ENERGY 498S

Energy and the Environment Capstone I: Bootcamp

Campus Utilities Research, Resources, Engineering, and Networking Team (CURRENT) Capstone Sequence

Fall · 2026 · 0.5 Credits · Duke University

Instructors: Tom J. Cinq-Mars · Rebecca Simmons · Nicole Vijgen

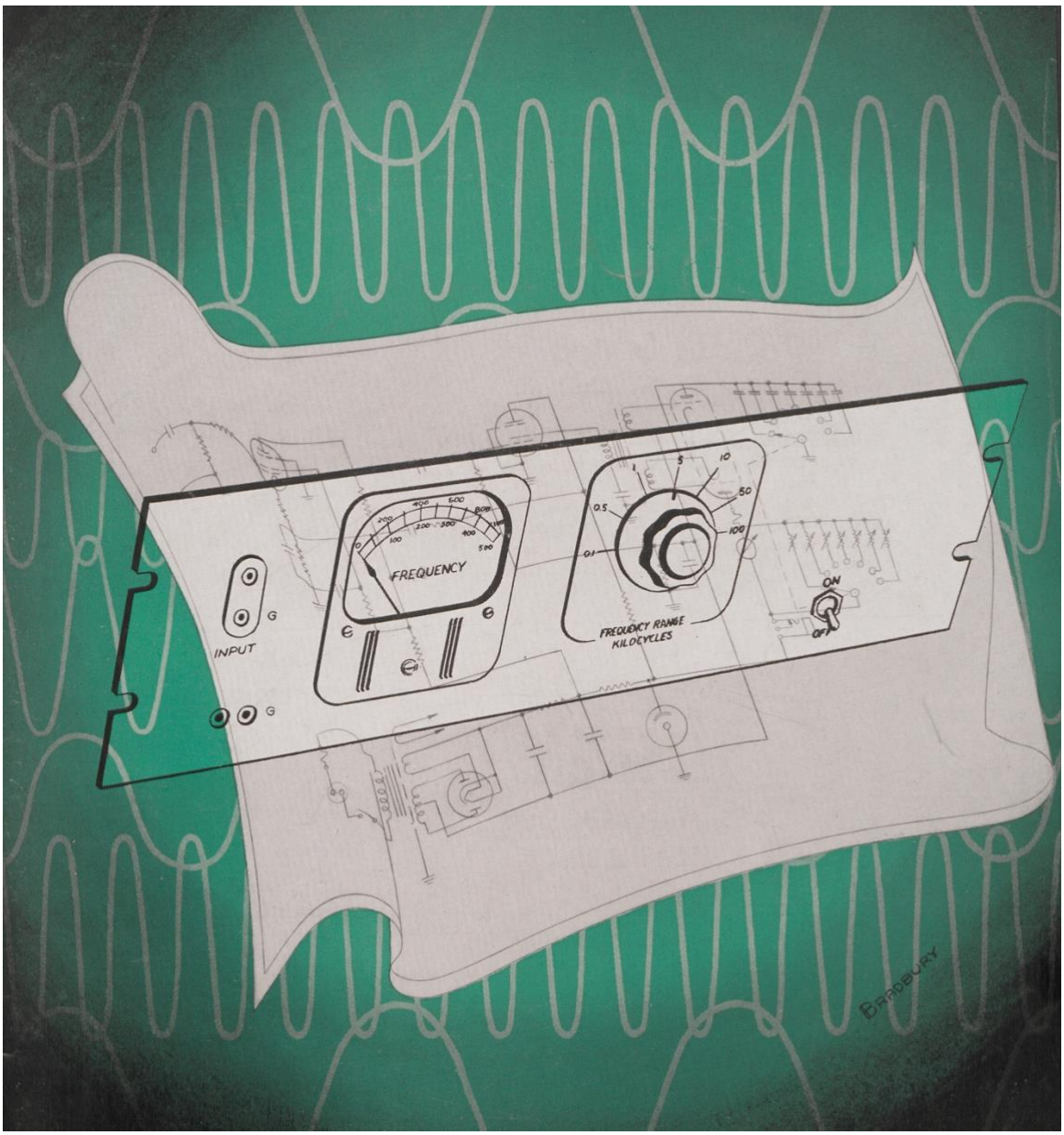


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Cover Image: Bill Bradbury, cover illustration, *The DukEngineer* 13, no. 3 (February 1951), Duke University Libraries Digital Collections, https://repository.duke.edu/dc/dukengineer/denms13003.

