INSTITUTE FOR DATA, SYSTEMS, AND SOCIETY

The mission of the Institute for Data, Systems, and Society (IDSS) is to advance education and research in state-of-the-art, analytical methods in information and decision systems; statistics and data science; and the social sciences, and to apply these methods to address complex societal challenges in a diverse set of areas such as energy systems, finance, healthcare, social networks, and urban science. Its mission also includes the creation of an MIT-wide focal point for advancing research and educational programs related to statistics and data science.

Technology advances in areas such as smart sensors, big data, communications, computing, and social networking are rapidly scaling the size and complexity of interconnected systems and networks and, at the same time, are generating massive data that can lead to new insights and understanding. Research at IDSS will aim to understand and analyze data from across these systems, which present unique and substantial challenges due to scale, complexity, and the difficulties of extracting clear, actionable insights.

Our ability to understand data and develop models across complex, interconnected systems is at the core of our ability to uncover new insights and solutions.

Spanning all five schools at MIT, IDSS embraces the collision and synthesis of ideas and methods from analytical disciplines including statistics, data science, information theory and inference, systems and control theory, optimization, economics, human and social behavior, and network science. These disciplines are relevant both for understanding complex systems and for presenting design principles and architectures that allow for the systems' quantification and management. IDSS seeks to integrate these areas, fostering new collaborations, introducing new paradigms and abstractions, and utilizing the power of data to address societal challenges.

Undergraduate Study

Minor in Statistics and Data Science

The Minor in Statistics and Data Science (*https://catalog.mit.edu/interdisciplinary/undergraduate-programs/minors/statistics-data-science*) provides students with a working knowledge base in statistics, probability, and computation, along with an ability to perform data analysis. For a description of the minor, see Interdisciplinary Programs (*https://catalog.mit.edu/interdisciplinary/undergraduate-programs*).

Graduate Study

IDSS provides educational programs anchored in the following intellectual pillars: statistics, information and decision sciences, and human and institutional behavior.

IDSS's academic programs embrace the collision and synthesis of ideas and methods from analytical disciplines, including statistics, stochastic modeling, information theory and inference, systems and control theory, optimization, economics, human and social behavior, and network science. Each of these fields in isolation is an insufficient basis for a deep understanding of complex interactions and systems. However, the intersections of these disciplines provide new tools and perspectives for understanding complex systems, addressing overarching challenges (including sustainability and systemic risk), and presenting design principles and architectures that enable those systems' quantification, management, and regulation.

Inquiries about IDSS academic programs may be directed to the Academic Office (*idss_academic_office@mit.edu*).

Admission Requirements for Graduate Study

Application forms for all programs (*http://web.mit.edu/admissions/graduate*) are available online. Applicants whose first language is not English must offer evidence of written and oral proficiency in English by registering for the International English Language Testing System (IELTS) exam (*http://www.ielts.org*), academic format, and achieving a score of 7.5 or better. Information about the Graduate Record Examinations (GRE) (*https://idss.mit.edu/academics*) can be obtained through the IDSS website. Applicants should refer to the details of each program concerning specific requirements for admission.

Master of Science in Technology and Policy

The Technology and Policy Program (TPP) (*http://tpp.mit.edu*) educates students seeking leadership roles in the constructive development and use of technology—an area that is not well served by the traditional education of technical or social science specialists. TPP focuses on meeting the need for leaders who are engineers and scientists—people with not only strong technical foundations but also the skills and abilities to deal cogently and effectively with the economic, political, and administrative dimensions of the technological challenges of the 21st century.

The Master of Science in Technology and Policy is an engineering research degree with a focus on the increasingly central role of technology in the framing, formulation, and resolution of policy problems. Many students combine TPP's curriculum with complementary subjects to obtain dual degrees in TPP and either a specialized branch of engineering or an applied social science, such as political science or urban studies and planning.

TPP's coursework provides a solid grounding in technology and policy by combining advanced subjects in the student's chosen technical field with courses in economics, politics, modern quantitative methods, and social science. All students must complete a satisfactory research thesis that has a substantial technology and policy component. In order to prepare students for effective professional practice, TPP stresses leadership and communication. It also encourages students to participate in TPP's summer internship program, which places students in government and industry in the US and around the world.

The TPP curriculum consists of three blocks of subjects and a research thesis. The first block is a required integrative subject in technology and policy and a subject in applied quantitative methods. The second block focuses on training in formal frameworks for policy development and consists of subjects in microeconomics, political economy, and one core restricted elective that treats problems of technology and policy from a domain that is outside that of the students' area of research concentration and deepens the students' understanding of framings and rationales for governance in this area. The third block comprises a minimum of three coherent electives that fulfill professional and research objectives. The research thesis is the culmination of scholarship integrating technology and policy.

Completion of the academic and research requirements of the TPP SM typically takes four terms.

The TPP curriculum normally begins in September; applications are due by December 15. TPP seeks applicants with relevant work or research experience as well as the ability to demonstrate evidence of leadership and initiative in their professional or other activities. All applicants should have a strong basis in engineering or science. For the 2025 admissions cycle, the GRE General Test will be optional.

Contact the TPP program office (*tpp@mit.edu*), Room E17-373, 617-258-7295, for additional information.

Doctor of Philosophy in Social and Engineering Systems

The Doctor of Philosophy in Social and Engineering Systems (SES) (*http://idss.mit.edu/academics/ses_doc*) is focused on addressing concrete and societally significant problems by combining methods from engineering and the social sciences. A student's doctoral program includes coursework that prepares them for advanced, rigorous, and original research leading to a doctoral thesis. Both coursework and research must include breadth and depth in engineering and quantitative methods, as well as in the social sciences, and in a particular application domain.

Student research in SES is characterized by the following traits:

- It is driven by problems of societal interest, in areas such as energy, finance, health care, social networks, urban science, as well as in policy-related topics.
- It is application domain driven.
- It involves quantitative methods. The program is focused on problems that can be addressed through mathematical modeling and data analysis.
- It relies on real-world data. Research is expected to analyze data from the application domain of interest, and draw upon the training provided in statistics, etc., through the program's coursework.
- It engages societal aspects of the problem. The research incorporates theories and tools from the social sciences.

