a special responsibility to learn from Duke's own energy history, one in which James B. Duke played but a part. Yet what does that responsibility entail, exactly, and what should we do about it? Working together, we will devote considerable time throughout the term to exploring these questions and debating our conclusions. Driven by a common desire to secure a sustainable energy future, we will strive to become better citizens of our campus, our communities, and our shared planet.

[9] Rupert B. Vance, *Human Geography of the South: A Study in Regional Resources and Human Adequacy* (Chapel Hill, N.C.: University of North Carolina Press, 1932), esp. chap. 12.
[10] Christopher J. Manganiello, "Hitching the New South to 'White Coal': Water and Power, 1890–1933," *The Journal of Southern History* 78, no. 2 (2012): 255–92.
[11] Eliot Marshall, "Bloody Harlan Revisited," *New Republic* 170, no. 23 (June 8, 1974): 14–16.

2. Logistics

2.1. Instructor

You are warmly invited to call the instructor by his first name, Tom. A business historian, Tom earned his Ph.D. in 2020 from Duke's own Department of History. He enjoys interacting with students and encourages you to engage him with questions about life at Duke, the Energy & Environment Certificate, and Energy Studies broadly.

Tom J. Cinq-Mars, Ph.D. (he/him/his)
Nicholas Institute for Energy, Environment & Sustainability
tom.cinq.mars@duke.edu
(919) 681-6255
Gross Hall 102R

2.2. Meeting Times & Locations

This course meets in Gross Hall for seventy-five minutes twice per week, the first time on Tuesday, the second time on Thursday. Outside of class time, Tom holds drop-in office hours, also in Gross Hall, on Monday afternoons. In addition, he encourages you to arrange one-on-one consultations with him to address any questions or concerns.

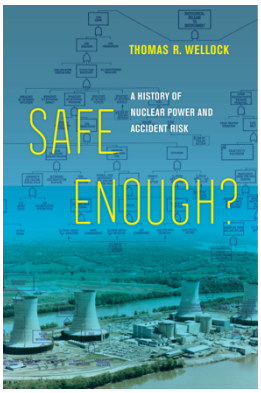
#	EVENT TYPE	DAY	TIME	LOCATION
1	Office Hours	Monday	2:00-4:00pm	Gross Hall 102R
2	Seminar	Tuesday	1:25-2:40pm	Gross Hall 100C
3	Seminar	Thursday	1:25-2:40pm	Gross Hall 100C

2.3. Learning Management System

You will use Canvas to submit your written work, review slide decks, and engage multimedia content, among several other tasks. At the start of the term, be sure to familiarize yourself with the course site and its tools. See the link below. Should you have any questions about Canvas, be sure to connect with Tom as soon as possible.

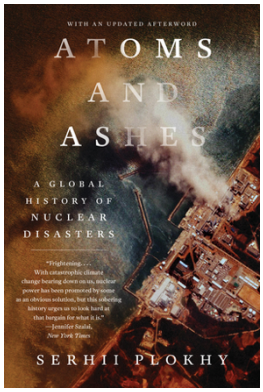
https://canvas.duke.edu/courses/49987

2.4. Textbooks



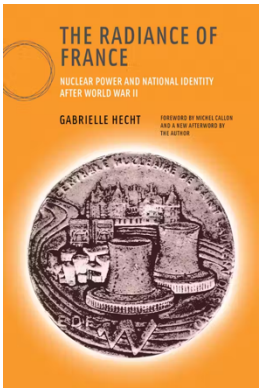
Thomas R. Wellock, *Safe Enough?: A History of Nuclear Power and Accident Risk* (Oakland: University of California Press, 2021).

Wellock's *Safe Enough?* traces the development of civilian nuclear power in the United States from the perspective of federal regulators. The book's emphasis on risk makes it an ideal starting point for our investigation. You may obtain paper copies from several sources, including popular online marketplaces and independent retailers like the The Regulator on Ninth Street (https://www.regulatorbookshop.com/). [$39.34–$56.45]



Serhii Plokhy, *Atoms and Ashes: A Global History of Nuclear Disasters* (New York: W. W. Norton, 2022).

Plokhy's *Atoms and Ashes* provides detailed yet accessible narratives of the world's worst nuclear power plant accidents. A fitting follow-up to Wellock's book, it will help us understand how individuals, firms, and governments make decisions under extraordinary circumstances. In addition to the outlets named above, the University Bookstore stocks paper copies for sale (https://duke.ecampus.com/shop-by-course). [$6.27–$20.39]



Gabrielle Hecht, *The Radiance of France: Nuclear Power and National Identity after World War II*, 2nd ed. (Cambridge, MA: MIT Press, 2009).

Perhaps the course's most challenging, Hecht's book investigates the long history of France's nuclear scale-up, the most successful in an industrialized country to date. Deploying technological, political, and cultural analysis, it exemplifies the study of energy as social relations. Paper copies are available from all sources named above. [$32.69–$43.06]

ENERGY 89S Custom Course Pack

Compiled by Tom, this course pack brings together thirty primary source documents from more than a dozen repositories. Dating from the 1950s to the 2010s, these documents include everything from trade journal articles to formerly classified intelligence reports. Read in tandem with the textbooks above, they will not only help us practice textual analysis but also impart deep insights into the nature of sociotechnical systems. [$56.12]

2.5. Academic & Wellness Resources

Effortless perfection is a myth. The reality is that learning at the college level pushes us to our intellectual, emotional, and physical limits, even when everything else in life is going well. To navigate these challenges, you are encouraged to explore the many academic and wellness resources Duke provides, including those listed below. After interacting with these places, students often emerge feeling more relaxed, better prepared, and wishing only that they had gone sooner.

Academic Resource Center (ARC): Offers free academic support services like peer tutoring, test prep, and learning communities to any Duke undergraduate student, in any year, studying in any discipline. Helpful resources include a real-time map of campus study spaces. For more information, and to schedule a consultation, check out ARC's website: https://arc.duke.edu/.

Thompson Writing Program (TWP) Writing Studio: Facilitates critical and creative writing through collaborative workshops, writing groups, and events. Free non-evaluative consultations with specialized writing consultants offered in person and synchronously online. For more information, and to schedule a consultation, see TWP's website: https://twp.duke.edu/twp-writing-studio.

Center for Data and Visualization Sciences: Staffed by consultants who can help with a variety of data projects and related computing problems. Consultations in the Brandaleone Lab, on the first floor of Bostock Library, are available during walk-in hours as well as by appointment. Workshops on programming languages offered regularly. See https://library.duke.edu/data.

DukeReach: Provides comprehensive outreach services like advocacy, referrals, and follow-ups to students experiencing difficulties related mental health, physical well-being, social adjustment, post-hospitalization, and coordination of care. Encourages reports of non-emergency concerns from students, faculty, and staff. For information, see https://students.duke.edu/wellness/dukereach/.