ACKNOWLEDGEMENTS

This course would not exist without the generosity, vision, and collaborative spirit of many people across Duke University. Above all, we gratefully acknowledge the generous support of Duke University's Undergraduate Program Enhancement Fund (UPEF), whose investment made possible the creation of the Campus Utilities Research, Resources, Engineering, and Networking Team (CURRENT) capstone sequence. Particular thanks are due to Bryan Koen, Colleen Nieto, and Alix Zwane for their encouragement, guidance, and partnership throughout the development of this new initiative. CURRENT also stands on the foundations laid by more than a decade of leadership within the Energy and the Environment Certificate program. We are especially indebted to Emily Klein and Josiah Knight, who co-directed the certificate from its inception in 2009 until their well-earned retirements in 2026. Their sustained commitment to interdisciplinary education, experiential learning, and student success shaped the program that CURRENT now seeks to carry forward into a new chapter.

More broadly, this syllabus reflects pedagogical lessons learned over decades of college teaching and from countless conversations with colleagues, staff, and students across multiple institutions. In particular, we wish to acknowledge the contributions of Lee Baker, Edward Balleisen, Kyle Bradbury, Jackson Ewing, Nico Hotz, Katharine Jo, Luana Lima, Brian Murray, Christine Payne, Deborah Reisinger, and Carl Thompson. Their insights, encouragement, and generosity of spirit have shaped not only this syllabus but also the educational philosophy that underpins it. This course, then, is as much a product of their collective wisdom as it is of its instructors.

1. OVERVIEW

1.1. Purpose

At its core, ENERGY 498S exists to prepare a new generation of leaders capable of managing the systems society depends on but rarely sees. Every campus, city, and region runs on aging, interconnected infrastructure — steam plants, electrical grids, water systems — that must be maintained, modernized, and decarbonized simultaneously, often by people who never set foot inside them. By placing students directly into the operations of Duke's own utility system, the course closes that gap. It turns an abstract societal challenge, the transition to clean and reliable energy, into a tangible, local one that students can see, touch, and begin to solve.

This work matters beyond any single semester. The engineers, planners, and policymakers who will manage tomorrow's energy transition need firsthand experience with the practical constraints — budgets, safety codes, aging equipment, competing stakeholders — that make infrastructure decisions hard. Bootcamp gives students that grounding early, ensuring that when they enter the private, public, or nonprofit sectors, they carry with them not just technical knowledge, but a working understanding of how energy systems actually get built, maintained, and improved.

1.2. Cost of Enrollment

No textbooks or course materials are required for purchase. All readings, tools, and resources needed to complete the course successfully will be provided or made freely available to students.

1.3 Important Due Dates

The fall semester's graded deliverables build progressively from team formation through sustained project work. Early assignments — the initial survey, reflection essay, and team charter — establish each team's working structure and problem framing, while the Problem Statement & Timeline and second reflection essay mark the transition into deeper research. A three-part sequence of progress reports and reflection essays then tracks each team's momentum through the semester's second half, bookended by an off-cycle hydroelectric facility tour on October 30. The semester closes with a final presentation and slide deck summarizing each team's findings and plans for spring.

Meeting #	Date	Deliverable / Event
Meeting 5	*Wed, Sep 23*	*Team Charter*
Meeting 6	*Wed, Sep 30*	*Problem Statement & Timeline*
Meeting 10	***Fri, Oct 30***	***Off-cycle field trip: hydroelectric facility tour***
Meeting 13	*Wed, Nov 18*	*Final Presentation & Slide Deck*

1.4. Detailed Description

Bootcamp is the first of two courses in the Energy and the Environment Certificate's capstone sequence. Over fourteen fall-semester class meetings, students build the foundation for a yearlong facilities-improvement project undertaken in partnership with Duke Utilities & Engineering Services (DUES), a division of Duke Facilities Management (FMD).

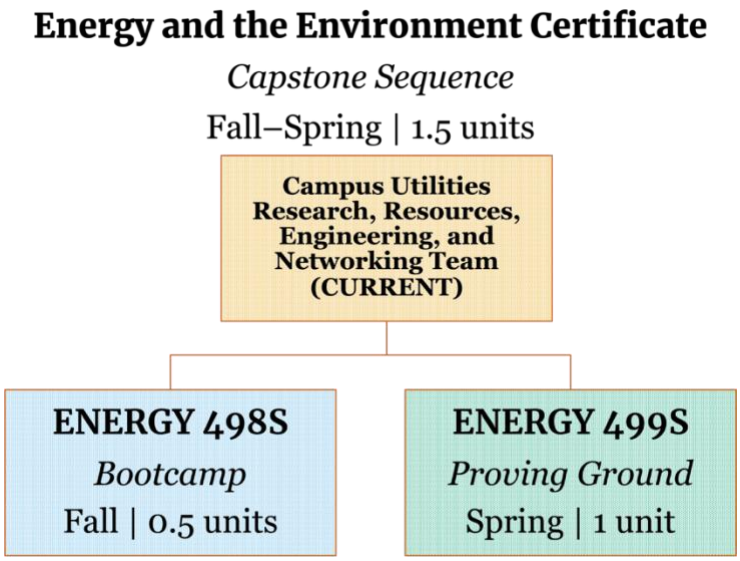


Figure 1: *The Energy and the Environment Certificate capstone sequence. Students join Campus Utilities Research, Resources, Engineering, and Networking Team (CURRENT) and complete two linked courses: ENERGY 498S (Bootcamp, Fall, 0.5 units) followed by ENERGY 499S (Proving Ground, Spring, 1 unit), together totaling 1.5 units across the fall–spring sequence.*

The semester unfolds in two halves. In "Making Contact," students form project teams, tour an on-campus utility plant (chilled water or steam), and work through a sequence of team-building and problem-framing exercises: drafting a team charter, defining stakeholder needs and scope, and learning research methods, codes, and policy context. A guest speaker series introduces real-world project management practice and energy career paths along the way.