The program's subject requirements follow. Waivers for some of the requirements are possible in special circumstances.

Core	
Select 12 units from each of three areas below:	
Probability	
6.7700[J]	Fundamentals of Probability
Statistics	
18.6501	Fundamentals of Statistics
18.655	Mathematical Statistics
IDS.160[J]	Mathematical Statistics: a Non-Asymptotic Approach
IDS.131[J]	Statistics, Computation and Applications
Social Science	
17.850	Political Science Scope and Methods
21A.809	Designing Empirical Research in the Social Sciences
21A.819	Ethnographic Research Methods
Microeconomics / Causal Inference	
14.121 & 14.122	Microeconomic Theory I and Microeconomic Theory II
14.320	Econometric Data Science
14.386	New Econometric Methods
14.388	Inference on Causal and Structural Parameters Using ML and AI
17.802	Quantitative Research Methods II: Causal Inference
Information Systems and Decision Science	
Five subjects in the areas of probabilistic modeling, statistics, optimization, or systems/control theory, including:	
One subject from the list of Statistical Processing of Data Subjects below	
One subject of substantial mathematical content [1]	
Two subjects belonging to a sequence that provides increasing depth on a particular topic [2]	
Social Science	

Four subjects that create a coherent and rigorous program of study in the social sciences, providing necessary background for research, including:	
Three subjects comprising a coherent collection that builds depth in a particular social science focus area [2]	
Problem Domain	
Two subjects in the application domain of the student's research [3,4]	

1 *Criteria defined by the graduate program committee.*

2 *Subjects used to satisfy the core can be counted toward this requirement. However, the remaining subjects should be at a more-advanced level.*

3 *One subject may be satisfied by an internship or independent study in which the student is evaluated on their performance of hands-on work in a particular domain.*

4 *One subject may also be counted toward the social science requirement.*

Statistical Processing of Data Subjects

6.7810	Algorithms for Inference	12
6.7900	Machine Learning	12
9.520[J]	Statistical Learning Theory and Applications	12
14.382	Econometrics	12
15.077[J]	Statistical Machine Learning and Data Science	12
16.391	Statistics for Engineers and Scientists	12
17.802	Quantitative Research Methods II: Causal Inference	12
17.804	Quantitative Research Methods III: Generalized Linear Models and Extensions	12
17.806	Quantitative Research Methods IV: Advanced Topics	12

The program begins in September and applications are due by December 15 of the preceding year.

Further information about SES is available on the program website (*http://idss.mit.edu/academics/ses_doc*) or by contacting the IDSS Academic Office (*idss_academic_office@mit.edu*), Room E17-375, or 617-253-1182.

Research Centers

Research in IDSS addresses overarching challenges, including the modeling and prediction of system behavior and performance; systems design and architecture; and issues including social welfare, monetization, and regulation, as well as sustainability and resilience, cascades and contagion phenomena, and systemic risk.

IDSS will sustain this research agenda by fostering and prioritizing several types of strong connections, including:

- A community of experts, at MIT and elsewhere, with demonstrated success performing impactful, multidisciplinary research in these domains.
- A close connection between research and domain expertise, to enable a contextually-informed understanding of the challenges and opportunities in complex systems.
- Educational and research methodologies, not considered in isolation, but instead anchored in one or several of the cross-disciplinary fields of statistics, information and decision sciences, the science of interconnections, as well as the study of social and institutional behavior.

Sociotechnical Systems Research Center

The Sociotechnical Systems Research Center (SSRC) (*http://ssrc.mit.edu*) is an interdisciplinary research center that focuses on the study of high-impact, complex, sociotechnical systems that shape our world.

SSRC brings together faculty, researchers, students, and staff from across MIT to study and seek solutions to complex societal challenges that span healthcare, energy, infrastructure networks, the environment, and international development.

For further information on SSRC and its programs (*https://catalog.mit.edu/mit/research/sociotechnical-systems-research-center*), see the Research and Study (*https://catalog.mit.edu/mit/research*) section.

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IDS.012[J] Statistics, Computation and Applications
Same subject as 6.3730[J]
Subject meets with 6.3732[J], IDS.131[J]
Prereq: (6.100B, (18.03, 18.06, or 18.C06[J]), and (6.3700, 6.3800, 14.30, 16.09, or 18.05)) or permission of instructor
U (Spring)
3-1-8 units

Hands-on analysis of data demonstrates the interplay between statistics and computation. Includes four modules, each centered on a specific data set, and introduced by a domain expert. Provides instruction in specific, relevant analysis methods and corresponding algorithmic aspects. Potential modules may include medical data, gene regulation, social networks, finance data (time series), traffic, transportation, weather forecasting, policy, or industrial web applications. Projects address a large-scale data analysis question. Students taking graduate version complete additional assignments. Enrollment limited; priority to Statistics and Data Science minors, and to juniors and seniors.
C. Uhler, N. Azizan

IDS.013[J] Statistical Thinking and Data Analysis
Same subject as 15.075[J]
Prereq: 6.3700 or 15.069
Acad Year 2024-2025: Not offered
Acad Year 2025-2026: U (Spring)
3-1-8 units. Institute LAB

See description under subject 15.075[J].
M. Fazel Zarandi

IDS.014[J] Fundamentals of Statistics
Same subject as 18.650[J]
Subject meets with 18.6501
Prereq: 6.3700 or 18.600
U (Fall, Spring)
4-0-8 units

See description under subject 18.650[J].
Fall: P. Rigollet. Spring: A. Katsevich

IDS.045[J] System Safety
Same subject as 16.63[J]
Prereq: None
U (Fall)
3-0-9 units. REST

See description under subject 16.63[J].
N. Leveson

IDS.050[J] Cybersecurity
Same subject as 17.447[J], MAS.460[J]
Subject meets with 17.448[J], IDS.350[J], MAS.660[J]
Prereq: None
U (Spring)
3-0-9 units. HASS-S

See description under subject 17.447[J].
N. Choucri, S. Pentland

IDS.055[J] Science, Technology, and Public Policy
Same subject as 17.309[J], STS.082[J]
Prereq: None
Acad Year 2024-2025: Not offered
Acad Year 2025-2026: U (Fall)
4-0-8 units. HASS-S; CI-H
Credit cannot also be received for 17.310[J], IDS.412[J], STS.482[J]

