

NEW COURSE—CONTENTS SUBJECT TO CHANGE

SLOAN SCHOOL OF MANAGEMENT MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Andrew W. Lo

15.S05 Special Seminar in Management

Fall 2026

CATAPULT Advanced Energy Technologies

How do breakthrough advances across science and engineering become real-world energy systems that deliver reliable, dispatchable, carbon-free, large-scale power? This course is designed to equip the next generation of scientists, engineers, and innovators with the knowledge and skills to answer that question—and to act on it.

Students are introduced to the full lifecycle of translating advanced energy technologies into practice. Drawing on examples from fusion, advanced fission, and adjacent technologies with shared technical and industrial challenges, students will explore how complex energy systems are designed, built, and deployed. Topics include reactor and system design considerations, regulatory and permitting pathways, supply chains and industrial ecosystems, and the techno-economic factors that determine commercial viability.

Students will learn how technical performance translates into cost, value, and impact; how uncertainty, timelines, and capital intensity shape decision-making; how large-scale energy projects are financed and developed; and how market structures, policy frameworks, and partnerships influence outcomes.

Beyond technical knowledge, the course emphasizes core translational skills required to move ideas from concept to reality. Students will develop the ability to communicate complex technical concepts to diverse stakeholders, work effectively across disciplines, navigate collaborations and conflicts of interest, and manage intellectual property in academic and industrial settings. The course also addresses the human side of innovation—leadership, negotiation, resilience, and decision-making under uncertainty.

Other topics include career pathways across academia, industry, startups, investing, and policy; communicating technical ideas for impact; energy system development and deployment; techno-economic analysis; supply chain and ecosystem development; intellectual property strategy; academic–industry collaboration; company formation; and managing both failure and success.

CATAPULT Advanced Energy Technologies is intended primarily for Ph.D. students interested in translating their academic research in science and engineering into real-world energy systems—whether through research, industry, startups, investing, or policy. No prior business experience is required.

Prerequisite

Permission of instructor required. Please complete the application form here: https://survey.qualtrics.com/jfe/form/SV_7NBm7zF0ZU5YsD4.

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Class Schedule and Format

The class meets once per week on Tuesdays from 4:00 to 7:00pm in 45-230. Classes will consist of a mix of lectures and guest speakers. Runs in parallel with other CATAPULT core courses, with combined sessions during weeks covering shared topics.

Recitations

The TA, [TBD], will hold recitations on [DAY/TIME], in [LOCATION]. Class material will be reviewed and additional applications and exercises presented. Questions should be directed to [TA CONTACT].

Course Websites

The primary course website is Canvas, [URL], and all teaching materials *except problem sets* will be posted on this site, including announcements, TA office hours, lecture notes, readings, handouts, and data.

Online problem sets and their solutions, pre-lecture questions, and in-class group problems can be found on the MITx website: [URL].

Office Hours

Professor Lo and [TA] will hold regular office hours. Professor Lo's office hours will be by appointment and scheduled by his assistant, Viniqua Gooding (goodin41@mit.edu). [TA]'s office hours will be on [DAY/TIME] in [LOCATION] and by appointment.

Course Admin

The course administrators, Viniqua Gooding and Andres Gallego (afg1988@mit.edu), are responsible for all logistical aspects of the course, including scheduling meetings with guest speakers, practicum mentors, and Professor Lo.

Course Requirements and Grading

Course requirements include: (1) regular attendance (which includes coming to class **on time**) and class participation which requires having read the articles, cases if any, completing the pre-lecture questions on MITx prior to coming to class, and being prepared to discuss these materials (25%); (2) three online problem sets (30% = 10% for each problem set); and (3) one group “practicum” due before the end of the semester (45% = 20% for project deliverables + 25% for peer evaluation). There is no final examination for the class.

The group project involves proposing a live translational challenge—perhaps a technology being developed by a team member—and then applying the principles covered in class throughout the semester, culminating in a written plan for translation due at the end of the semester. Groups will have the opportunity to present the results of their project to their peers and this presentation will be recorded and graded, along with their project plan.

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Course Materials

- TBD
- Research articles and case studies will be made available on the course website and Study.net.

Additional Recommended Readings

TBD

AI Policy

This course encourages students to explore the use of generative artificial intelligence (GAI) tools such as ChatGPT, Claude, Gemini, or DeepSeek for all assignments and assessments. Any such use must be appropriately acknowledged and cited. It is each student's responsibility to assess the validity and applicability of any GAI output that is submitted; you bear the final responsibility. Violations of this policy will be considered academic misconduct. We draw your attention to the fact that different classes at MIT Sloan may implement different AI policies, and it is the student's responsibility to conform to expectations for each course.

Sloan Values

You are responsible for upholding Sloan's code of conduct, which mandates zero tolerance for cheating and plagiarism. For more details on Sloan's academic policies, please read the document "Classroom Values in Practice" which is available on the course website.

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Class and Assignments Schedule[†]

Asterisk indicates combined session with other CATAPULT core courses.