After a brief mid-semester reset, "Stepping Up the Voltage" shifts students into sustained project work. Teams consult directly with their DUES project partners, visit an off-campus hydroelectric facility, and submit a series of progress reports while refining their problem statement and direction. Individual reflection essays run throughout both halves, prompting students to process the experience as it unfolds.

The course culminates in a team presentation of findings, proposed direction, and a plan for the spring semester, when teams will carry their projects into full design and delivery.

1.5. Historical / Institutional Context

Bootcamp's opening plant tour reflects nearly a century of history bound up in the infrastructure students will study.

Duke's original coal-burning steam plant went up beside East Campus in 1929, designed by Horace Trumbauer, architect of the original East and West Campus buildings. Its coal-fired boilers, fed by rail shipments from West Virginia and Kentucky, produced steam that heated buildings, dehumidified them in summer, and sterilized surgical equipment — an operation that ran largely unchanged for nearly fifty years, until a newer West Campus plant took over in 1978 and the original sat dormant for three decades.



Figure 2: *The East Campus Heating Plant, photographed in 1939, with its tall brick smokestack and a Norfolk & Western coal hopper car parked on the rail spur above the boiler house. This facility illustrates the campus utility infrastructure that predates the current CURRENT team's work in campus energy systems.* Source: Duke University Archives Photographic Negative Collection, 1855–1995, Duke University Archives, Duke University Libraries, Durham, NC, https://idn.duke.edu/ark:/87924/r4jq18493.

Its second life began in 2009, when the plant was converted from coal to natural gas and its historic brickwork restored. By 2011, Duke had burned through its last coal reserves, a milestone on the path to climate neutrality. The plant's smokestack still stands today, preserved as a marker of that transition — the same arc from coal to gas to a lower-carbon future that students trace on their opening tour, walking through spaces that have themselves been the site of one energy transition and are now positioned for another.[1]

[1] Elizabeth Van Brocklin, "Time and Energy: An Audit of Duke's Power Sources, Then and Now," *Duke Magazine*, Special Issue 2015, 50–51.

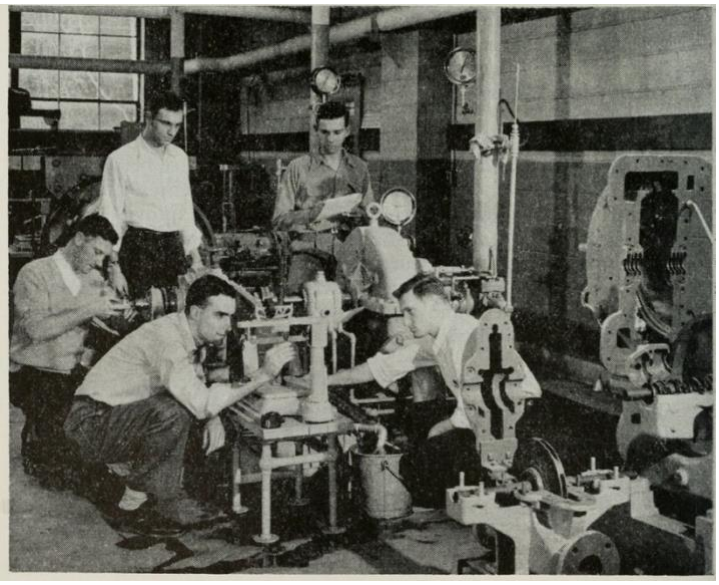


Figure 3: *Pratt mechanical engineering students work with rotating machinery and gauges in a campus laboratory, part of the hands-on instruction described in Duke's mechanical engineering curriculum, circa 1955–1956*. Source: "Mechanical Engineering," *Bulletin of Duke University: Catalogue Number, 1955–1956*, vol. 28, no. 8 (June 1956): 66, Internet Archive, https://archive.org/details/bulletinofdukeun1955duke/mode/1up.