See description under subject 17.309[J].
N. Selin

IDS.057[J] Data and Society
Same subject as 11.155[J], STS.005[J]
Prereq: None
Acad Year 2024-2025: Not offered
Acad Year 2025-2026: U (Spring)
3-0-9 units. HASS-H

See description under subject STS.005[J].
E. Medina, S. Williams

IDS.060[J] Environmental Law, Policy, and Economics: Pollution Prevention and Control
Same subject as 1.801[J], 11.021[J], 17.393[J]
Subject meets with 1.811[J], 11.630[J], 15.663[J], IDS.540[J]
Prereq: None
U (Spring)
3-0-9 units. HASS-S

Analyzes federal and state regulation of air and water pollution, hazardous waste, greenhouse gas emissions, and production/use of toxic chemicals. Analyzes pollution/climate change as economic problems and failure of markets. Explores the role of science and economics in legal decisions. Emphasizes use of legal mechanisms and alternative approaches (i.e., economic incentives, voluntary approaches) to control pollution and encourage chemical accident and pollution prevention. Focuses on major federal legislation, underlying administrative system, and common law in analyzing environmental policy, economic consequences, and role of the courts. Discusses classical pollutants and toxic industrial chemicals, greenhouse gas emissions, community right-to-know, and environmental justice. Develops basic legal skills: how to read/understand cases, regulations, and statutes. Students taking graduate version explore the subject in greater depth.
N. Ashford, C. Caldart

IDS.061[J] Regulation of Chemicals, Radiation, and Biotechnology
Same subject as 1.802[J], 11.022[J]
Subject meets with 1.812[J], 10.805[J], 11.631[J], IDS.436[J], IDS.541[J]
Prereq: IDS.060[J] or permission of instructor
U (Spring)
Not offered regularly; consult department
3-0-9 units

Focuses on policy design and evaluation in the regulation of hazardous substances and processes. Includes risk assessment, industrial chemicals, pesticides, food contaminants, pharmaceuticals, radiation and radioactive wastes, product safety, workplace hazards, indoor air pollution, biotechnology, victims' compensation, and administrative law. Health and economic consequences of regulation, as well as its potential to spur technological change, are discussed for each regulatory regime. Students taking the graduate version are expected to explore the subject in greater depth.
N. Ashford, C. Caldart

IDS.062[J] Global Environmental Negotiations
Same subject as 12.346[J]
Prereq: Permission of instructor
U (Fall)
Not offered regularly; consult department
2-0-4 units

Practical introduction to global environmental negotiations designed for science and engineering students. Covers basic issues in international negotiations, such as North-South conflict, implementation and compliance, trade, and historical perspective on global environmental treaties. Offers hands-on practice in developing and interpreting international agreements through role-play simulations and observation of ongoing climate change negotiating processes. Students taking graduate version complete additional assignments.
N. E. Selin

IDS.063[J] People and the Planet: Environmental Governance and Science
Same subject as 12.387[J], 15.874[J]
Prereq: None
U (Fall)
3-0-6 units

See description under subject 12.387[J].
N. Selin, S. Solomon, J. Sterman

IDS.065[J] Energy Systems for Climate Change Mitigation
Same subject as 1.067[J], 10.421[J]
Subject meets with 1.670[J], 10.621[J], IDS.521[J]
Prereq: (Calculus I (GIR), Chemistry (GIR), and Physics I (GIR)) or permission of instructor
U (Fall)
3-0-9 units

Reviews the contributions of energy systems to global greenhouse gas emissions, and the levers for reducing those emissions. Lectures and projects focus on evaluating energy systems against climate policy goals, using performance metrics such as cost, carbon intensity, and others. Student projects explore pathways for realizing emissions reduction scenarios. Projects address the climate change mitigation potential of energy technologies (hardware and software), technological and behavioral change trajectories, and technology and policy portfolios. Background in energy systems strongly recommended. Students taking the graduate version complete additional assignments and explore the subject in greater depth. Preference to students in the Energy Studies or Environment and Sustainability minors.
J. Trancik

IDS.066[J] Law, Technology, and Public Policy
Same subject as 11.122[J]
Subject meets with 11.422[J], 15.655[J], IDS.435[J]
Prereq: None
U (Fall)
3-0-9 units. HASS-S

Examines how law, economics, and technological change shape public policy, and how law can sway technological change; how the legal system responds to environmental, safety, energy, social, and ethical problems; how law and markets interact to influence technological development; and how law can affect wealth distribution, employment, and social justice. Covers energy/climate change; genetic engineering; telecommunications and role of misinformation; industrial automation; effect of regulation on technological innovation; impacts of antitrust law on innovation and equity; pharmaceuticals; nanotechnology; cost/benefit analysis as a decision tool; public participation in governmental decisions affecting science and technology; corporate influence on technology and welfare; and law and economics as competing paradigms to encourage sustainability. Students taking graduate version explore subject in greater depth.
N. Ashford, C. Caldart

IDS.075[J] Transportation: Foundations and Methods
Same subject as 1.041[J]
Subject meets with 1.200[J], 11.544[J], IDS.675[J]
Prereq: (1.010 and (1.00 or 1.000)) or permission of instructor
U (Spring)
3-1-8 units

See description under subject 1.041[J].
C. Wu

IDS.131[J] Statistics, Computation and Applications
Same subject as 6.3732[J]
Subject meets with 6.3730[J], IDS.012[J]
Prereq: (6.100B, (18.03, 18.06, or 18.C06[J]), and (6.3700, 6.3800, 14.30, 16.09, or 18.05)) or permission of instructor
G (Spring)
3-1-8 units

Hands-on analysis of data demonstrates the interplay between statistics and computation. Includes four modules, each centered on a specific data set, and introduced by a domain expert. Provides instruction in specific, relevant analysis methods and corresponding algorithmic aspects. Potential modules may include medical data, gene regulation, social networks, finance data (time series), traffic, transportation, weather forecasting, policy, or industrial web applications. Projects address a large-scale data analysis question. Students taking graduate version complete additional assignments. Limited enrollment; priority to Statistics and Data Science minors and to juniors and seniors.
C. Uhler, N. Azizan

