CLIMATE SYSTEM SCIENCE AND ENGINEERING (COURSE 1-12)

Climate System Science and Engineering (*https://catalog.mit.edu/interdisciplinary/undergraduate-programs/degrees/climate-system-science-engineering*)

Bachelor of Science in Climate System Science and Engineering

General Institute Requirements (GIRs)

The General Institute Requirements include a Communication Requirement that is integrated into both the HASS Requirement and the requirements of each major; see details below.

Summary of Subject Requirements	Subjects
Science Requirement	6
Humanities, Arts, and Social Sciences (HASS) Requirement; at least two of these subjects must be designated as communication-intensive (CI-H) to fulfill the Communication Requirement.	8
Restricted Electives in Science and Technology (REST) Requirement [can be satisfied with 18.03 and 12.003 in the departmental program]	2
Laboratory Requirement (12 units) [Laboratory Requirement (12 units) [can be satisfied with 1.108 in the Departmental Program]]	1
Total GIR Subjects Required for SB Degree	**17**

Physical Education Requirement
Swimming requirement, plus four physical education courses for eight points.

Departmental Program

Choose at least two subjects in the major that are designated as communication-intensive (CI-M) to fulfill the Communication Requirement.

Foundational Analytical and Computational Requirements		Units
1.010A & 1.010B	Probability: Concepts and Applications and Causal Inference for Data Analysis	12
or 6.3700	Introduction to Probability	
1.073	Introduction to Environmental Data Analysis	6
or 1.074	Multivariate Data Analysis	
6.100A	Introduction to Computer Science Programming in Python	6
or 6.100L	Introduction to Computer Science and Programming	
6.100B	Introduction to Computational Thinking and Data Science	6
or CSE.C20[J]	Introduction to Computational Science and Engineering	
18.03	Differential Equations	12
Core Climate Requirements		
Atmosphere, Ocean and Climate Dynamics		
12.003	Introduction to Atmosphere, Ocean, and Climate Dynamics	12
Computational Methods for Sustainability		
1.020	Modeling and Decision-Making for Sustainability	12
Physics of Low Carbon Energy Systems		
1.086	Physics of Renewable Energy Systems and Computational Analysis	12
Climate Policy (choose one)		12
1.067[J]	Energy Systems for Climate Change Mitigation	
12.385	Science, Politics, and Environmental Policy	
11.169	Global Climate Policy and Sustainability	
14.42	Environmental Policy and Economics	
11.165	Urban Energy Systems and Policy	
14.44[J]	Energy Economics and Policy	
15.0201[J]	Economics of Energy, Innovation, and Sustainability	
Global Carbon Cycle & Climate Science (choose one)		12
12.349	Mechanisms and Models of the Global Carbon Cycle	
1.076	Carbon Management	
12.301	Climate Science	
Group Design		
1.108	Climate and Sustainability Lab (CI-M)	12
CI-M Lab (choose one)		12
12.307	Weather and Climate Laboratory (CI-M)	
12.335	Experimental Atmospheric Chemistry (CI-M)	
1.101 & 1.102	Introduction to Civil and Environmental Engineering Design I and Introduction to Civil and Environmental Engineering Design II (CI-M)	
1.106 & 1.107	Environmental Fluid Mechanics Lab and Environmental Chemistry Laboratory (CI-M)	

Restricted Electives	
Select at least 42 units from the list below.	42
Units in Major	**168**
Unrestricted Electives	**48**
Units in Major That Also Satisfy the GIRs	(36)
Total Units Beyond the GIRs Required for SB Degree	**180**

The units for any subject that counts as one of the 17 GIR subjects cannot also be counted as units required beyond the GIRs.

Restricted Electives

Humanities, Social Science, and Economics

Policy

11.003[J]	Methods of Policy Analysis
11.148	Environmental Justice: Law and Policy
11.165	Urban Energy Systems and Policy
11.169	Global Climate Policy and Sustainability
12.385	Science, Politics, and Environmental Policy
14.42	Environmental Policy and Economics
14.44[J]	Energy Economics and Policy
17.30[J]	Making Public Policy
17.181	Sustainability: Political Economy, Science, and Policy
IDS.055[J]	Science, Technology, and Public Policy
IDS.060[J]	Environmental Law, Policy, and Economics: Pollution Prevention and Control
IDS.062[J]	Global Environmental Negotiations
IDS.063[J]	People and the Planet: Environmental Governance and Science

Ethics

1.082	Ethics for Engineers
24.03	Good Food: The Ethics and Politics of Food
24.191	Being, Thinking, Doing (or Not): Ethics in Your Life
24.233	The Ethics of Climate Change

Climate in the Humanities

3.982	The Ancient Andean World
3.983	Ancient Mesoamerican Civilization
4.211[J]	The Once and Future City
11.011	The Art and Science of Negotiation
12.386[J]	Environment and History
21A.155	Food, Culture, and Politics
21A.303[J]	The Anthropology of Biology
21A.312	Planetary Change and Human Health
21A.407[J]	Gender, Race, and Environmental Justice
21A.410	Environmental Struggles
21H.186	Nature and Environment in China
21H.187	US Environmental Governance: from National Parks to the Green New Deal
21H.383	Technology and the Global Economy, 1000-2000
21L.449	The Wilds of Literature
21W.012	Writing and Rhetoric: Food for Thought
21W.036	Science Writing and New Media: Writing and the Environment
21W.775	Writing about Nature and Environmental Issues
22.04[J]	Social Problems of Nuclear Energy
CMS.374[J]	Transmedia Art, Extraction, and Environmental Justice
CMS.375	Reading Climate Through Media
EC.701[J]	D-Lab: Development
STS.021[J]	Science Activism: Gender, Race, and Power
STS.034	Science Communication: A Practical Guide