Class	Topic
L1: 9/15	STEM Career Paths and Core Skills for Success* <ul style="list-style-type: none">▪ Overview of career pathways across academia, industry, startups, investing, and policy—including how roles differ in incentives, impact, and success metrics▪ Core translational skills including communication, problem framing, and connecting technical work to real-world applications▪ Navigating career decisions and professional growth including working in interdisciplinary teams, evaluating opportunities, and building networks and mentorship▪ Time management Readings: Background:
R1: 9/18	[TBA]
L2: 9/22	Writing and Delivering STEM Topics Effectively* <ul style="list-style-type: none">▪ Translating complex science into clear, impact-oriented narratives that resonate with both expert (grants) and non-expert (pitches, business plans) audiences▪ Tailoring communication to stakeholders including government funding agencies, investors, executives, and policymakers with different goals and incentives▪ Communicating data, uncertainty, and risk in a credible way that supports decision-making and enables funding and partnerships Readings: Assignment:
R2: 9/25	[TBA]
L3: 9/29	Energy System Design and Regulatory Framework <ul style="list-style-type: none">▪ Overview of leading energy system architectures, including fusion (tokamak, stellarator, inertial confinement), advanced fission (small modular, micro, and molten-salt reactors), geothermal, and other firm low-carbon energy systems—highlighting core principles of heat generation, conversion, and grid integration▪ Comparative analysis of key subsystems across technologies, including fuel cycles, thermal management, materials constraints, and balance-of-plant requirements needed to deliver reliable electricity▪ Navigating regulatory landscapes across energy sectors, including nuclear (fusion and fission), geothermal, and large-scale infrastructure projects—

[†] Guest speakers are tentative and there may be last-minute changes.

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covering licensing pathways, permitting timelines, and the role of early regulatory engagement in shaping design choices and deployment strategies

- Siting, environmental review, and safety case development across technologies, including waste streams, emissions, land and water use, and public engagement strategies that affect permitting and social license to operate

Readings:

Assignment:

R3: 10/2 [TBA]

L4: 10/6 **Supply Chain and Ecosystem Requirements and Current Status**

- Mapping critical materials, components, and capabilities across advanced energy systems—e.g., superconducting materials, nuclear fuels, high-temperature materials, drilling technologies, and specialized manufacturing—and assessing current availability and bottlenecks
- Building the workforce and industrial ecosystem required to scale emerging energy technologies, including partnerships with national laboratories, universities, and private industry, and government programs in supporting commercialization
- Scaling deep-tech supply chains, qualifying vendors, and managing long lead-time procurement under uncertainty

Readings:

Assignment:

R4: 10/9 [TBA]

10/13 No Class – Monday Schedule of Classes

10/20 No Class – LEAD Week

L5: 10/27 **Techno-economic Analysis A**

- Translating technical performance metrics (e.g., efficiency, capacity factor, reliability) into levelized cost of electricity (LCOE) and other economic measures, and understanding how assumptions about learning curves, plant lifetime, and utilization drive economic viability across energy technologies
- Stage-gating investment decisions in emerging energy systems: identifying key technical and commercial inflection points (e.g., demonstration plants, first-of-a-kind deployment) and how milestone achievement affects valuation, risk, and financing strategy
- Comparative analysis of advanced energy technologies—fusion, advanced fission, geothermal, and renewables-plus-storage—including tradeoffs in dispatchability, scalability, cost trajectories, and system value to the grid

Readings:

Assignment:

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R5: 10/30 [TBA]

L6: 11/3 Techno-economic Analysis B

- Capital cost structures and financing challenges across advanced energy technologies, including long development timelines, construction risk, cost-of-capital sensitivity, and differences between first-of-a-kind (FOAK) and *n*th-of-a-kind (NOAK) deployment
- Use of analytical tools (e.g., real-options frameworks, Monte Carlo simulation) to model uncertainty and inform investment decisions under deep technological and market uncertainty
- Revenue models and market opportunities across energy systems, including electricity markets, industrial heat, hydrogen production, and other emerging applications, and how off-take agreements, capacity markets, and policy incentives shape commercial feasibility
- Investor and partner perspectives across the energy landscape, including portfolio strategies, deal structures (equity, grants, milestone-based funding), and the role of public-private partnerships in de-risking deployment

Readings:

Assignment:

R6: 11/6 [TBA]

L7: 11/10 Creating and Managing Your IP in Academic Settings*

- Fundamentals of patents, trade secrets, and data rights
- Navigating university tech transfer offices and invention disclosure processes
- Strategies for protecting IP while enabling publication, collaboration, and startup formation

Readings:

Assignment:

R7: 11/13 [TBA]

L8: 11/17 Managing Scientific and Commercial Collaborations and Navigating Conflicts of Interest*

- Structuring academic collaborations, industry partnerships, sponsored research, and joint ventures
- Identifying and managing conflicts of interest and commitment in academic settings
- Governance, transparency, and ethical considerations in academia-industry collaboration

Readings:

Assignment:

R8: 11/20 [TBA]

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- L9: 11/24** **How to Start an Energy-Related Company If You Must**
- Building the founding team across physics, engineering, and business, securing early funding from government grants, venture capital, and strategic investors, and defining an initial technical and commercial strategy
 - Evaluating when to spin out a company versus pursuing a public–private partnership or licensing approach, including navigating DOE IP rules, lab partnership agreements, and institutional conflicts
 - Translating scientific vision into a compelling investment thesis—articulating the pathway to a pilot plant, managing investor expectations around long timelines, and structuring equity among founders, early employees, and capital providers

Readings:

Assignment:

11/27 *No Recitation – Happy Thanksgiving!*

- L10: 12/1** **Dealing with People***
- Leading interdisciplinary teams across science, engineering, and business domains
 - Hiring, incentives, and culture in early-stage ventures
 - Negotiation and stakeholder management across investors, partners, and regulators
 - How to deal with difficult people, and what if **you** are difficult people?

Readings:

Assignment:

R9: 12/4 [TBA]

- L11: 12/8** **Dealing with Failure and with Success***
- Learning from technical, regulatory, and commercial setbacks and successes
 - Managing risk, resilience, and decision-making under uncertainty
 - Scaling responsibly after failure or success including governance, capital strategy, and long-term impact
 - Course wrap-up and looking ahead

Readings:

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Readings

Most readings will be made available on Canvas.

TBD

Preliminary