IDS.136[J] Graphical Models: A Geometric, Algebraic, and Combinatorial Perspective
Same subject as 6.7820[J]
Prereq: 6.3702 and 18.06
G (Fall)
Not offered regularly; consult department
3-0-9 units

Provides instruction in the geometric, algebraic and combinatorial perspective on graphical models. Presents methods for learning the underlying graph and inferring its parameters. Topics include exponential families, duality theory, conic duality, polyhedral geometry, undirected graphical models, Bayesian networks, Markov properties, total positivity of distributions, hidden variables, and tensor decompositions.
C. Uhler

IDS.140[J] Reinforcement Learning: Foundations and Methods
Same subject as 1.127[J], 6.7920[J]
Prereq: 6.3700 or permission of instructor
G (Fall)
4-0-8 units

See description under subject 6.7920[J].
C. Wu, M. Dahleh

IDS.145[J] Data Mining: Finding the Models and Predictions that Create Value
Same subject as 15.062[J]
Subject meets with 15.0621
Prereq: 15.060, 15.075[J], or permission of instructor
G (Spring; second half of term)
2-0-4 units

See description under subject 15.062[J].
R. E. Welsch

IDS.147[J] Statistical Machine Learning and Data Science
Same subject as 15.077[J]
Prereq: Permission of instructor
G (Spring)
Not offered regularly; consult department
4-0-8 units

See description under subject 15.077[J].
R. E. Welsch

IDS.160[J] Mathematical Statistics: a Non-Asymptotic Approach
Same subject as 9.521[J], 18.656[J]
Prereq: (6.7700[J], 18.06, and 18.6501) or permission of instructor
G (Spring)
3-0-9 units

See description under subject 9.521[J].
S. Rakhlin, P. Rigollet

IDS.190 Doctoral Seminar in Statistics and Data Science
Prereq: None
G (Fall)
1-0-2 units

Interdisciplinary seminar explores diverse topics in statistics and data science. Restricted to students in the Interdisciplinary Doctoral Program in Statistics.
Consult D. Shah

IDS.250[J] The Theory of Operations Management
Same subject as 1.271[J], 15.764[J]
Prereq: (6.7210[J] and 6.7700[J]) or permission of instructor
G (Spring)
3-0-9 units
Can be repeated for credit.

See description under subject 15.764[J].
Staff

IDS.305[J] Business and Operations Analytics
Same subject as 1.275[J]
Prereq: Permission of instructor
G (Spring; first half of term)
2-0-4 units

Provides instruction on identifying, evaluating, and capturing business analytics opportunities that create value. Also provides basic instruction in analytics methods and case study analysis of organizations that successfully deployed these techniques.
D. Simchi-Levi

IDS.332 System Design and Management for a Changing World: Combined
Engineering School-Wide Elective Subject.
Offered under: 1.146, 16.861, EM.422, IDS.332
Prereq: Permission of instructor
G (Fall)
3-0-9 units
Credit cannot also be received for EM.423[J], IDS.333[J]

Practical-oriented subject that builds upon theory and methods and culminates in extended application. Covers methods to identify, value, and implement flexibility in design (real options). Topics include definition of uncertainties, simulation of performance for scenarios, screening models to identify desirable flexibility, decision analysis, and multidimensional economic evaluation. Students demonstrate proficiency through an extended application to a system design of their choice. Complements research or thesis projects. Class is "flipped" to maximize student engagement and learning. Meets with IDS.333[J] in the first half of term. Enrollment limited.
R. de Neufville

IDS.333[J] System Design and Management for a Changing World: Tools
Same subject as EM.423[J]
Prereq: None
G (Fall; first half of term)
3-0-3 units
Credit cannot also be received for 1.146, 16.861, EM.422, IDS.332

Focuses on design choices and decisions under uncertainty. Topics include identification and description of uncertainties using probability distributions; the calculation of commensurate measures of value, such as expected net present values; Monte Carlo simulation and risk analysis; and the use of decision analysis to explore alternative strategies and identify optimal initial choices. Presents applied analysis of practical examples from a variety of engineering systems using spreadsheet and decision analysis software. Class is "flipped" to maximize student engagement and learning. Meets with IDS.332 first half of term.
R. de Neufville

IDS.334[J] System Design and Management for a Changing World: Projects (IDS.330)
Same subject as EM.424[J]
Prereq: IDS.333[J] or permission of instructor
G (Fall, Spring)
3-0-3 units

Focuses on implementation of flexibility (real options) in the design of products, start-ups, ongoing management of operations, or policy plans. Applies the methods presented in IDS.333[J]: recognition of uncertainty, identification of best opportunities for flexibility, and valuation of these options and their effective implementation. Students work on their own project concept, for which they develop a dynamic business plan for design, deployment, and most beneficial implementation of their system over time. Useful complement to thesis or research projects. Class is "flipped" to maximize student engagement and learning. Subject meets in second half of term in the fall and first half of term in the spring.
R. de Neufville

IDS.336[J] Systems Architecting Applied to Enterprises
Same subject as 16.855[J], EM.429[J]
Prereq: Permission of instructor
G (Spring)
3-0-9 units

Focuses on understanding, designing and transforming sociotechnical enterprises using systems principles and practices. Includes discussions and reading on enterprise theory, systems architecting, transformation challenges and case studies of evolving enterprises. Covers frameworks and methods for ecosystem analysis, stakeholder analysis, design thinking, systems architecture and evaluation, and human-centered enterprise design strategies. Students engage in interactive breakout sessions during class and participate in a selected small team project to design a future architecture for a real-world enterprise. Selected projects are based on student interests in enterprises such as small, medium, or large companies, government agencies, academic units, start-ups, and nonprofit organizations.
D. Rhodes

IDS.337[J] Aerospace Biomedical and Life Support Engineering
Same subject as 16.423[J], HST.515[J]
Prereq: 16.06, 16.400, or permission of instructor
Acad Year 2024-2025: Not offered
Acad Year 2025-2026: G (Spring)
3-0-9 units