Counseling and Psychological Services (CAPS): A short-term care clinic that provides individual and group counseling, including couples counseling, as well as a wide range of skill-building workshops and assistance with referrals for more specialized services. Located on the third floor of the Student Wellness Center next to Penn Pavilion. For information, see https://students.duke.edu/wellness/caps/.

3. Pedagogy

3.1. Learning Objectives

This course adopts a pedagogical framework known as Bloom's Taxonomy. Formulated in 1956 and revised in 2001, Bloom's Taxonomy has provided generations of college instructors with an effective roadmap for guiding students' work with knowledge. It comprises six main categories of educational goals lying along a continuum from simple to complex. The act of Remembering represents the simplest type of cognitive process, the act of Creating the most complex.[12] In addition, this course adds a seventh category, the act of Collaborating, an even more demanding core competence essential to success in any job, career, and major undertaking.

#	CATEGORY	DESCRIPTION
1	Remembering	Recall some of the major themes, questions, and research agendas of the interdisciplinary field of Energy Studies.
2	Understanding	Explain sociotechnical systems theory as it relates to the design and performance of energy-related infrastructure like nuclear power plants.
3	Applying	Sketch the evolution of risk assessment methods in the civilian nuclear industry in terms of deterministic and probabilistic approaches to safety.
4	Analyzing	Explain nuclear accidents as the result of organizational behavior, citing examples of safety culture, technological style, and regulatory capture, among other social phenomena.
5	Evaluating	Assess the potential contributions, if any, of nuclear power to the challenges of climate change and energy access in local, national, as well as global contexts.
6	Creating	Compose parts of a United Nations-style issue brief on a salient question of human energy use and power generation.
7	Collaborating	Work together with a small group of classmates to plan, prepare, and present the same UN-style issue brief above.

[12] Lorin W. Anderson, ed. et al, *A Taxonomy for Learning Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives* (New York: Longman, 2001). See also Patricia Armstrong, "Bloom's Taxonomy," Vanderbilt University Center for Teaching, retrieved November 9, 2022, https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/.

3.2. Teaching Philosophy

To help you achieve the learning objectives above, this course is taught according to three principles derived from academic training, classroom experience, and continuous reading in the field of college teaching. Students interested in learning more about these principles should refer to the sources in the footnotes. Moreover, you are warmly encouraged to consult with Tom, who is always eager to discuss ideas about teaching with students.

Principle 1: Social scientists are information processors par excellence. Although partial to the written word, social scientists weave together narratives using broad arrays of materials. Statistics, photographs, maps, engineering schematics, art–all have proven indispensable to richly textured studies of peoples and organizations. This ability to synthesize vast and varied sources in compelling ways, Tom argues, sets social scientists apart from other scholars.[13] When finely honed, it empowers practitioners to tackle major societal problems better than even the most advanced artificial intelligence–to become, in short, robot-proof.[14] Thus, this course leverages a kaleidoscope of sources to help you cultivate a creative mindset that no smart machine can ever match.

Principle 2: Studying history requires getting our hands dirty (literally). The past is not just an abstraction. It persists in the material world around us–on our campus, in our homes, and even throughout the ground beneath our feet. Learning the history of energy, then, means engaging not only a variety of artefacts but also a variety of human senses, especially touch. To that end, several lessons in this course include hands-on components aimed at placing you in physical contact with things like fire, steam, coal, slag, and oil–messy substances one and all. Regardless, these exercises, when properly carried out, are eminently safe and designed to show you an academic discipline that is as much tactile as textual.

Principle 3: Collective efforts yield impactful scholarship. Popular histories often emphasize heroic achievements, or the work of exceptional individuals. We know, for example, that Darwin alone wrote *On the Origin of Species* (1859); that Einstein single-handedly revolutionized theoretical physics; that Carson all but launched the environmental movement on her own. Yet careful investigations of the past just as often reveal the prosaic realities behind such stylized narratives. In truth, the great majority of history's movers and shakers benefited from the support of others less known to us. Moreover, the most lasting achievements, including the advancement of entire industries, generally prove impossible to trace to any one person.[15] Much of this course, therefore, is dedicated to leveraging the power of teamwork.

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[13] Anthony Grafton, *The Footnote: A Curious History* (Cambridge, Mass.: Harvard University Press, 1999).
[14] Joseph E. Aoun, *Robot-Proof: Higher Education in the Age of Artificial Intelligence* (Cambridge, Mass.: The MIT Press, 2017).
[15] Robert C. Allen, "Collective Invention," *Journal of Economic Behavior & Organization* 4, no. 1 (March 1, 1983): 1–24, https://doi.org/10.1016/0167-2681(83)90023-9.

3.3. A Typical Class

Even on good days, most of us command only short attention spans. To stay focused on the course's learning objectives, then, we will divide almost every seminar into a series of short activities. The table below provides an example of an agenda for a typical class. But note that the order of activities will vary from class to class; and that several classes will include unstructured time for research.

#	ACTIVITY	DESCRIPTION	TIME
1	Warm Up	A puzzle designed to redirect your thoughts back to the assigned readings.	10 min
2	Conversation Piece	A student-led discussion about the assigned readings and related topics of interest.	25 min
3	Practicum	A hands-on lesson about a particular energy technology or a small-group research exercise.	15 min
4	Explainer	A brief lecture from Tom about the day's key concept that ties together the above.	15 min
5	Cool Down	An overview of upcoming assignments plus some extra time for clarifying questions	10 min

3.4. Classroom Environment

We will all strive to maintain a classroom that is at once inclusive and intellectual.

3.5. A Promise about Grading

If you make a good-faith effort to complete assignments on time, show up in class, and communicate with me proactively, then I will do everything in my power to help you earn your desired grade in the course. I cannot guarantee anyone a top or even a high mark. But I can guarantee everyone that I will meet them halfway. I make that guarantee to you here and now.

Tom J. Cinq-Mars, Ph.D.
January 6, 2025

Grade Point Equivalents

LETTER	PERCENT	4.0 SCALE
A+	97-100	4.0
A	93-96	4.0
A-	90-92	3.7
B+	87-89	3.3
B	83-86	3.0
B-	80-82	2.7
C+	77-79	2.3
C	73-76	2.0
C-	70-72	1.7

4. Accountability

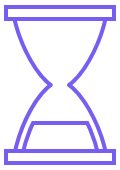
4.1. Core Policies

Electronics: "The pen," as a pair of psychologists famously declared in 2014, "is mightier than the keyboard."[16] In other words, taking notes by hand generally improves how students encode and recall material. Therefore, you will swap your laptops, tablets, etc. for pens and paper notebooks in most (but not all!) classes. Exceptions will be happily granted for any student needing accommodations.