This tour also continues an older Duke tradition. Since at least the mid-1950s, a facilities-based lab co-taught with FMD staff has served as the capstone experience for Duke's Mechanical Engineering majors, giving students hands-on exposure to the boilers, pumps, and turbines that keep the university running.[2] More recently, Duke's legacy Energy Initiative spent years deepening ties between the University's academic and facilities communities in pursuit of institutional carbon-neutrality goals.[3] Bootcamp inherits both threads — an engineering-education tradition rooted in campus infrastructure, and a more recent push to align academic learning with the university's own decarbonization efforts. The plant tour, in this light, is less a preliminary than the course's argument in miniature: Duke's own campus as a living case study in energy transition.

[2] *Bulletin of Duke University: Catalogue Number, 1955-1956*, vol. 28, no. 8 (June 1956), 180, Internet Archive, https://archive.org/details/bulletinofdukeun1955duke/mode/1up.
[3] See for example Peter Ordal, "Opening Duke University's Energy Data" (master's thesis, Duke, 2013), https://hdl.handle.net/10161/6908.

2. LOGISTICS

2.1. Instructors & Support Staff

Bootcamp is co-led by **Tom J. Cinq-Mars**, who brings expertise in the history and sociology of science, and **Rebecca (Becky) Simmons**, who contributes backgrounds in mechanical engineering, project management, and entrepreneurship. Together they run weekly meetings, grade assignments, and give feedback throughout the semester, offering students both critical and practical perspectives on utilities work. **Nicole Vijgen**, a Pratt School of Engineering doctoral student, serves as graduate project manager, coordinating course activities, supporting project teams through assignments and milestones, and offering additional mentorship as students build technical, professional, and collaborative skills. **Christopher Silcott** represents Duke Facilities Management as the course's primary liaison, bringing firsthand knowledge of Duke's utilities systems and connecting classroom work to real institutional practice. **Ali Stocks** stewards The Foundry, the space where Bootcamp meets weekly. Students should treat it as Ali's house, respecting the space, equipment, and rules accordingly.



Tom J. Cinq-Mars
Lecturing Fellow
Nicholas Institute for Energy, Environment & Sustainability
Email: tom.cinq.mars@duke.edu
Phone: +1 (919) 685-6255



Rebecca (Becky) Simmons
Professor of the Practice
Pratt School of Engineering (PSOE)
Email: rebecca.simmons@duke.edu
Phone: +1 (919) 257-7856



Nicole Vijgen
Graduate Project Manager
PSOE
Email: nicole.vijgen@duke.edu



Christopher Silcott
Assistant Director for Operations
Duke Facilities Management
Email: chris.silcott@duke.edu
Phone: +1 (919) 407-2309



Ali Stocks
Manager, The Foundry
Email: ali.stocks@duke.edu
Phone: +1 (919) 613-1517

2.2. Meeting Times & Locations

Bootcamp meets weekly for the fall semester, with additional office hours available for one-on-one support. Regular class sessions are held in the main project area on the lower level of The Foundry (Gross Hall 0050) — more information on the space is available at https://foundry.duke.edu/resources/spaces/project-work-space-050. Students are encouraged to make use of instructor office hours throughout the semester.

Meeting Type	Day	Time	Location
Weekly Class Meeting	*Wednesdays*	*4:40–5:55 p.m.*	*Gross Hall 0050, "The Foundry" (lower level)*
Tom's Office Hours	*Mondays*	*1:00–3:00 p.m.*	*Gross Hall 102R*
Becky's Office Hours	*By Request*	*———*	*1407 Fitzpatrick Center (inside of room 1405A)*

2.3. Learning Management System

In this course, you will use the Canvas Learning Management System 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. To access it, follow this hyperlink: https://canvas.duke.edu/courses/85218. Should you have any questions about Canvas, be sure to connect with Tom or Becky as soon as possible.

2.4. Project Budgets & Materials

One advantage of working on real-world facilities and infrastructure challenges is that modest financial resources can often unlock meaningful learning opportunities. To support project development, each team will have access to a small project budget funded through the Undergraduate Program Enhancement Fund (UPEF) grant that established CURRENT. These funds may be used for approved project-related expenses such as prototype construction, measurement and testing supplies, site-visit materials, printing and presentation costs, software or data services not otherwise available through Duke, and other reasonable expenditures that advance the team's work. Because CURRENT emphasizes planning, feasibility assessment, and project delivery rather than large-scale implementation, budgets are intended to support research, analysis, and demonstration activities rather than capital improvements. All purchases must receive advance approval from Tom or Becky and comply with Duke University purchasing policies. Teams are encouraged to treat these funds as practicing professionals would: carefully, transparently, and with a clear connection between expenditures and project objectives. Budget allocations and reimbursement procedures will be discussed during the first month of the semester.

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 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/.



Writing & Communications Center: Facilitates critical and creative writing through collaborative workshops, writing groups, and events. Free non-evaluative consultations with specialized writing consultants offered in person and online. For more information, and to schedule a consultation, see the Center's website: https://wrp.duke.edu/wcc.



Center for Data & 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 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 & 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/.