See description under subject 16.423[J].
D. J. Newman

IDS.338[J] Multidisciplinary Design Optimization
Same subject as 16.888[J], EM.428[J]
Prereq: 18.085 or permission of instructor
Acad Year 2024-2025: Not offered
Acad Year 2025-2026: G (Fall)
3-1-8 units

See description under subject 16.888[J].
O. de Weck

IDS.339[J] Space Systems Engineering
Same subject as 16.89[J]
Prereq: 16.842, 16.851, or permission of instructor
G (Spring)
4-2-6 units

See description under subject 16.89[J].
E. F. Crawley

IDS.340[J] System Safety Concepts
Same subject as 16.863[J]
Prereq: Permission of instructor
G (Fall)
3-0-9 units

See description under subject 16.863[J]. Enrollment may be limited.
N. G. Leveson

IDS.341[J] Concepts in the Engineering of Software
Same subject as 16.355[J]
Prereq: Permission of instructor
G (Spring)
3-0-9 units

See description under subject 16.355[J]. Enrollment may be limited.
N. G. Leveson

IDS.350[J] Cybersecurity
Same subject as 17.448[J], MAS.660[J]
Subject meets with 17.447[J], IDS.050[J], MAS.460[J]
Prereq: Permission of instructor
G (Spring)
3-0-9 units

See description under subject 17.448[J].
N. Choucri, S. Pentland

IDS.405 Critical Internet Studies (CMS.867)
Subject meets with 21W.791[J], CMS.614[J], WGS.280[J]
Prereq: None
G (Spring)
3-0-9 units

Focuses on the power dynamics in internet-related technologies (including social networking platforms, surveillance technology, entertainment technologies, and emerging media forms). Theories and readings focus on the cultural, social, economic, and political aspects of internet use and design, with a special attention to gender and race. Topics include: online communication and communities, algorithms and search engines, activism and online resistance, surveillance and privacy, content moderation and platform governance, and the spread of dis- and misinformation. Instruction and practice in written and oral communication provided. Students taking the graduate version complete additional readings and assignments.
Staff

IDS.410 Modeling and Assessment for Policy
Prereq: None
Acad Year 2024-2025: Not offered
Acad Year 2025-2026: G (Spring)
3-0-6 units

Explores how scientific information and quantitative models can be used to inform policy decision-making. Develops an understanding of quantitative modeling techniques and their role in the policy process through case studies and interactive activities. Addresses issues such as analysis of scientific assessment processes, uses of integrated assessment models, public perception of quantitative information, methods for dealing with uncertainties, and design choices in building policy-relevant models.
N. E. Selin

IDS.411 Concepts and Research in Technology and Policy
Prereq: Permission of instructor
G (Spring)
3-0-6 units

Core integrative subject, with substantive participation from a series of guest faculty lecturers, examines key technology-policy concepts. Explores alternative framings of roles of technology in policy, emphasizing the implications of these alternatives upon problem-solving in the area. Exercises prepare students to apply these concepts in the framing of their thesis research. Preference to first-year students in the Technology and Policy Program.
F. Field

IDS.412[J] Science, Technology, and Public Policy
Same subject as 17.310[J], STS.482[J]
Prereq: Permission of instructor
G (Fall)
4-0-8 units
Credit cannot also be received for 17.309[J], IDS.055[J], STS.082[J]

See description under subject 17.310[J].
N. Selin

IDS.435[J] Law, Technology, and Public Policy
Same subject as 11.422[J], 15.655[J]
Subject meets with 11.122[J], IDS.066[J]
Prereq: None
G (Fall)
3-0-9 units

Examines how law, economics, and technological change shape public policy, and how law can sway technological change; how the legal system responds to environmental, safety, energy, social, and ethical problems; how law and markets interact to influence technological development; and how law can affect wealth distribution, employment, and social justice. Covers energy/climate change; genetic engineering; telecommunications and the role of misinformation; industrial automation; effect of regulation on technological innovation; impacts of antitrust law on innovation and equity; pharmaceuticals; nanotechnology; cost/benefit analysis as a decision tool; public participation in governmental decisions affecting science and technology; corporate influence on technology and welfare; and law and economics as competing paradigms to encourage sustainability. Students taking graduate version explore subject in greater depth.
N. Ashford, C. Caldart

IDS.436[J] Technology, Law, and the Working Environment
Same subject as 10.805[J]
Subject meets with 1.802[J], 1.812[J], 11.022[J], 11.631[J], IDS.061[J], IDS.541[J]
Prereq: Permission of instructor
G (Spring)
Not offered regularly; consult department
3-0-6 units

Addresses relationship between technology-related problems and the law applicable to work environment. National Labor Relations Act, Occupational Safety and Health Act. Toxic Substances Control Act, state worker's compensation, and suits by workers in the courts discussed. Problems related to occupational health and safety, collective bargaining as a mechanism for altering technology in the workplace, job alienation, productivity, and the organization of work addressed. Prior courses or experience in the environmental, public health, or law-related areas.
N. A. Ashford, C. C. Caldart

IDS.437[J] Technology, Globalization, and Sustainable Development
Same subject as 1.813[J], 11.466[J], 15.657[J]
Prereq: Permission of instructor
G (Fall)
3-0-9 units

Investigates sustainable development, taking a broad view to include not only a healthy economic base, but also a sound environment, stable and rewarding employment, adequate purchasing power and earning capacity, distributional equity, national self-reliance, and maintenance of cultural integrity. Explores national, multinational, and international political and legal mechanisms to further sustainable development through transformation of the industrial state. Addresses the importance of technological innovation and the financial crisis of 2008 and the emergence of the Covid-19 pandemic, Russia's invasion of Ukraine, and inflation, as well as governmental interventions to reduce inequality.
N. Ashford

IDS.448 Professional Development: Policy Hackathon
Prereq: None
G (Fall)
2-0-4 units

Bridges knowledge to action for student organizers of the MIT Policy Hackathon. Students work with stakeholders to define needs for information and analysis, identify appropriate data sets, and craft problem statements that aim to provide actionable outputs for decision-making. Builds competence in management and organization, networking, presentation, and fundraising. Restricted to the student organizers for the MIT Policy Hackathon.
F. Field, N. E. Selin

IDS.449 Technology Policy Internship and Professional Perspectives Seminar
Prereq: IDS.411 or permission of instructor
G (Fall, Spring)
1-1-1 units
Can be repeated for credit.