Accommodations: Since all students have the right to have certain accommodations met, you are encouraged to notify Tom about any needs as soon as possible. In addition, you are strongly encouraged to consult Duke's Disability Management System. For helpful information on Duke's accommodations, accessibility, and assistance policies, see https:// access.duke.edu/requests.

Attendance: You are expected to attend and participate in every class. Excessive tardiness, or arriving to class more than 10 minutes late, will count as an absence. In the event of a short-term medical issue or instance of distress, you should consult with Tom at your earliest convenience and submit an Incapacitation Form: https://class-absences.trinity.duke.edu/if/.

Academic Integrity: While completing this course, you are expected to uphold the Duke Community Standard. The Registrar's annual bulletin entitled *The Duke Community Standard in Practice* explains what this means in detail. Likewise, many students find the Duke Libraries' resources on avoiding plagiarism to be helpful: https://library.duke.edu/research/plagiarism.



Late Work: With the exception of bluebook tests, all written work must be submitted before class time on the appointed date. Should you need extra time to complete any assignment, contact Tom in advance of the due date or as soon as possible. Without Tom's written approval, late submissions will result in a reduction of 25 percent per day late.

[16] Pam A. Mueller and Daniel M. Oppenheimer, "The Pen Is Mightier Than the Keyboard: Advantages of Longhand Over Laptop Note Taking," *Psychological Science* 25, no. 6 (June 1, 2014): 1159–68, https://doi.org/10.1177/0956797614524581. True, experts have debated Mueller and Oppenheimer's conclusions. See Kayla Morehead et al., "How Much Mightier Is the Pen than the Keyboard for Note-Taking?," *Educational Psychology Review* 31, no. 3 (September 2019): 753–80, https://doi.org/10.1007/s10648-019-09468-2. Yet the consensus in favor of longhand notes remains strong. See Linlin Luo et al., "Laptop Versus Longhand Note Taking: Effects on Lecture Notes and Achievement," *Instructional Science* 46, no. 6 (December 1, 2018): 947–71, https://doi.org/10.1007/s11251-018-9458-0.

4.2. Assignments & Grade Weights

To prepare for most classes, you will take brief notes in longhand–that is, with pen and paper–on readings totaling about 40 pages in length, sometimes more, sometimes less. Most readings will be primary sources. After about four such classes, you will compose a short essay on a broader topic in preparation for a wide-ranging discussion with Tom and your classmates. You will also complete an open-ended or "bluebook" test, which will serve as a capstone to a thematic unit or module. Altogether, the course consists of three such modules. Thus, by the end of the term, you will have assembled a portfolio of twelve sets of longhand notes, three essays, and three tests all on your own. This independent portfolio assignment is designed to help you retain the course's most critical knowledge over the long term.

In addition, you will complete two collaborative assignments. The first is a research project proposal. Working with several classmates, you will lead a class discussion, compose a prospectus, and then "pitch" a project idea to your classmates in a lightening talk. The four most compelling project pitches, determined by a class-wide vote, will provide the basis of the second collaborative assignment: an United Nations-style oriented issue brief. Working with a larger team, you will prepare a brief report (backgrounder), build a slide deck, and then deliver a more formal oral presentation before an expert panel. Both assignments are designed to help you hone your research skills and explore emerging interests under minimal supervision.

The table below breaks down each assignment by work mode, deliverables, their occurrences, and grade weights. The next section shows how they unfold over time.

#	TITLE	WORK MODE	DELIVERABLE	OCCS.	WEIGHT
1	Reading Portfolio	Individual	Longhand Notes (4x)	3	5%
			Mini Essay	3	5%
			Bluebook Test	3	6%
2	Project Proposal	Collaborative (Short Term)	Conversation Piece	1	5%
			Prospectus	1	6%
			Pitch	1	7%
3	Issue Brief	Collaborative (Long Term)	Rough Backgrounder	1	6%
			Rough Slide Deck	1	6%
			Polished Backgrounder	1	7%
			Polished Slide Deck	1	7%
			Presentation	1	8%

4.3. Extra Credit Opportunities

In addition to the assignments above, you will have three opportunities to earn extra credit, all of which require some form of collaboration with your classmates.

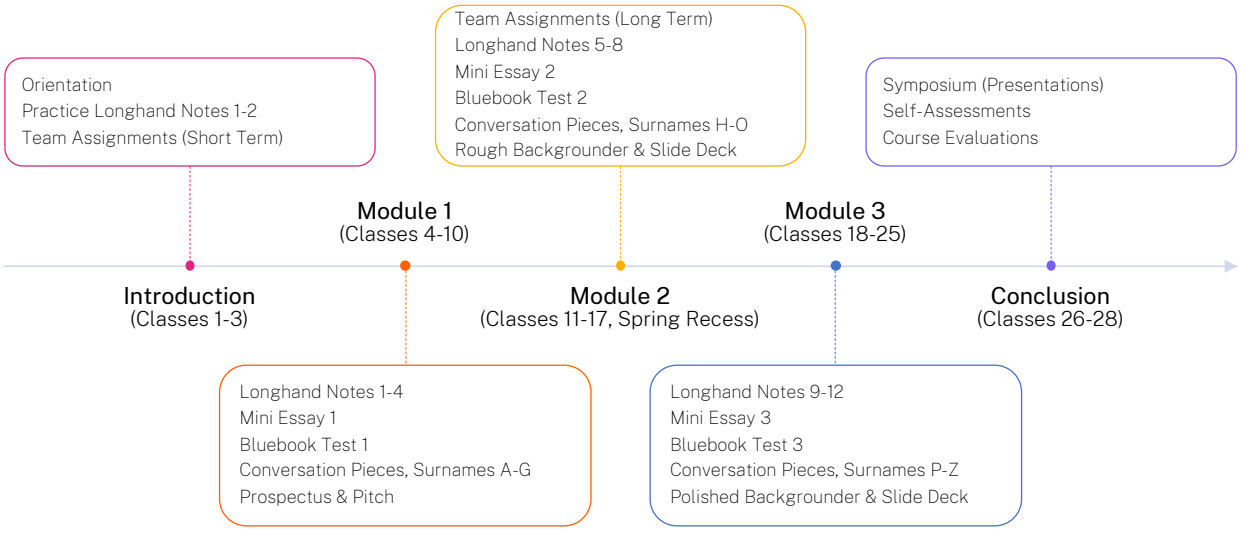
Project Pitch Day, Tuesday, February 11: Working together with a small team, deliver on the designated day the most compelling of six research project pitches as determined by Tom. Your reward will be one extra point to your final course grade.