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.[4] 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 the key components of Duke's campus utility systems — steam, chilled water, and electrical distribution — and identify the major infrastructure milestones that have shaped their current form.*
2	***Understanding***	*Explain how Duke Facilities Management's Project Delivery Guide structures a facilities improvement project, including the roles of scope definition, stakeholder needs, and project timelines.*
3	***Applying***	*Apply research and documentation methods — stakeholder interviews, site observation, codes and standards review — to investigate a real project drawn from DUES' maintenance backlog.*
4	***Analyzing***	*Analyze a candidate facilities project in terms of its technical constraints, policy and economic context, and competing stakeholder priorities, identifying where these factors align or conflict.*
5	***Evaluating***	*Evaluate the feasibility and relative merits of possible project directions, weighing evidence gathered from site visits, project partners, and background research.*
6	***Creating***	*Compose an original problem statement, timeline, and presentation that frame a selected facilities project and propose a credible direction for spring-semester work.*
7	***Collaborating***	*Work within a project team to divide research and planning responsibilities, coordinate through a shared team charter, and jointly produce deliverables — including progress reports and a final presentation — that reflect the team's collective work.*

[4] 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

Bootcamp is built around a simple premise: understanding complex systems requires more than acquiring information about them. Students learn most effectively when they can see systems firsthand, wrestle with problems that resist easy solutions, and work alongside others toward a shared goal. Although the course focuses on campus infrastructure and facilities management, its broader purpose is to cultivate habits of observation, inquiry, and collaboration that extend well beyond the built environment. The curriculum therefore emphasizes experiential learning, authentic problem-solving, and collective responsibility over passive absorption of content. Each assignment, site visit, and team project is designed not merely to convey technical knowledge, but to help students think and act more like professionals confronting real-world challenges. The three principles outlined below provide the intellectual and pedagogical foundation for that approach, shaping how students encounter infrastructure, engage uncertainty, and contribute to work larger than themselves.

Principle 1: *Energy infrastructure hides in plain sight, and learning it demands direct contact.* The systems that heat, cool, and power a university campus are engineered, in a sense, to be invisible — buried in tunnels, tucked behind mechanical-room doors, humming along without a second thought from the people who depend on them.[5] Bootcamp treats that invisibility as a problem to be solved through firsthand encounter rather than lecture alone. Site visits to an on-campus utility plant and an off-campus hydroelectric facility put students in physical proximity to the machinery that makes modern life possible, while individual reflection essays after each trip ask them to translate that sensory experience into observation and insight. The aim is a kind of infrastructural literacy that no textbook can substitute for.

Principle 2: *Real problems don't come with answer keys.* Much of Bootcamp's coursework is deliberately open-ended. Students frame their own problem statements, define their own scope and success measures, and select a project from Duke Facilities Management's actual, ever-shifting maintenance backlog. This is not an oversight but a design choice.[6] The professional world rarely serves up cleanly bounded assignments; and learning to define a problem is as important a skill as learning to solve one. Research methods, technical standards, and policy context are introduced not as ends in themselves, but as tools for navigating genuine uncertainty.

Principle 3: *The most durable work is collective work.* Bootcamp asks students to function less like individual scholars and more like members of a professional organization — drafting a team charter, dividing research responsibilities, consulting with project partners, and producing shared deliverables like progress reports and a final presentation. This mirrors how facilities work actually gets done at Duke: through collaboration across a complex, multidivisional structure, not through the efforts of any single person. Teamwork, in other words, isn't a supplement to the course's content — it is a substantial part of the content itself.[7].

[5] For a useful discussion of infrastructure's invisibility, see Daniel French, *When They Hid the Fire: A History of Electricity and Invisible Energy in America* (University of Pittsburgh Press, 2017).
[6] Melissa Kennedy et al., "Co-Creative Pedagogies: Learning Through Uncertainty in Higher Education," *Higher Education*, ahead of print, April 10, 2025, https://doi.org/10.1007/s10734-025-01444-w.
[7] Edward J. Balleisen et al., "The Impact of Applied Project-Based Learning on Undergraduate Student Development," *Higher Education* 87, no. 4 (2024): 1141–56, https://doi.org/10.1007/s10734-023-01057-1.

3.3. A Typical Class Meeting

Because CURRENT meets for only 75 minutes each week, initial meetings are carefully structured to balance discussion, skill development, collaborative work, and project management within a relatively short class period. Rather than relying on a single extended activity, most meetings will move through several focused segments that keep students actively engaged while advancing course milestones. The precise balance of activities will vary over the academic year, with some sessions devoting additional time to site visits, document analysis, or project work, but the schedule below illustrates the general rhythm of a typical meeting.