Seminar examines what technology policy is in practice. Considers the question of "Who achieves what, when, how, and why?" regarding technology and policy. Students who completed summer internships present and dissect their experiences with special reference to specific cases in which they participated. Develops perspectives on practice in the field through sessions with alumni, other practitioners, and development professionals within MIT.
Staff

IDS.505[J] Engineering, Economics and Regulation of the Electric Power Sector
Same subject as 15.032[J]
Prereq: None
G (Spring)
3-0-9 units

Presents an in-depth interdisciplinary look at the electric power sector, with regulation providing the link among engineering, economic, legal and environmental viewpoints. Topics include electricity markets, incentive regulation of networks, service reliability, renewable energy sources, network issues, retail competition, tariff design, distributed generation, rural electrification, multinational electricity markets, environmental impacts, and the future of utilities and strategic sustainability issues under traditional and competitive regulatory frameworks. Covers engineering, economic and legal basis to evaluate worldwide regulatory instruments. Regulatory approaches apply in other industrial sectors such as fuel gases, telecoms, transportation, water supply. Provides the basis for research or professional activities in energy sectors in industry, government, and consulting. Permission of instructor required for undergraduates wishing to take the class.
C. Batlle-Lopez, T. Schittekatte

IDS.521[J] Energy Systems for Climate Change Mitigation
Same subject as 1.670[J], 10.621[J]
Subject meets with 1.067[J], 10.421[J], IDS.065[J]
Prereq: Permission of instructor
G (Fall)
3-0-9 units

Reviews the contributions of energy systems to global greenhouse gas emissions, and the levers for reducing those emissions. Lectures and projects focus on evaluating energy systems against climate policy goals, using performance metrics such as cost, carbon intensity, and others. Student projects explore pathways for realizing emissions reduction scenarios. Projects address the climate change mitigation potential of energy technologies (hardware and software), technological and behavioral change trajectories, and technology and policy portfolios. Background in energy systems strongly recommended. Students taking the graduate version complete additional assignments and explore the subject in greater depth.
J. Trancik

IDS.522 Mapping and Evaluating New Energy Technologies
Prereq: Permission of instructor
G (Fall)
3-0-9 units

Project-based seminar reviews recent developments in energy conversion and storage technologies. Merits of alternative technologies are debated based on their environmental performance and cost, and their potential improvement and scalability. Project teams develop qualitative insights, quantitative models, and interactive visualization tools to inform the future development of technologies. Models may probe how the impact of a technology depends on assumptions about future advancements in performance, and how quantitative performance targets can be estimated to inform investment and design decisions. Other projects may develop models to inform rational investments in a portfolio of technologies based on economic and environmental performance and scalability constraints. Both information-based (e.g., software and codified practices) and physical technologies will be discussed.
J. Trancik

IDS.524[J] People and the Planet: Environmental Histories and Engineering
Same subject as 11.204[J]
Subject meets with 11.004[J], STS.033[J]
Prereq: None
G (Spring)
Not offered regularly; consult department
3-3-6 units

See description under subject 11.204[J].
A. Slocum, R. Scheffler, J. Trancik

IDS.526[J] Sustainability Science and Engineering
Same subject as 12.845[J]
Prereq: None
G (Spring)
Not offered regularly; consult department
3-0-6 units

Introduces and develops core ideas and concepts in the field of sustainability science and engineering from an engineering systems perspective. Takes an interdisciplinary approach to discuss case studies of sustainability systems research. Exposes students to techniques for sustainability research across engineering, natural and social science disciplines. Term projects focus on applying techniques.
N. E. Selin

IDS.540[J] Environmental Law, Policy, and Economics: Pollution Prevention and Control
Same subject as 1.811[J], 11.630[J], 15.663[J]
Subject meets with 1.801[J], 11.021[J], 17.393[J], IDS.060[J]
Prereq: None
G (Spring)
3-0-9 units

Analyzes federal and state regulation of air and water pollution, hazardous waste, greenhouse gas emissions, and production/use of toxic chemicals. Analyzes pollution/climate change as economic problems and failure of markets. Explores the role of science and economics in legal decisions. Emphasizes use of legal mechanisms and alternative approaches (i.e., economic incentives, voluntary approaches) to control pollution and encourage chemical accident and pollution prevention. Focuses on major federal legislation, underlying administrative system, and common law in analyzing environmental policy, economic consequences, and role of the courts. Discusses classical pollutants and toxic industrial chemicals, greenhouse gas emissions, community right-to-know, and environmental justice. Develops basic legal skills: how to read/understand cases, regulations, and statutes. Students taking graduate version explore the subject in greater depth.
N. Ashford, C. Caldart

IDS.541[J] Regulation of Chemicals, Radiation, and Biotechnology
Same subject as 1.812[J], 11.631[J]
Subject meets with 1.802[J], 10.805[J], 11.022[J], IDS.061[J], IDS.436[J]
Prereq: IDS.540[J] or permission of instructor
G (Spring)
Not offered regularly; consult department
3-0-9 units

Focuses on policy design and evaluation in the regulation of hazardous substances and processes. Includes risk assessment, industrial chemicals, pesticides, food contaminants, pharmaceuticals, radiation and radioactive wastes, product safety, workplace hazards, indoor air pollution, biotechnology, victims' compensation, and administrative law. Health and economic consequences of regulation, as well as its potential to spur technological change, are discussed for each regulator regime. Students taking the graduate version are expected to explore the subject in greater depth.
N. Ashford, C.Caldart

IDS.620[J] Principles and Practice of Drug Development
Same subject as 10.547[J], 15.136[J], HST.920[J]
Prereq: Permission of instructor
G (Fall)
3-0-6 units

See description under subject 15.136[J].
S. Finkelstein, A. J. Sinskey, R. Rubin

IDS.670[J] Planning and Design of Airport Systems
Same subject as 1.231[J], 16.781[J]
Prereq: None
Acad Year 2024-2025: G (Spring)
Acad Year 2025-2026: Not offered
3-0-9 units