Research Symposium, Thursday, April 17: Similar to the above, work with a small team to deliver the most compelling of four research project presentations, only this time before a panel of outside experts. The prize is two extra points to your final course grade.

Course Evaluation, Tuesday, April 22: On the final day of the course, submit a completed course evaluation through Watermark at duke.evaluationkit.com. If the class as a whole achieves a response rate of 93 percent or higher, then everyone will be awarded one extra point to their final course grades.

4.3. Course Design

Like any good story, this course unfolds in three parts: a beginning, a middle, and an end. The beginning spans the term's first week and introduces not only the course content but also Energy Studies as a broader academic discipline, including its key questions, debates, and research methods. The middle includes three parts all its own, or modules based on a distinct time period and overarching themes. Each module lasts about four weeks and culminates in a bluebook test. The modules themselves culminate in the course's end: a formal research symposium followed by a far less formal debrief, both slated for the last week of classes. Taken together, these three parts structure our long-term learning while varying our short-term practices.



4.5. Keywords

Most lessons will boil down to a single core concept or keyword. Drawn from disciplines ranging from evolutionary anthropology to engineering, these keywords have rich histories all their own that map closely onto the overarching narratives we will encounter in our textbooks and course parks. Thus, the keywords provide a useful means of focusing our reading and class discussions. Practically speaking, they also serve as the subjects of our three bluebook tests.

For detailed discussions of several keywords, see Daniel P. Carpenter, *The Forging of Bureaucratic Autonomy: Reputations, Networks, and Policy Innovation in Executive Agencies, 1862-1928* (Princeton, NJ: Princeton University Press, 2001); Lee Clarke, *Mission Improbable: Using Fantasy Documents to Tame Disaster* (University of Chicago Press, 1999); Thomas P. Hughes, "Technological Momentum," chap. 9 in *Technology and Society: Building Our Sociotechnical Future*, ed. Deborah G. Johnson and Jameson M. Wetmore (Cambridge, Mass.: MIT Press, 2008), 141–50; Nuno Luis Madureira, *Key Concepts in Energy* (Cham, Switzerland: Springer International 2014); and Charles Perrow, *The Next Catastrophe: Reducing Our Vulnerabilities to Natural, Industrial, and Terrorist Disasters* (Princeton, N.J.: Princeton University Press, 2007).

#	MODULE 1	MODULE 2	MODULE 3
1	Design Basis Accident	Normal Accident	Technocracy/Technocrat
2	Fault Tree	Fantasy Document	Bureaucratic Autonomy
3	Probabilistic Risk Assessment	Technological Style	Technological Momentum
4	Risk-Informed Decisionmaking	Regulatory Capture	Charismatic Technology
5	Safety Culture	Nuclear Fuel Cycle	Levelized Electricity Costs

5. Schedule

In each class description below, the combination of blue, bold, and small-caps font denotes KEYWORDS, while the combination of orange, bold, and standard font signifies deliverables. Note that copies of all recommended readings can be found on Canvas.

Introduction: An Allegory for the Atomic Age

Week 1: The Legend of Faust and Nuclear History

Class 1: Our Unexpected Nuclear Era[17]

Thursday, January 9

An overview of the course and, by way of teaching demonstration, a short lesson on the history and legacy of the world's first civilian nuclear power plant.

1. D. I. Blokhintsev and N. A. Nikolaev, "The First Atomic Power Station of the USSR and the Prospects of Atomic Power Development," A/CONF.8/P/615 (August 1955), United Nations Digital Library, https://digitallibrary.un.org/record/3905126.
2. Josiah Eccles, "Three Weeks in the U.S.S.R.," *Journal of the Institution of Electrical Engineers* 3, no. 27 (March 1, 1957): 142–48, https://doi.org/10.1049/jiee-3.1957.0069.

Week 2: What Is a Sociotechnical System?

Class 2: Anatomy of a Nuclear Power Plant

Tuesday, January 14

A lesson on the technical aspects of civilian nuclear power that are essential to understanding its evolution in social, political, and environmental contexts.

1. Savannah Fitzwater, "Nuclear Power: A Technical Overview," chap. 3 in *The Oxford Handbook of Energy Politics*, ed. Kathleen J. Hancock and Juliann Emmons Allison (New York: Oxford University Press, 2018), 42–67, https://doi.org/10.1093/oxfordhb/9780190861360.013.27.
2. U.S. Nuclear Regulatory Commission (NRC), *Typical Pressurized Water Reactor*, last updated February 9, 2023, infographic, https://www.nrc.gov/reactors/power/pwrs.html.
3. NRC, *Typical Boiling Water Reactor*, last updated February 9, 2023, infographic, https://www.nrc.gov/reactors/power/bwrs.html.

[17] Yican Wu et al., "Nuclear Safety in the Unexpected Second Nuclear Era," *Proceedings of the National Academy of Sciences of the United States of America* 116, no. 36 (September 3, 2019): 17673–82, https://doi.org/10.1073/pnas.1820007116.

Class 3: "A Hell of a Way to Boil Water"[18]
Thursday, January 16
A team-based discussion about shifting attitudes towards atomic energy around the world and, more broadly, the "socio" part of "sociotechnical systems."
Surnames A-G

1. Henry DeWolf Smyth, "War Department Release on New Mexico Test, July 16, 1945" app. 6 in *Atomic Energy for Military Purposes: The Official Report on the Development of the Atomic Bomb under the Auspices of the United States Government, 1940-1945*. (Princeton, NJ: Princeton University Press, 1945), 247–54, Office of History and Heritage Resources, U.S. Department of Energy (DOE), https://www.osti.gov/opennet/manhattan-project-history/publications/smyth_report.pdf.

Surnames H-O

2. Draft #5 of Presidential Speech before the General Assembly of the United Nations, November 28, 1953, Box 30, C. D. Jackson Papers, Dwight D. Eisenhower Presidential Library, Abilene, KS, https://www.eisenhowerlibrary.gov/sites/default/files/research/online-documents/atoms-for-peace/atoms-for-peace-draft.pdf.

Surnames P-Z

3. Remarks Prepared by Lewis L. Strauss, Chairman of the U.S. Atomic Energy Commission, Founders' Day Dinner, National Association of Science Writers, New York City, September 16, 1954, ML16131A120, NRC ADAMS, https://www.nrc.gov/docs/ML1613/ML16131A120.pdf.

[18] Often misattributed to Albert Einstein, this description of commercial nuclear power comes from Karl Grossman, Professor of Journalism at SUNY College at Old Westbury. See Gayle Greene, *The Woman Who Knew Too Much: Alice Stewart and the Secrets of Radiation*, 2nd ed. (Ann Arbor: The University of Michigan Press, 2020), 11n13.

