ISYE/PUBP 6701 Syllabus

Energy Technology and Policy | Spring 2027

Jimmy & Rosalynn Carter School of Public Policy - H. Milton Stewart School of Industrial and Systems Engineering

Instructor Information

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Office hours: by appointment. Teaching assistant and support contacts to be announced in Canvas.

General Course Information

Description

This graduate course examines how energy resources, technologies, markets, and public policies interact to shape energy systems. Students develop a working understanding of major fuels and energy technologies while learning to evaluate their economic, technical, environmental, social, and security implications. Emphasis is placed on evidence-based decisions: comparing alternatives, recognizing market and institutional constraints, and recommending policies or investments that can succeed in practice.

The course develops a set of integrated modules. Each combines technical foundations, policy context, analytical tools, and real-world cases. Topics include electricity systems and reliability; fossil fuels and energy security; renewable electricity and storage; nuclear energy; transportation and electrification; efficiency; climate policy and resilience; and emerging challenges such as data centers, critical minerals, and industrial decarbonization. Equity, innovation, diffusion, and uncertainty recur throughout.

Course Learning Outcomes

- Explain how major energy fuels, technologies, and infrastructure systems operate, including their performance limits and resource requirements.
- Apply quantitative and qualitative evaluation tools—including energy-flow analysis, levelized costs, life-cycle thinking, cost-benefit and cost-effectiveness analysis, and policy evaluation—to compare alternatives.
- Assess how markets, institutions, policy instruments, and stakeholder interests influence technology adoption and energy-system outcomes.
- Use credible data and carefully stated assumptions to evaluate economic, environmental, reliability, equity, and security tradeoffs.
- Develop and defend a practical recommendation for a real-world energy technology or policy decision, acknowledging uncertainty and implementation constraints.

Required Course Materials

Core text: M. A. Brown and V. M. Thomas, Energy Technology and Policy Innovation.

Reading expectations: normally one focused core selection and one short application or data source per module; the instructors will specify essential pages and distinguish required from optional readings. Students should come prepared to explain one key insight, one uncertainty, and one implication for a decision.

Grading Policy

Component	Weight	Expected work
Preparation and participation	25%	Short reading checks, case discussions, polls/debates, brief reflections; equivalent online pathway
Pre-Class Quiz/Low-Stakes Assessment (LSA)	15%	3 low-stakes assessments completed in/outside of class (5% each)
Midterm applied assessment	15%	Interpretation, quantitative reasoning, and policy/technology comparison
Team decision project	25%	Real-world evaluation, recommendation, presentation, and short executive brief
Final integrative assessment	20%	Individual scenario-based synthesis and defended recommendation

Georgia Tech course grades use A, B, C, D, and F without plus/minus designations. Proposed numerical cutoffs for faculty confirmation: A 90–100, B 80–89.99, C 70–79.99, D 60–69.99, F below 60. Canvas will display weighted progress; the final syllabus will confirm rounding and late-work rules.

Description of Graded Components

Preparation and participation (25%). Each module includes a short reading-based readiness check or response and an applied activity. Evaluation rewards preparation, quality of reasoning, use of evidence, respectful engagement, and responsiveness to competing arguments—not simply attendance or how often a student speaks. Low-stakes exercises may be completed individually or in teams.

Pre-Class Quiz/Low-Stakes Assessments (LSA) (15%). Periodic quizzes to assess learnings at key points along the semester. Some will be completed in class, others take-home (distance learners will complete independently).

Midterm (15%). Applied questions on energy systems, basic quantitative tools, markets, and policy choices. The emphasis is interpretation and justified decisions rather than isolated definitions.

Team decision project (25%). Small teams evaluate a real technology investment, policy proposal, or energy-system challenge using technical evidence, economics, policy and stakeholder analysis. Deliverables: scoped proposal/check-in, executive brief, and final presentation with questions. Individual contribution and peer feedback may inform grading. Project scope and rubric will be distributed in Canvas.

Final integrative assessment (20%). An individual case or scenario requiring students to compare alternatives, use multiple course tools, and recommend an implementable course of action. Format, permitted materials, and timing will be announced well in advance.