Focuses on current practice, developing trends, and advanced concepts in airport design and planning. Considers economic, environmental, and other trade-offs related to airport location, as well as the impacts of emphasizing "green" measures. Includes an analysis of the effect of airline operations on airports. Topics include demand prediction, determination of airfield capacity, and estimation of levels of congestion; terminal design; the role of airports in the aviation and transportation system; access problems; optimal configuration of air transport networks and implications for airport development; and economics, financing, and institutional aspects. Special attention to international practice and developments.
R. de Neufville, A. R. Odoni

IDS.675[J] Transportation: Foundations and Methods
Same subject as 1.200[J], 11.544[J]
Subject meets with 1.041[J], IDS.075[J]
Prereq: 1.000, (1.00 and 1.010), or permission of instructor
G (Spring)
3-1-8 units

See description under subject 1.200[J].
C. Wu

IDS.700[J] Applied Probability and Stochastic Models
Same subject as 1.203[J], 15.073[J]
Prereq: 6.3700 or 18.600
G (Fall)
Not offered regularly; consult department
3-0-9 units

See description under subject 15.073[J].
A. Barnett

IDS.730[J] Logistics Systems
Same subject as 1.260[J], 15.770[J], SCM.260[J]
Subject meets with SCM.271
Prereq: Permission of instructor
G (Fall)
3-0-9 units

See description under subject SCM.260[J].
C. Caplice, D. Correll

IDS.735[J] Supply Chain Analytics
Same subject as 1.273[J], 15.762[J]
Prereq: 15.761 or SCM.260[J]
G (Spring)
3-0-9 units

See description under subject 15.762[J].
N. Trichakis, S. Willems

IDS.736[J] Supply Chain: Capacity Analytics
Same subject as 1.274[J], 15.763[J]
Prereq: 15.761, 15.778, or SCM.260[J]
G (Spring; second half of term)
Not offered regularly; consult department
2-0-4 units

See description under subject 15.763[J].
S. Graves, N. Trichakis, S. Willems

IDS.900 Doctoral Seminar in Social and Engineering Systems
Prereq: Permission of instructor
G (Fall)
2-0-1 units

Introduces doctoral students to IDSS research areas. Preference to first-year students in SES.
A. Jadbabaie

IDS.910 Leadership Development
Prereq: Permission of instructor
G (Fall; partial term)
Not offered regularly; consult department
1-1-1 units

Seminar environment created to develop leadership capabilities, and to take advantage of leadership opportunities. An initial Outward Bound experience builds trust, teamwork and communications. Readings and assignments emphasize the characteristics of desired leadership skills. Global leaders participate in the Leadership Lunch series to share their experiences and recommendations. Discussions explore leadership development. Culminates in a personal leadership plan. Restricted to entering students in the Technology and Policy program or instructor permission.
Staff

IDS.950 Independent Study in Data, Systems, and Society
Prereq: Permission of IDSS Academic Office
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit.

For graduate students in IDSS. Individual study in data, systems, and society. Intended to expose student to expert-level domain material. Supervised by a member of MIT's teaching staff.
Consult IDSS Academic Office

IDS.951 Independent Study in Technology and Policy
Prereq: Permission of TPP Education Office
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit.

For graduate students in TPP. Individual study in technology and policy. Intended to expose student to expert-level domain material. Supervised by a member of MIT's teaching staff.
Consult TPP Education Office

IDS.955 Practical Experience in Data, Systems, and Society
Prereq: None
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit.

For IDSS doctoral students participating in off-campus practical experiences in data, systems, and society. Before registering for this subject students must have a training offer from a company or organization, must identify a research advisor, and must receive prior approval from the IDSS Academic Office. Upon completion of the experience students must submit a letter from the company or organization describing the goals accomplished and a substantive final report to the MIT advisor.
Consult IDSS Academic Office

IDS.956 Practical Experience in Technology and Policy
Prereq: None
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]

For TPP students participating in off-campus internship experiences in technology and policy. Before registering for this subject, students must have an employment offer from a company or organization, must identify a research advisor, and must receive prior approval from the TPP Education Office. Upon completion of the internship, student must submit a letter from the employer describing the work accomplished, along with a substantive final report from the student approved by the MIT advisor.
Consult TPP Education Office

IDS.957 Practical Experience in Data Analysis
Prereq: None
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit.

For doctoral students in the Interdisciplinary Doctoral Program in Statistics participating in off-campus practical experiences in data analysis in programs where practical experience is accepted. Before registering for this subject students must have a training offer from a company or organization, must identify a research advisor, and must receive prior approval from the IDSS Academic Office. Upon completion of the experience, students must submit a letter from the company or organization describing the goals accomplished and a substantive final report to the MIT advisor discussing how data science and statistical tools were used during their experience and any interesting problems, applications, or results.
E. Milnes

IDS.960 Teaching in Data, Systems, and Society
Prereq: None
G (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit.

For Teaching Trainees in IDSS. Laboratory, tutorial, or classroom teaching under supervision of a faculty member. Restricted to doctoral students in IDSS who have completed requisite modules and training.
Consult IDSS Academic Office

IDS.961 Teaching in Technology and Policy
Prereq: None
G (Fall, IAP, Spring)
Units arranged [P/D/F]
Can be repeated for credit.

For Teaching Assistants in TPP, in cases where teaching assignment is approved for academic credit. Laboratory, tutorial, or classroom teaching under supervision of a faculty member. Credit for this subject may not be used for any degree granted by IDSS.
Consult TPP Academic Office

IDS.970 Pre-Thesis Research in Data, Systems, and Society
Prereq: None
G (Fall, Spring, Summer)
Units arranged
Can be repeated for credit.

For doctoral students defining their dissertation topic in IDSS. Covers all activities leading to an acceptable thesis proposal and approved for academic credit by the student's academic program. Includes identifying a research advisor and program planning. Culminates in a thesis proposal, approved by a complete doctoral committee, with working title, abstract, problem summary, significance, literature review, approach, timeline, and references. Academic advisor monitors student progress until a research advisor is identified. Restricted to doctoral students in IDSS.
Consult IDSS Academic Office

IDS.971 Research in Technology and Policy
Prereq: None
G (Fall, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit.