Module 1: Managing the Nuclear Faustian Bargain (Overviews)[19]

Week 3: The Three "Ds" of Nuclear Safety Assurance

Class 4: Early Forays into Reactor Risk Assessment

Tuesday, January 21

A lesson on the first moves from qualitative to quantitative analysis among U.S. nuclear safety experts; keyword DESIGN BASIS ACCIDENT; submit Longhand Notes 1.

1. Thomas R. Wellock, "When Is a Reactor Safe? The Design Basis Accident," chap. 1 in *Safe Enough?: A History of Nuclear Power and Accident Risk* (Oakland, CA: University of California Press, 2021), 1–10.
2. U.S. Atomic Energy Commission (AEC), *Summary Report of Reactor Safeguard Committee*, WASH-3, (Oak Ridge, TN: AEC, 1950), 2–19, ML15113A624, U.S Nuclear Regulatory Commission Agencywide Documents Access and Management System (hereafter NRC ADAMS), https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML15113A624.
3. J. W. Healy, "Computations of the Environmental Effects of a Reactor Disaster," HW-30280, December 14, 1953, 2–7, https://doi.org/10.2172/7175255.

Class 5: The AEC and the Bandwagon Market for Nuclear Power

Thursday, January 23

A deep dive into the evolution of nuclear regulators' safety philosophies from the late 1950s through the late 1960s; keyword FAULT TREE; submit Longhand Notes 2.

1. Wellock, "The Design Basis in Crisis," chap. 2 in *Safe Enough?:* (2021), 11–39.
2. AEC, "Sequence of Events Related to the SL-1 Accident at the National Reactor Testing Station," news release of January 12, 1960.
3. Robert V. Latour, "The Atom: That Idaho Explosion," *Frontier: The Voice of the New West* 14, no. 6 (April 1963): 13–14.
4. Ed Cray to Glenn Seaborg, Request for Comment on R. V. Latour Article, April 2, 1963, NRC ADAMS, https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML20235A008.
5. Robert Lowenstein to Cray, Response to Request for Comment, June 3, 1963, ML20234F564, NRC ADAMS, https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML20234F564.

[19] Alvin Weinberg, a leader of the Manhattan Project, in a 1972 paper first described nuclear energy as a "Faustian bargain," or deal with the devil. See Weinberg, *The First Nuclear Era: The Life and Times of a Technological Fixer* (New York: American Institute of Physics, 1994), 176. See also Robert Pool, "Managing the Faustian Bargain," in *Beyond Engineering: How Society Shapes Technology*, ed. Robert Pool (New York: Oxford University Press, 1997), 278, https://doi.org/10.1093/oso/9780195107722.003.0013.

Week 4: Credible Accidents of Greatest Concern

Class 6: The NRC and the Reactor Industry Shakeout

Tuesday, January 28

A close look at the first major statistical study of nuclear plant accidents and their consequences; keyword PROBABILISTIC RISK ASSESSMENT; submit Longhand Notes 3.

Required

1. Wellock, "Beyond the Design Basis: The Reactor Safety Study," chap. 3 in *Safe Enough* (2021), 40–81.
2. Jack Veneman to James Cannon, "California Land Use, Nuclear Power Liability, and Safeguards Act," memorandum, March 4, 1976, Box 25, James M. Cannon Files, Gerald R. Ford Presidential Library, Ann Arbor, MI, https://catalog.archives.gov/id/1515902.
3. U.S. Central Intelligence Agency (CIA), *The Nuclear Reactor Industry: International Shakeout*, GI 83-10005, January 1983, CIA Freedom of Information Act Electronic Reading Room (hereafter CIA FOIA), https://www.cia.gov/readingroom/document/cia-rdp84s00558r000100030002-9.

Recommended

4. Wayne C. Booth et al., "From Topics to Questions," chap. 3 in *The Craft of Research*, 4th ed. (Chicago, IL: University of Chicago Press, 2016), 33–48, Duke Libraries, https://find.library.duke.edu/catalog/DUKE008488813.
5. Chris Foulds et al., "An Agenda for Future Social Sciences and Humanities Research on Energy Efficiency…" *Humanities and Social Sciences Communications* 9, no. 1 (June 30, 2022): 1–18, https://doi.org/10.1057/s41599-022-01243-z.

Class 7: Fulminate Debates over Adequate Protection

Thursday, January 30

A lesson on the NRC's formulation of safety goals following the Rasmussen Report and Three Mile Island; keyword RISK-INFORMED DECISIONMAKING; submit Longhand Notes 4.

1. Wellock, "Putting a Number on 'Safe Enough,'" chap. 4 in *Safe Enough?* (2021), 82–101.
2. S. H. Hanauer to J. F. O'Leary, F. E. Kruesi, and L. Rogers, September 20, 1972, ML11530443, NRC ADAMS, https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML111530443.
3. G. W. Wade, "Evolution and Current Status of the BWR Containment System," *Nuclear Safety* 15, no. 2 (March-April 1974): 163–73, Google Books, https://books.google.com/books?id=VWVIF8DHf8gC.

Week 5: New Paradigms of Government Oversight

Class 8: The Incremental Transition to Risk-Informed Regulation

Tuesday, February 4

A discussion about the state of commercial nuclear power at the end of the twentieth century; keyword SAFETY CULTURE; submit Mini Essay 1.

1. Wellock, "Beyond Design: Toward Risk-Informed Regulation," chap. 5 in *Safe Enough?* (2021), 102–45.
2. "Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities; Final Policy Statement," 60 Fed. Reg. 42622, August 16, 1995, https://www.federalregister.gov/citation/60-FR-42622.
3. Remarks by Shirley Ann Jackson, NRC Chairman, to the American Nuclear Society Washington, D.C. Local Chapter, Wheaton, MD, October 12, 1995, ML003710147, NRC ADAMS, https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML003710147.

Class 9: The Power of Memory as a Learning Tool

Thursday, February 6

A summative assessment based on the keywords in Module 1 (see Section 4.5. Keywords above); complete Bluebook Test 1 in class.

Recommended

1. Peter C. Brown, "To Learn, Retrieve," chap. 2 in *Make It Stick: The Science of Successful Learning* (Cambridge, Mass.: Harvard University Press, 2014), 23–45, https://doi.org/10.4159/9780674419377-002.
2. Michael Chen, "The Best Test Prep Structure," filmed August 2020 for the Learning Strategies Center, Cornell University, Ithaca, NY, MP4 video, 4:00, YouTube, https://youtu.be/mKJ9TBObYrw.
3. Duke Academic Resource Center (ARC), "Memory & Review," May 30, 2017, https://arc.duke.edu/memory-review#principles.

Week 6: Faust in His Study

Class 10: An Exercise in Academic Persuasion

Tuesday, February 11

A friendly competition for extra credit; come ready to deliver your Prospectus & Pitch.