Course Organization and Tentative Schedule

The first class of most modules establishes the system, technology, and analytical foundations; the second emphasizes an applied case, discussion, quantitative exercise, or decision. A recurring question is: What should the decision-maker do, and why?

Module	Focus / balanced coverage	Application or tool
1. Foundations	Energy flows, units, supply/demand; systems framing	Sankey diagrams, data interpretation, comparison baselines
2. Markets and policy	Externalities, market failure, institutions, policy instruments	Policy logic, stakeholder and incentive mapping
3. Fuels and security	Coal, oil, natural gas; resource constraints and geopolitics	Fuel-system comparison, emissions and security scenarios
4. Electricity systems	Generation, transmission, dispatch, reliability and resilience	Capacity vs. energy; reliability metrics; grid case
5. Renewable electricity	Solar, wind, variability, storage, grid integration	LCOE and system-level tradeoffs; deployment policy

6. Nuclear and firm power	Nuclear technology, waste, safety; firm low-carbon options	Technology evaluation, cost and risk comparisons
7. Transportation	Liquid fuels, EVs, charging, alternative pathways	Life-cycle comparison and technology diffusion
8. Efficiency and buildings	Efficiency, electrification, demand-side options	LCSE, cost-benefit analysis, split incentives
9. Climate and resilience	Mitigation, adaptation, climate policy, equity	Policy evaluation, distributional and resilience analysis
10. Carbon and industry	Carbon pricing, emissions accounting, hard-to-abate sectors	Cost per ton, LCA boundaries, industrial case
11. Supply chains and innovation	Critical minerals, circularity, industrial policy	Supply risk, recycling potential, policy diffusion
12. Emerging energy decisions	AI/data centers, demand growth, technology and policy uncertainty	Integrated scenario analysis and policy tradeoffs
13. Integration and projects	Team presentations, cross-case synthesis, course review	Defend a recommendation; compare across systems

The schedule will be adjusted to the official calendar, holidays, exam periods, and instructor availability. Modules may be combined or re-sequenced; final reading selections, cases, and due dates will appear in Canvas. AI, energy equity, and implementation are integrated across modules rather than isolated in a single survey lecture.

Course Policies

Attendance and Participation

Students are expected to prepare for and engage with class activities. Atlanta-section students ordinarily participate in person. Distance-learning students will have comparable opportunities through synchronous discussion where feasible and structured asynchronous responses when live attendance is impractical. Specific synchronous requirements, deadlines, and accommodations will be confirmed before the term; participation will be assessed using the same evidence-based rubric across modalities. Institute-approved and other appropriately documented absences will be handled consistently with Georgia Tech policy.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards and follow Georgia Tech's Honor Code and Student Code of Conduct. Suspected violations will be referred to the Office of Student Integrity under applicable Institute procedures.

Collaboration, Group Work, and Generative AI

Collaboration is encouraged for designated in-class exercises and team work; individual memos and assessments must reflect each student's own reasoning unless otherwise stated. Generative AI may be used for brainstorming, clarifying concepts, or checking structure when expressly permitted, but not as a substitute for analysis, original calculations, verification of sources, or independent judgment. Students must disclose substantive AI assistance and verify all claims, numbers, and references. Specific permitted uses for each assessment will be provided in Canvas.

Accommodations for Students with Disabilities

If you have learning needs that require accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to discuss your needs and obtain an accommodation letter. Please also email the instructors to arrange a discussion of appropriate accommodations.

Student–Faculty Expectations Agreement

We seek an atmosphere of mutual respect, acknowledgment, and responsibility. Students and faculty share responsibility for thoughtful preparation, constructive dialogue, academic integrity, and respectful treatment of different perspectives.

Extensions, Missed Work, and Disruptions

Contact the instructors or TA promptly if illness, approved Institute activities, religious observances, or other circumstances affect participation or deadlines. Arrangements will follow Georgia Tech policy. Detailed deadlines, late-work provisions, and any digital-learning contingency will be finalized in Canvas before the term.

Campus Resources

Georgia Tech provides graduate academic support, library and communication resources, disability accommodations, and student well-being services. Consult the Office of Graduate and Postdoctoral Education and Georgia Tech student resource guide for current contacts and support.