For research assistants in TPP when assigned research is not used for thesis, but is approved for academic credit. Credit for this subject may not be used for any degree granted by IDSS.
Consult TPP Academic Office

IDS.C57[J] Optimization Methods (New)
Same subject as 6.C57[J], 15.C57[J]
Subject meets with 6.C571[J], 15.C571[J]
Prereq: 18.C06[J] or permission of instructor
G (Fall)
4-0-8 units

See description under subject 15.C57[J].
A. Jacquillat

IDS.S00 Special Undergraduate Subject in Data, Systems, and Society
Prereq: Permission of instructor
U (Fall, IAP, Spring, Summer)
Not offered regularly; consult department
Units arranged
Can be repeated for credit.

Opportunity for study of topics in Data, Systems, and Society not otherwise included in the curriculum. Offerings initiated by faculty on an ad hoc basis subject to IDSS approval.
Consult IDSS Academic Office

IDS.S01 Special Undergraduate Subject in Data, Systems, and Society
Prereq: Permission of instructor
U (Fall, IAP, Spring, Summer)
Not offered regularly; consult department
Units arranged
Can be repeated for credit.

Opportunity for study of topics in Data, Systems, and Society not otherwise included in the curriculum at MIT. Offerings are initiated by faculty on an ad-hoc basis subject to IDSS approval.
Consult IDSS Academic Office

IDS.S10 Special Undergraduate Subject in Data, Systems, and Society
Prereq: Permission of instructor
U (Fall, IAP, Spring, Summer)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit.

Opportunity for study of topics in Data, Systems, and Society not otherwise included in the curriculum at MIT. Offerings are initiated by faculty on an ad-hoc basis subject to IDSS approval.
Consult IDSS Academic Office

IDS.S11 Special Undergraduate Subject in Data, Systems, and Society
Prereq: None
U (Fall, IAP, Spring, Summer)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit.

Opportunity for study of topics in Data, Systems, and Society not otherwise included in the curriculum. Offerings initiated by faculty on an ad hoc basis subject to IDSS approval.
Consult IDSS Academic Office

IDS.S20 Special Graduate Subject in Data, Systems, and Society
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Not offered regularly; consult department
Units arranged
Can be repeated for credit.

Opportunity for study of advanced topics in Data, Systems, and Society not otherwise included in the curriculum at MIT. Offerings are initiated by faculty on an ad-hoc basis subject to IDSS approval.
Consult IDSS Academic Office

IDS.S21 Special Graduate Subject in Data, Systems, and Society
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Not offered regularly; consult department
Units arranged
Can be repeated for credit.

Opportunity for study of advanced topics in Data, Systems, and Society not otherwise included in the curriculum at MIT. Offerings are initiated by faculty on an ad-hoc basis subject to IDSS approval.
Information: Consult IDSS Academic Office

IDS.S22 Special Graduate Subject in Data, Systems, and Society
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Not offered regularly; consult department
Units arranged
Can be repeated for credit.

Opportunity for study of advanced topics in Data, Systems, and Society not otherwise included in the curriculum at MIT. Offerings are initiated by faculty on an ad-hoc basis subject to IDSS approval.
Consult IDSS Academic Office

IDS.S23 Special Graduate Subject in Data, Systems, and Society
Prereq: Permission of instructor
G (Fall, IAP, Spring, Summer)
Not offered regularly; consult department
Units arranged
Can be repeated for credit.

Opportunity for study of advanced topics in Data, Systems, and Society not otherwise included in the curriculum at MIT. Offerings are initiated by faculty on an ad-hoc basis subject to IDSS approval.
Consult IDSS Academic Office

IDS.S24 Special Graduate Subject in Data, Systems, and Society
Prereq: Permission of instructor
G (Fall, Spring)
Not offered regularly; consult department
Units arranged
Can be repeated for credit.

Opportunity for study of advanced topics in Data, Systems, and Society not otherwise included in the curriculum at MIT. Offerings are initiated by faculty on an ad-hoc basis subject to IDSS approval.
Consult IDSS Academic Office

IDS.S30 Special Graduate Subject in Data, Systems, and Society
Prereq: None
G (Summer)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit.

Opportunity for study of advanced topics in Data, Systems, and Society not otherwise included in the curriculum. Offerings are initiated by faculty on an ad-hoc basis subject to IDSS approval.
Staff

IDS.S31 Special Graduate Subject in Data, Systems, and Society
Prereq: None
G (Fall, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit.

Opportunity for individual or group study of advanced topics in Data, Systems, and Society not otherwise included in the curriculum at MIT. Offerings are initiated by faculty on an ad-hoc basis subject to IDSS approval.
Consult IDSS Academic Office

IDS.S32 Special Graduate Subject in Data, Systems, and Society
Prereq: None
G (Fall, IAP, Spring, Summer)
Not offered regularly; consult department
Units arranged [P/D/F]
Can be repeated for credit.

Opportunity for individual or group study of advanced topics in Data, Systems, and Society not otherwise included in the curriculum at MIT. Offerings are initiated by faculty on an ad-hoc basis subject to IDSS approval.
Consult IDSS Academic Office

IDS.THG Graduate Thesis
Prereq: IDS.970 or permission of instructor
G (Fall, IAP, Spring, Summer)
Units arranged
Can be repeated for credit.

Program of research, leading to the writing of an SM or PhD thesis to be arranged by the student with a member of the IDSS faculty. A minimum of 24 thesis units are required for the SM degree. Doctoral students must first complete IDS.970.
Consult IDSS Academic Office

IDS.UR Undergraduate Research
Prereq: None
U (Fall, IAP, Spring, Summer)
Units arranged [P/D/F]
Can be repeated for credit.

Undergraduate research opportunities in Data, Systems, and Society.
IDSS Academic Office

IDS.URG Undergraduate Research
Prereq: None
U (Fall, IAP, Spring, Summer)
Units arranged
Can be repeated for credit.

Undergraduate research opportunities in Data, Systems, and Society.
Consult IDSS Academic Office