Recommended

1. Chris Anderson, "How to Give a Killer Presentation," *Harvard Business Review* 91, no. 6 (June 2013): 121–25, https://hbr.org/2013/06/how-to-give-a-killer-presentation.
2. David Epstein, "How to Give a Killer Speech," April 20, 2021, in *How To!*, produced by Derek John, Rachael Allen, and Rosemary Belson, podcast, MP3 audio, 32:31, https://slate.com/podcasts/how-to/2021/04/how-to-give-a-killer-speech.
3. Will Reynolds, "Regenerative Systems: How We Could Redesign a Thriving, Lasting Economy," filmed February 2022 at TEDxDuke, Durham, N.C., video, 15:04, YouTube, https://youtu.be/jrlFV5nRjL8.

Module 2: Surrendering to Irradiant Mephistopheles (Accidents)

Class 11: The Most Studied Nuclear Accident in History[20]

Thursday, February 13
A postmortem of TMI-2; keyword NORMAL ACCIDENT, submit Longhand Notes 5.
Everyone Reads

1. Serhii Plokhy, "Atoms for Peace: Three Mile Island," chap. 3 in *Atoms and Ashes: A Global History of Nuclear Disasters* (New York: W. W. Norton & Co., 2022), 137–78.
2. Preliminary Notification of Event or Unusual Occurrence (PNO) 79-67 and Supplements A-B, Three Mile Island Unit 2, March 28-30, 1979, TMI-2 Knowledge Management Library (hereafter TMI-2 KML), https://tmi2kml.inl.gov/HTML/Search.html?folder=1b-PN-Response.

Choose One

3. President's Commission on the Accident at Three Mile Island, preface to *The Legacy of TMI: A Need for Change* (Washington, D.C.: GPO, October 1979), 1–4, TMI-2 KML, https://tmi2kml.inl.gov/HTML/Search.html?folder=2a-Kemeny.
4. NRC Special Inquiry Group, *Three Mile Island: A Report to the Commissioners and to the Public, Vol. 1*, NUREG/CR-1250 (Washington, D.C.: NRC, January 1980), 1–5, TIM-2 KML, https://tmi2kml.inl.gov/HTML/Search.html?folder=2b-Rogovin.

Week 7: Myths and Realities of Chernobyl

Class 12: Deconstructing the Highest-Rated TV Series of All Time[21]

Tuesday, February 18
A screening and discussion of "Open Wide, O Earth," the third episode of HBO's *Chernobyl* (2019); keyword FANTASY DOCUMENT; submit Longhand Notes 6.
Required

1. CIA, *Soviet Civil Defense: Medical Planning for Postattack Recovery*, SOV-84-10101X, July 1984, CIA FOIA, https://www.cia.gov/readingroom/document/cia-rdp85t00313r000200030007-2.

Recommended

2. Booth et al., "Planning and Drafting," chap. 12 in *The Craft of Research*, 4th ed. (2016), 177–88, https://find.library.duke.edu/catalog/DUKE008488813.
3. Anne Lamott, "Shitty First Drafts," in *Language Awareness: Readings for College Writers*, ed. Paul Eschholz, Alfred Rosa, and Virginia Clark, 9th ed. (Boston: Bedford/St. Martin's, 2005), 93–96, https://wrd.as.uky.edu/sites/default/files/1-Shitty%20First%20Drafts.pdf.

[20] U.S. Government Accounting Office, *Three Mile Island: The Most Studied Nuclear Accident in History*, EMD-80-109 (Washington, D.C.: GPO, September 1980), https://www.gao.gov/products/emd-80-109.
[21] "'Chernobyl'" Is the Highest-Rated TV Series Ever," *The Economist* (online), June 4, 2019, https://www.economist.com/graphic-detail/2019/06/04/chernobyl-is-the-highest-rated-tv-series-ever.

Class 13: "Everything about Chernobyl Was Soviet"[22]

Thursday, February 20

A class-wide debate on the most important lessons to be learned from Chernobyl; keyword TECHNOLOGICAL STYLE; submit Longhand Notes 7.

1. Plokhy, "The Star of Apocalypse: Chernobyl," chap. 4 in *Atoms and Ashes:* (2022), 179–226.
2. E. V. Kulikov, "State-of-the Art and Development Prospects for Nuclear Power Stations Containing RBMK Reactors," *Atomnaia energiia* [*Atomic Energy*] 56, no. 6 (June 1, 1984): 368–74, CIA FOIA, https://www.cia.gov/readingroom/document/cia-rdp10-02196r000300040006-2.
3. Anatoly Dyatlov, "How It Was: An Operator's Perspective," *Nuclear Engineering International* 36, no. 448 (November 1991): 43–44, 46, 48–50, North Carolina State University Libraries.

Week 8: "There is a Before and After Fukushima"[23]

Class 14: Revisiting Japan's "Triple Disaster"

Tuesday, February 25

The meltdown at Fukushima; keyword REGULATORY CAPTURE; submit Longhand Notes 8.

1. Plokhy, "Nuclear Tsunami: Fukushima," chap. 5 in *Atoms and Ashes* (2022), 227–76.
2. "Japan Nuclear Plants Gets $68.8 Million Eximbank Assistance," *International Commerce* 75, no. 1 (January 6, 1969): 31, Google Books, https://books.google.com/books?id=keg1P7te-RkC.
3. Tokyo Electric Power Company Holdings (Tepco), "Report on the Investigation into Inspection and Maintenance Problems at TEPCO's Nuclear Power Plants, Pointed Out by GE," press release of September 17, 2002, https://www.tepco.co.jp/en/press/corp-com/release/02091701-e.html.

Class 15: The Forgotten Nuclear Accident of 2011

Thursday, February 27

The incident at CENTRACO; keyword NUCLEAR FUEL CYCLE; submit Mini Essay 2.

1. Plokhy, "Afterword: What Comes Next?," in *Atoms and Ashes* (2022), 277–88.
2. Autorité de sûreté nucléaire (ASN) [Nuclear Safety Authority], "EDF Waste Management," sec. 1.3.3., chap. 16 in *Nuclear Safety and Radiation Protection in France in 2011* (Paris: ASN, 2012), 451–53, https://www.french-nuclear-safety.fr/asn-informs/publications/asn-s-annual-reports/nuclear-safety-and-radiation-protection-in-france-in-2011.
3. ASN, Resolution No. 2011-DC-0242 dated September 27, 2011, https://www.french-nuclear-safety.fr/asn-informs/news-releases/industrial-accident-at-the-centraco-facility-level-1-on-the-ines-scale.