Foundational Science

Earth Science

1.018[J]	Fundamentals of Ecology
1.080	Environmental Chemistry
1.089	Environmental Microbial Biogeochemistry
12.001	Introduction to Geology
12.002	Introduction to Geophysics and Planetary Science
12.007	Geobiology: History of Life on Earth
18.352[J]	Nonlinear Dynamics: The Natural Environment

Climate and Atmospheric Chemistry

1.071[J]	Global Change Science
1.085[J]	Air Pollution and Atmospheric Chemistry
12.306	Atmospheric Physics and Chemistry
12.377	The History of Earth's Climate

Modeling & Computation

12.086	Modeling Environmental Complexity

4.432	Modeling Urban Energy Flows for Sustainable Cities and Neighborhoods
6.C01	Modeling with Machine Learning: from Algorithms to Applications
1.C01	Machine Learning for Sustainable Systems
15.8731	System Dynamics: Tools for Solving Complex Problems
6.3400	Introduction to EECS via Communication Networks
6.9010	Introduction to EECS via Interconnected Embedded Systems
6.9080	Introduction to EECS via Robotics
6.1200[J]	Mathematics for Computer Science
6.1910	Computation Structures
6.3700	Introduction to Probability
6.3800	Introduction to Inference
6.4100	Artificial Intelligence
18.200	Principles of Discrete Applied Mathematics
18.200A	Principles of Discrete Applied Mathematics
18.211	Combinatorial Analysis
6.1210	Introduction to Algorithms
6.1010	Fundamentals of Programming
6.1220[J]	Design and Analysis of Algorithms
6.1400[J]	Computability and Complexity Theory
6.1800	Computer Systems Engineering
6.3730[J]	Statistics, Computation and Applications
6.3900	Introduction to Machine Learning
6.4120[J]	Computational Cognitive Science
6.4400	Computer Graphics
6.4530[J]	Principles and Practice of Assistive Technology
6.5151	Large-scale Symbolic Systems
6.5831	Database Systems
6.8301	Advances in Computer Vision
6.8371	Digital and Computational Photography
6.8611	Quantitative Methods for Natural Language Processing
6.8701	Computational Biology: Genomes, Networks, Evolution
6.8711[J]	Computational Systems Biology: Deep Learning in the Life Sciences
18.404	Theory of Computation
6.1220[J]	Design and Analysis of Algorithms
6.1020	Software Construction
6.1040	Software Design
6.1060	Software Performance Engineering
6.1100	Computer Language Engineering
6.1920	Constructive Computer Architecture
6.4200[J]	Robotics: Science and Systems
6.4550[J]	Interactive Music Systems
6.5081	Multicore Programming

Climate Mitigation and Adaptation

Greenhouse Gas Emissions and Energy

2.60[J]	Fundamentals of Advanced Energy Conversion
2.652[J]	Applications of Energy in Global Development
3.002	Materials for Energy and Sustainability
3.18	Materials Science and Engineering of Clean Energy
5.371	Continuous Flow Chemistry: Sustainable Conversion of Reclaimed Vegetable Oil into Biodiesel
5.372	Chemistry of Renewable Energy
8.21	Physics of Energy
10.04	A Philosophical History of Energy
10.05	Foundational Analyses of Problems in Energy and the Environment
12.021	Earth Science, Energy, and the Environment
14.43[J]	Economics of Energy, Innovation, and Sustainability
22.081[J]	Introduction to Sustainable Energy
EC.711[J]	Introduction to Energy in Global Development
IDS.065[J]	Energy Systems for Climate Change Mitigation

Design

1.005	Experiential Sustainability
1.006	Tools for Sustainable Design
1.013	Senior Civil and Environmental Engineering Design
1.103[J]	Infrastructure Design for Climate Change
4.657	Design: The History of Making Things
10.496[J]	Design of Sustainable Polymer Systems
22.033	Nuclear Systems Design Project

1.UAR[J]	Climate and Sustainability Undergraduate Advanced Research
EC.713[J]	D-Lab Schools: Building Technology Laboratory
EC.720[J]	D-Lab: Design
Water & Hydrology	
1.061	Transport Processes in the Environment
or 1.061A	Transport Processes in the Environment I
1.070A[J]	Introduction to Hydrology and Water Resources
1.070B[J]	Introduction to Hydrology Modeling
12.104	Geochemistry of Natural Waters
12.372	Elements of Modern Oceanography
12.390	Fluid Dynamics of the Atmosphere and Ocean
EC.715	D-Lab: Water, Sanitation and Hygiene
EC.719	D-Lab: Climate Change and Planetary Health
Structures & Materials	
1.035	Mechanics of Materials
3.081	Industrial Ecology of Materials
3.094[J]	Materials in Human Experience
3.19	Sustainable Chemical Metallurgy
4.218	Disaster Resilient Design
4.401	Environmental Technologies in Buildings
11.123	Big Plans and Mega-Urban Landscapes
Transportation & Supply Chain	
11.149	Decarbonizing Urban Mobility
11.158	Behavioral Science, AI, and Urban Mobility
EC.733[J]	D-Lab: Supply Chains
Business & Innovation	
1.004	Startup Sustainable Tech