#	Activity	Description	Time
1	*Warm-Up*	*Brief check-in or prompt connecting the week's readings, reflections, or project work to the day's objectives.*	*5 min*
2	*Full-Team Discussion*	*Discussion of readings, sources, technical documents, or other shared materials.*	*15 min*
3	*Skill Practice / Workshop*	*Hands-on exercise developing a targeted research, analytical, or professional skill.*	*15 min*
4	*Sub-Team Work*	*Focused small-group work on utilities research, project planning, or assigned tasks.*	*20 min*
5	*Share-Out & Explainer*	*Brief team reports and synthesis of key findings, challenges, and next steps.*	*15 min*
6	*Cool Down*	*Preview of upcoming work, deliverables, and time for questions.*	*5 min*

3.4. Project-Team Cultures

Positive team culture is built by the team, not imposed from above. In early meetings, members will collaboratively establish team norms — shared expectations for behavior and accountability — through open discussion rather than a preset list. Each person suggests key behaviors, and the group refines and agrees on them together. Norms will be posted visibly and revisited as needed. Common starting points include one speaker at a time, open-minded listening, equality among members, focusing on interests over positions, constructive debate, keeping commitments, and honest feedback. Beyond these norms, healthy culture requires full participation, direct discussion of difficult issues, and genuine appreciation for the diverse perspectives everyone brings.



Figure 5. *Students in safety gear and hard hats tour the West Campus Steam Plant during Bootcamp. Veterans of last year's capstone offer a piece of hard-won advice: the team culture you build together is what makes the work worthwhile.*

3.5. Safety & Security at The Foundry

As described on The Foundry's website (foundry.duke.edu/about), Bootcamp's home base is a working shop space with real equipment, which means safety and security expectations apply every time you're in the building:



Personal Protective Equipment. Always wear required gear, such as safety goggles and earplugs, when operating machinery.



Clothing and Hair. Secure loose clothing, tie back long hair, and remove dangling jewelry before using any equipment.



Keep It Clean. Maintain a tidy workspace throughout your session to help prevent accidents.



No Food or Drink. Eating and drinking are strictly prohibited inside the facility. No exceptions.



Equipment Care. Use only Foundry-supplied laptops with approved software — personal laptops may never be connected to Foundry machinery.

These rules are in addition to any space-specific guidance Ali Stocks provides at the start of the semester. As noted in Section 2.1, treat The Foundry as Ali's house: respecting its space, equipment, and rules is a shared responsibility for everyone who works there.

FOUNDRY ACCESS POLICIES	*Before using The Foundry, students must join the **Pratt Passport** and complete required training. Full policy details are available at https://foundry.duke.edu/resources/policies.*

ACCOUNTABILITY

4.1. Core Policies

This course follows a set of policies designed to support academic integrity, fairness, and a productive learning environment for everyone. Please review the guidelines below regarding coursework deadlines, attendance, accommodations, and classroom conduct, including expectations around electronics, AI tools, and recording. Most policies allow for flexibility in cases of genuine need, but this generally requires reaching out to Tom and Becky in advance. If you have any questions about how these policies apply to your situation, don't hesitate to ask.



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: In general, all written work must be submitted before class time on the appointed date. Should you need extra time to complete any assignment, contact Becky or Tom or Nicole in advance of the due date or as soon as possible. Without prior written approval, late submissions will result in a reduction of five points per day late.



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 Becky or Tom at your earliest convenience and submit an Incapacitation Form: https://class-absences.trinity.duke.edu/if/.



Artificial Intelligence: You are encouraged to treat AI and machine-learning tools as part of your working toolkit — useful for brainstorming, troubleshooting, and drafting. The instructors invite you to check in with them on any given task to help you use these tools to maximum effect while still building the skills the assignment is designed to develop.

ACCOMMODATIONS	*Since all students have the right to have certain accommodations met, you are encouraged to notify Becky or 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 policies, see https://access.duke.edu/requests.*

4.2. Assignments & Grade Weights

Throughout the semester, you will complete three individual reflection essays — brief personal accounts written at key points in the course, from your team's early plant tour through your guest-speaker conversation and into the thick of sustained project work. This independent portfolio is designed to help you process the experience as it unfolds and to build the habits of observation and inquiry this course depends on. Early in the semester, your team will also draft a charter establishing how you'll work together, then revisit that charter twice more through short AI-supported check-ins as your working relationships mature.

The bulk of the semester's work, however, unfolds at the team level. After grounding your project in stakeholder needs, scope, and constraints, your team will translate that understanding into a formal problem statement and initial timeline — a living document your team will revisit throughout the term. As you move into sustained project work in the semester's second half, your team will produce a series of progress reports tracking your momentum, findings, and any changes to your plan. The semester closes with your team's final presentation and slide deck, summarizing your findings and proposing a direction for spring-semester work.

The table below breaks down each set of deliverables by work mode, occurrences, and grade weight.