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[22] Sonja D. Schmid, *Producing Power: The Pre-Chernobyl History of the Soviet Nuclear Industry* (Cambridge, MA: The MIT Press, 2015), 161.

[23] France's Nuclear Safety Authority, editorial in *Nuclear Safety and Radiation Protection in France in 2011* (Paris: ASN, 2012), 5–6.

Week 9: Let's See How Far We've Come

Class 16: Sharpening New Knowledge of Sociotechnical Systems

Tuesday, March 4

A summative assessment based on the keywords in Module 2 (see (see Section 4.5. Keywords above); complete Bluebook Test 2 in class.

Recommended

1. Brown, "Mix Up Your Practice," chap. 3 in *Make It Stick* (2014), 46–66, https://doi.org/10.4159/9780674419377-003.
2. Chen, "Finding a New Routine," filmed March 2020 for the Learning Strategies Center, Cornell University, Ithaca, NY, MP4 video, 12:23, YouTube, https://youtu.be/duGAan8awUk.
3. ARC, "The Study Cycle," October 19, 2021, https://arc.duke.edu/study-cycle-0.

Class 17: Independent Work on Research Projects

Thursday, March 6

In lieu of a regular class, meet with your project team to wrap up the first draft of your U.N.-style Issue Brief; submit Rough Backgrounder & Slide Deck by 11:59pm.

Week 10: Spring Recess

No classes

Module 3: Asking the Critical "Gretchen Question" (Scale-Up)

Week 11: The Origins of the French Atomic State

Class 18: The Search for a Place in the Postwar World

Tuesday, March 18

A discussion about France's place in geopolitics in the immediate of aftermath World War II; keyword TECHNOCRAT/TECHNOCRACY; submit Longhand Notes 9.

1. Gabrielle Hecht, "A Technological Nation," chap. 1 in *The Radiance of France: Nuclear Power and National Identity After World War II*, 2nd ed. (Cambridge, MA: The MIT Press, 2009), 21–54.
2. L. Kowarski, "Atomic Energy Developments in France," *Bulletin of the Atomic Scientists* 4, no. 5 (May 1948): 139–40, 154–55, https://doi.org/10.1080/00963402.1948.11460199.

Class 19: The First and Second Five-Year Plans

Thursday, March 20

A lesson on the organization and administration of France's early nuclear program; keyword BUREAUCRATIC AUTONOMY; submit Longhand Notes 10.

Everyone Reads

1. Hecht, "Technopolitical Regimes," chap. 2 in *The Radiance of France* (2009), 55–90.

Choose One

2. France Atome, "Description of Reactors G2 and G3," A/CONF.15/P/1134 (September 1958), HeinOnline, https://heinonline.org/HOL/P?h=hein.unl/prcdngs0008&i=342.
3. M. Roux and M. Bienvenu, "The Chinon Nuclear Power Plant Divisions EDF-1 and EDF-2," A/CONF.15/P/1135 (September 1958), HeinOnline, https://heinonline.org/HOL/P?h=hein.unl/prcdngs0008&i=364.

Week 12: Charles de Gaulle and the Nuclear Revolution[24]

Class 20: The Gaullist Atom "from Above"

Tuesday, March 25

A discussion about the French nuclear program's management under Charles de Gaulle; keyword TECHNOLOGICAL MOMENTUM; submit Longhand Notes 11.

1. Hecht, "Technopolitics in the Fifth Republic," chap. 3 in *The Radiance of France* (2009), 91–130.
2. CIA, *Mounting Costs of the French Nuclear Program*, CIA/RR CB-63-50, May 23, 1963, CIA FOIA, https://www.cia.gov/readingroom/document/cia-rdp79t01003a001600210001-0.

[24] Philip H. Gordon, "Charles De Gaulle and the Nuclear Revolution," in *Cold War Statesmen Confront the Bomb: Nuclear Diplomacy Since 1945*, ed. John Gaddis et al. (Oxford University Press, 1999), 216–35, https://doi.org/10.1093/0198294689.003.0010.

Class 21: The Gaullist Atom "from Below"

Thursday, March 27

A team-based discussion on popular perceptions of the French nuclear state during the 1950s and '60s; keyword CHARISMATIC TECHNOLOGY; submit Longhand Notes 12.

Surnames A-K

1. Hecht, "Technological Spectacles," chap. 6 in *The Radiance of France* (2009), 201–40.
2. Bertrand Goldschmidt, "The French Atomic Energy Program," *Bulletin of the Atomic Scientists* 18, no. 7 (September 1962): 39–48, https://doi.org/10.1080/00963402.1962.11454394.

Surnames L-Zs

3. Hecht, "Atomic Vintage," chap. 7 in *The Radiance of France* (2009), 241–70.
4. Goldschmidt, "The French Atomic Energy Program," *Bulletin of the Atomic Scientists* 18, no. 8 (October 1962): 46–48, https://doi.org/10.1080/00963402.1962.11454409.

Week 13: Energy Crises and the Launch of the Messmer Plan

Class 22: Competing Visions of Nuclear Scale-Up

Tuesday, April 1

The history of Prime Minister Pierre Messer's landmark decision to scale-up nuclear power in the early 1970s; keyword LEVELIZED ELECTRICITY COSTS; submit Mini Essay 3.

1. Hecht, "Warring Systems," chap. 8 in *The Radiance of France* (2009), 271–324.
2. Nicholas Wade, "France's All-Out Nuclear Program Takes Shape," *Science* 209, no. 4459 (1980): 884–89, JSTOR, https://www.jstor.org/stable/1685073.
3. Charles Mathias, Jr. "Overview of the French Nuclear Program," sec. 2 in *Nuclear Power Development in France: Report to the Committee on Governmental Affairs, United States Senate*, 78-970 O (Washington, D.C.: GPO, 1981), 6–10, Google Books, https://books.google.com/books?id=AKgCTgblx_0C.

Class 23: Consolidating Our Intellectual Gains

Thursday, April 3

A summative assessment based on the keywords in Module 3 (see Section 4.5. Keywords above); complete Bluebook Test 3 in class.

Recommended

1. Brown, "Embrace Difficulties," chap. 4 in *Make It Stick* (2014), 67–101, https://doi.org/10.4159/9780674419377-004.
2. Chen, "Managing Multitasking," filmed March 2020 for the Learning Strategies Center, Cornell University, Ithaca, NY, MP4 video, 7:27, YouTube, https://youtu.be/OsW1YKl1gF4.
3. ARC, "Study Strategies That Work," January 22, 2019, https://arc.duke.edu/study-strategies-work.

Week 14: Once and Future Research Projects

Class 24: Paths to Senior Theses on Sociotechnical Systems

Tuesday, April 8

A wide-ranging discussion about opportunities to continue studying questions of energy and society at Duke led by a guest speaker.

Choose One and Skim

1. Peter Polonsky, Jr., "Politics and Solar Energy: Getting Beyond the Economics of Solar Deployment" (honors thesis, Duke University, 2019), https://hdl.handle.net/10161/19893.
2. Sophia Katz, "Wasted Energy: Re-Directing Investment into Renewables through Environmental Policy," (honors thesis, Duke University, 2020), https://hdl.handle.net/10161/22443.
3. Megan Wang, "Impact of Utility-Scale Solar Farms on Property Values in North Carolina," (honor thesis, Duke University, 2022), https://hdl.handle.net/10161/25560

Recommended:

4. Booth et al., "Communicating Evidence Visually," chap. 15 in *The Craft of Research*, 4th ed. (2016), 214–31, https://find.library.duke.edu/catalog/DUKE008488813.
5. Scott Berinato, "Visualizations That Really Work," *Harvard Business Review* 94, no. 6 (June 2016): 92–100, https://hbr.org/2016/06/visualizations-that-really-work.

Class 25: Final Revisions to Research Projects

Thursday, April 10

In lieu of a regular class, meet with your project team to putting the finishing touches on your U.N.-style Issue Brief; submit Polished Backgrounder & Slide Deck by 11:59pm.

Conclusion: Toward Damnation or Redemption?

Week 15: Putting Social Science to Work

Class 26: Nuclear Power in the Twenty-First Century

Tuesday, April 15

A capstone discussion on the key takeaways from the course followed by some unstructured time to work on research projects.

1. NRC, *Strategic Plan: Fiscal Years 2022-2026*, NUREG-1614, Vol. 8, April 2022, https://www.nrc.gov/docs/ML2206/ML22067A170.pdf.
2. Christopher M. Blanchard and Paul K. Kerr, "Prospects for U.S.-Saudi Nuclear Energy Cooperation," Congressional Research Service Report IF10799, updated June 9, 2023, https://crsreports.congress.gov/product/pdf/IF/IF10799.

Class 27: Research Symposium

Thursday, April 17

A grand showcase of our collaborative research projects before a panel of three external judges; at stake is not only extra credit but also eternal glory; come prepared to deliver your Presentation in class.

Recommended

1. Will Stephen, "How to Sound Smart in Your TEDx Talk," filmed September 2015 at TEDxNewYork, MP4 video, 5:55, YouTube, https://youtu.be/8S0FDjFBj8o.
2. Rita Gemayel and Seamus J. Martin, "How to Prepare and Deliver a Great Talk," *The FEBS Journal* 286, no. 1 (2019): 39–45, https://doi.org/10.1111/febs.14726.
3. Joel Schwartzberg, "8 Ways to Deliver a Great Presentation (Even If You're Super Anxious About It)," *Harvard Business Review* (online), July 12, 2020, https://hbr.org/2020/07/8-ways-to-deliver-a-great-presentation-even-if-youre-super-anxious-about-it.

Week 16: Thinking Back and Looking Ahead

Class 28: A Comprehensive Review

Tuesday, April 22

A debrief on the symposium followed by an informal discussion about the course as a whole; complete Self-Assessment & Course Evaluation in class.

Recommended

1. Amy Gallo, "How to Write the Dreaded Self-Appraisal," *Harvard Business Review* (online), March 29, 2013, https://hbr.org/2013/03/how-to-write-the-dreaded-self-appraisal.
2. "Giving Useful Feedback to Your Instructors and TAs: A Guide for Students," Center for Innovations in Teaching and Learning, University of California, Santa Cruz, July 2021, https://bpb-us-e1.wpmucdn.com/sites.ucsc.edu/dist/6/1180/files/2021/07/Giving-Useful-Feedback-to-Your-Instructions-and-TAs.pdf.

Further Reading

Alexievich, Svetlana. *Voices from Chernobyl: The Oral History of a Nuclear Disaster*. Translated by Keith Gessen. New York: Picador, 2006. https://find.library.duke.edu/catalog/DUKE007520618.

Augustine, Dolores L. *Taking on Technocracy: Nuclear Power in Germany, 1945 to the Present*. New York: Berghahn Books, 2021. https://find.library.duke.edu/catalog/DUKE008342300.

Balleisen, Edward J., Lori S. Bennear, Kimberly D. Krawiec, and Jonathon B. Wiener, eds. *Policy Shock: Recalibrating Risk and Regulation After Oil Spills, Nuclear Accidents, and Financial Crises*. New York: Cambridge University Press, 2017. https://find.library.duke.edu/catalog/DUKE008046033.

Brown, Kate. *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters*. New York: Oxford University Press, 2013. https://find.library.duke.edu/catalog/DUKE008161565.

Ellsberg, Daniel. *The Doomsday Machine: Confessions of a Nuclear War Planner*. Reprint. New York: Bloomsbury Publishing, 2018. https://find.library.duke.edu/catalog/DUKE008170956.

Higginbotham, Adam. *Midnight in Chernobyl: The Untold Story of the World's Greatest Nuclear Disaster*. Reprint. New York: Simon & Schuster, 2020. https://find.library.duke.edu/catalog/DUKE009319455.

Holloway, David. *Stalin and the Bomb: The Soviet Union and Atomic Energy, 1939-1956*. New Haven, CT: Yale University Press, 1996. https://find.library.duke.edu/catalog/DUKE001617204.

Kaijser, Arne, Markku Lehtonen, Jan-Henrik Meyer, and Mar Rubio-Varas, eds. *Engaging the Atom: The History of Nuclear Energy and Society in Europe from the 1950s to the Present*. Morgantown: West Virginia University Press, 2021. https://find.library.duke.edu/catalog/DUKE010218673.

Pasternak, Judy. *Yellow Dirt: A Poisoned Land and the Betrayal of the Navajos*. Reprint. New York: Free Press, 2011. https://find.library.duke.edu/catalog/DUKE004627090.

Schlosser, Eric. *Command and Control: Nuclear Weapons, the Damascus Accident, and the Illusion of Safety*. Reprint edition. New York: Penguin, 2014. https://find.library.duke.edu/catalog/DUKE005945832.

Schmid, Sonja D. *Producing Power: The Pre-Chernobyl History of the Soviet Nuclear Industry*. Cambridge, MA: MIT Press, 2015. https://find.library.duke.edu/catalog/UNCb8257619.

Smith, LeRoy. *Nearly Nuclear: A Mismanaged Energy Transition*. East Lansing: Michigan State University Press, 2021. https://find.library.duke.edu/catalog/DUKE010112583.

Voyles, Traci Brynne. *Wastelanding: Legacies of Uranium Mining in Navajo Country*. Minneapolis: University of Minnesota Press, 2015. https://find.library.duke.edu/catalog/DUKE006527702.