#	Title	Work Mode	Deliverable	Occs.	Weight
1	*Individual Reflections*	*Individual*	*Individual Reflection Essay*	*3*	*15%*
2	*Team Charter*	*Team (charter); Individual (update survey)*	*Team Charter*	*1*	*8%*
			Team Charter Update	*2*	*4%*
3	*Problem Framing*	*Collaborative (Team)*	*Problem Statement & Timeline*	*1*	*15%*
4	*Progress Reporting*	*Collaborative (Team)*	*Team Progress Report*	*3*	*33%*
5	*Final Presentation*	*Collaborative (Team)*	*Final Presentation & Slide Deck*	*1*	*25%*

Total: 100%

4.3. A Note about Grading

We want Bootcamp to be a challenging, engaging, and supportive learning experience. Because much of the course involves collaborative work, hands-on investigation, and open-ended projects, success depends less on already knowing all the answers and more on your willingness to participate, learn, and grow throughout the year.

If you make a good-faith effort to complete assignments on time, attend and contribute to class meetings, and communicate with us proactively when challenges arise, we will do everything in our power to help you succeed. We cannot promise any particular grade. But we can promise that we will meet your effort with our own. We are committed to providing clear expectations, constructive feedback, and the guidance you need to make steady progress toward your goals.

In short: show up, stay engaged, do your best work, and keep the lines of communication open. If you do that, Becky and Tom will be right alongside you every step of the way.

4.4. Capstone Design

Like any well-designed circuit, Bootcamp has a clear path from start to finish. The semester opens with a single orientation meeting, then splits into two structured halves: Making Contact, in which teams form, tour Duke's own utility infrastructure, and frame their problem, and Stepping Up the Voltage, in which teams consult with their DUES project partners and build sustained momentum toward a final presentation. A short closing meeting, Closing the Circuit, brings the semester to rest with individual and team debriefs. Running beneath this progression is a continuous thread of weekly research diary entries, connecting each meeting to the next even as the collaborative deliverables shift from phase to phase. The figure below traces this architecture, showing how Bootcamp's four phases relate to one another and which deliverables anchor each.

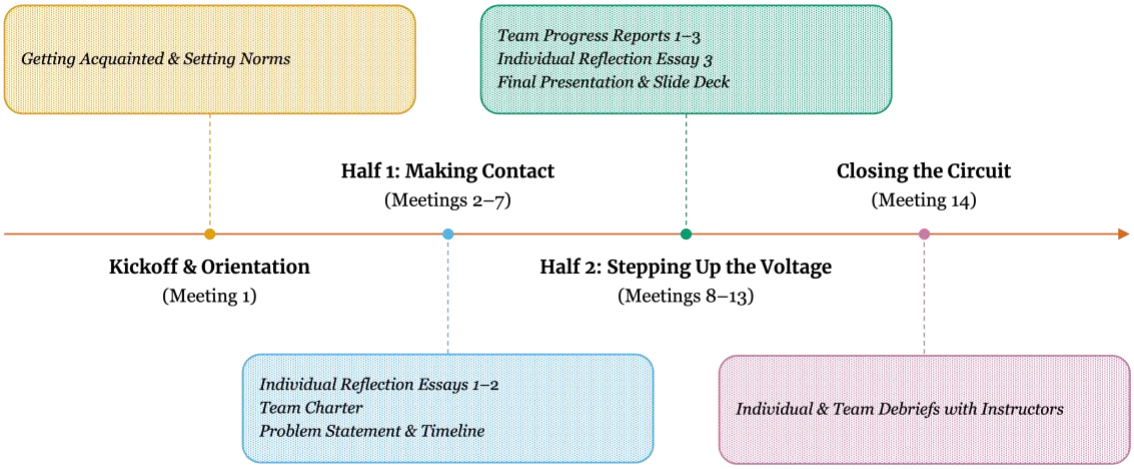


Figure 4. Bootcamp's four-phase structure: Kickoff & Orientation (Meeting 1) opens the semester; Half 1: Making Contact (Meetings 2–7) covers team formation, reflection essays, team charter, and problem statement; Half 2: Stepping Up the Voltage (Meetings 8–13) builds toward final progress reports, a reflection essay, and the final presentation; Closing the Circuit (Meeting 14) closes with individual and team debriefs.

4.5. Keywords

Bootcamp organizes much of its coursework around a small set of recurring keywords drawn from facilities management, engineering, and project practice. These terms surface throughout site visits, readings, and guest-speaker conversations, and they anchor the vocabulary teams use when framing and evaluating their own projects.

#	Half 1: Making Contact	Half 2: Stepping Up the Voltage
1	*Infrastructure*	*Maintenance Backlog*
2	*Stakeholder*	*Feasibility*
3	*Scope*	*Decarbonization*
4	*Problem Statement*	*Progress Report*
5	*Team Charter*	*Project Partner*

5. SCHEDULE

NOTE	*The course schedule outlined in this syllabus is subject to change at the instructors' discretion. While every effort will be made to keep this document current, the most up-to-date version of the course schedule will always be posted on the Canvas course site. Students are responsible for checking Canvas regularly for any updates, revisions, or announcements regarding readings, assignments, due dates, or exam dates. In the event of a discrepancy between this printed/PDF syllabus and the Canvas schedule, the Canvas version takes precedence.*

Half 1: Making Contact

Students establish the foundational connections of the capstone — forming teams, building a charter, framing their problem, and mastering research methods — while getting an up-close look at Duke's energy infrastructure through an on-campus plant tour.

Meeting 1: Kickoff & Orientation

Wednesday, August 26

Students meet the course, break the ice with guest stars, and get grounded in AI tools, communication norms, and available resources.

Deliverable Due

None

Meeting 2: Mapping the Grid

Wednesday, September 2

An overview of the semester's project topics orients students to the range of utilities challenges they'll be choosing from.

Deliverable Due

Qualtrics Survey (end of class)

Meeting 3: Behind the Meter

Wednesday, September 9

Students tour an on-campus plant (chill water or steam) to see firsthand infrastructure that normally stays out of sight.

Deliverable Due

None

Meeting 4: Wiring the Team

Wednesday, September 16

A dedicated workshop, led by Prof. Steve McClelland, helps teams draft their charter and establish how they'll work together.

Deliverable Due

Individual Reflection Essay 1

Meeting 5: Grounding the Problem

Wednesday, September 23

Students learn to frame stakeholder needs, scope, assumptions, and success measures, then translate that framing into a project timeline.

Deliverable Due

Team Charter

Meeting 6: Sparking Careers

Wednesday, September 30

A guest speaker shares real-world project management insight and energy career pathways, followed by Q&A.

Deliverable Due

Problem Statement & Timeline

Meeting 7: Tracing the Lines

Wednesday, October 7

Students dig into research methods, codes and standards, and policy/economic context, and practice documenting their findings.

Deliverable Due

Individual Reflection Essay 2

Half 2: Stepping Up the Voltage

Following the Hard Reboot, teams move from setup into sustained project work, visiting a hydroelectric facility, consulting with project partners, and building momentum toward their final presentation of findings and spring-semester plans.

Meeting 8: Hard Reset

Wednesday, October 14

Teams pause the regular class schedule for a brief, informal check-in to reset priorities, troubleshoot early snags, and realign before diving back into full project work.

Deliverable Due

None

Meeting 9: Under Load

Wednesday, October 21

Teams use in-class time to work directly on their projects, with instructors available to meet with each group.

Deliverable Due

Team Progress Report 1

Meeting 10: Downstream

Friday, October 30

Students travel off-campus to tour a hydroelectric facility.

Deliverable Due

None

Meeting 11: Load Balancing

Wednesday, November 4

Teams continue project work while consulting directly with their project partners.

Deliverable Due

Individual Reflection Essay 3; Team Progress Report 2

Meeting 12: Steady State

Wednesday, November 11

Another dedicated team work session to maintain project momentum.

Deliverable Due

Team Progress Report 3

Meeting 13: Switching On

Wednesday, November 18

Teams present their problem findings, proposed direction, and plan for spring semester work.

Deliverable Due

Presentation & Slide Deck

No Class – Thanksgiving Recess

Wednesday, November 25

Meeting 14: Closing the Circuit

Wednesday, December 2

Teams hold final meetings, wrap up charter updates, and post about their experience on LinkedIn.

Deliverable Due

None

FURTHER READING

Ackermann, Marsha E. *Cool Comfort: America's Romance with Air-Conditioning*. Smithsonian, 2002.

Bakke, Gretchen. *The Grid: The Fraying Wires Between Americans and Our Energy Future*. Bloomsbury USA, 2017.

Blunt, Katherine. *California Burning: The Fall of Pacific Gas and Electric – and What It Means for America's Power Grid*. Portfolio, 2022.

Cohn, Julie A. *The Grid: Biography of an American Technology*. Reprint. MIT Press, 2017.

Galili, Doron. *Seeing by Electricity: The Emergence of Television, 1878-1939*. Duke University Press, 2020.

Huemann, Martina, and Rodney Turner, eds. *The Handbook of Project Management*. 6th edition. Routledge, 2024.

Hughes, Thomas P. *Networks of Power: Electrification in Western Society, 1880-1930*. Reprint. Johns Hopkins University Press, 1993.

Isenstadt, Sandy. *Electric Light: An Architectural History*. The MIT Press, 2018.

McGarity, Thomas O. *Pollution, Politics, and Power: The Struggle for Sustainable Electricity*. Harvard University Press, 2019.

Montaño, Diana. *Electrifying Mexico: Technology and the Transformation of a Modern City*. University of Texas Press, 2023.

Nye, David E. *Electrifying America: Social Meanings of a New Technology, 1880-1940*. MIT Press, 2001.

Petroski, Henry. *To Forgive Design: Understanding Failure*. Harvard University Press, 2012.

Scheyder, Ernest. *The War Below: Lithium, Copper, and the Global Battle to Power Our Lives*. Atria/One Signal Publishers, 2025.

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