EARTH, ATMOSPHERIC, AND PLANETARY SCIENCES (COURSE 12)

Department of Earth, Atmospheric, and Planetary Sciences (*https://catalog.mit.edu/schools/science/earth-atmospheric-planetary-sciences/#undergraduatetext*)

Bachelor of Science in Earth, Atmospheric, and Planetary Sciences

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 by 12.001, 12.002, 12.003, or 12.004 and 18.03 in the Departmental Program]	2
Laboratory Requirement (12 units) [can be satisfied by a laboratory/field subject 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.

General Department Requirements	Units
Introductory Subjects	
Select three of the following: [1]	36
12.001	Introduction to Geology
12.002	Introduction to Geophysics and Planetary Science
12.003	Introduction to Atmosphere, Ocean, and Climate Dynamics
12.004	Introduction to the Global Carbon Cycle
12.TIP	Thesis Preparation	6

12.THU	Undergraduate Thesis (at least 6 units, CI-M)	6
Laboratory/Field Subjects		
Select one of the following:		12-15
12.115 & 12.116	Field Geology and Analysis of Geologic Data (CI-M) [2]	
12.307	Weather and Climate Laboratory (CI-M) [3]	
12.335	Experimental Atmospheric Chemistry (CI-M) [3]	
12.410[J]	Observational Techniques of Optical Astronomy (CI-M) [4]	
Computational Science Subjects		
Select one of the following:		12
12.010	Computational Methods of Scientific Programming	
12.012	MatLab, Statistics, Regression, Signal Processing	
12.C25[J]	Real World Computation with Julia	
6.100A & 6.100B	Introduction to Computer Science Programming in Python and Introduction to Computational Thinking and Data Science	
6.100A & 16.C20[J]	Introduction to Computer Science Programming in Python and Introduction to Computational Science and Engineering	
Concentration Subjects		**36-39**
Supporting Subjects		**36**
Units in Major		**144-150**
Unrestricted Electives		**48-72**
Units in Major That Also Satisfy the GIRs		(12-36)
Total Units Beyond the GIRs Required for SB Degree		**180-186**

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

[1] *With approval of the advisor, one introductory subject may be replaced by one concentration subject that is not being used to fulfill the concentration requirement.*

[2] *Recommended for concentration area 1. May also be applicable to areas 3 and 4.*

[3] *Recommended for concentration areas 2 and 4.*

[4] *Recommended for concentration area 3.*

Areas of Concentration [1]

Area 1—Earth Science [2]		
Select 36-39 units:		
12.007	Geobiology: History of Life on Earth	12

12.100	Plate Tectonics and Climate	9
12.104	Geochemistry of Natural Waters	12
12.108	Earth Materials: Minerals and Rocks	12
12.110A	Sedimentary Environments	6
12.110B	Sedimentology in the Field	9
12.113	Structural Geology	12
12.163	Geomorphology	12
12.177	Astrobiology, Origins and Early Evolution of Life	12
12.178	The Phylogenomic Planetary Record	12
12.201	Essentials of Global Geophysics	12
12.202	Flow, Deformation, and Fracture in Earth and Other Terrestrial Bodies	12
12.203	Mechanics of Earth	12
12.210	Introduction to Seismology	12
12.211	Field Geophysics	6
12.214	Essentials of Field Geophysics	12
12.225	Mechanisms of Faulting and Earthquakes	12
12.377	The History of Earth's Climate	12
12.421	Physical Principles of Remote Sensing	12

Area 2—Climate, Atmospheres, and Oceans [3]

12.301	Climate Science	12
or 12.318	Introduction to Atmospheric Data and Large-scale Dynamics	

Select 24-27 units:

12.006[J]	Nonlinear Dynamics: Chaos	12
12.086	Modeling Environmental Complexity	12
12.300[J]	Global Change Science	12
12.306	Atmospheric Chemistry Models & Climate	12
12.314[J]	Ocean Chemistry Change Laboratory	6
12.315	Atmospheric Radiation and Convection	12
12.320A[J]	Introduction to Hydrology and Water Resources	6
12.320B[J]	Introduction to Hydrology Modeling	6
12.349	Mechanisms and Models of the Global Carbon Cycle	12
12.372	Elements of Modern Oceanography	12
12.373	Field Oceanography	15
12.377	The History of Earth's Climate	12
12.390	Fluid Dynamics of the Atmosphere and Ocean	12
12.421	Physical Principles of Remote Sensing	12
12.422	Planetary Atmospheres	12

Area 3—Planetary Science and Astronomy [4]

12.420	Essentials of Planetary Science	12

Select 24-27 units:

12.006[J]	Nonlinear Dynamics: Chaos	12
12.104	Geochemistry of Natural Waters	12
12.177	Astrobiology, Origins and Early Evolution of Life	12
12.409	Hands-On Astronomy: Observing Stars and Planets	6
12.411	Astronomy Field Camp	9
12.412	Meteorites, Cosmochemistry, and Solar System Formation	12
12.421	Physical Principles of Remote Sensing	12
12.422	Planetary Atmospheres	12
12.425[J]	Extrasolar Planets: Physics and Detection Techniques	12
12.43[J]	Space Systems Engineering	12

Area 4—Environmental Science [5]

Select 36-39 units:

12.006[J]	Nonlinear Dynamics: Chaos	12
12.007	Geobiology: History of Life on Earth	12
12.031[J]	Fundamentals of Ecology	12
12.086	Modeling Environmental Complexity	12
12.104	Geochemistry of Natural Waters	12
12.110A	Sedimentary Environments	6
12.110B	Sedimentology in the Field	9
12.163	Geomorphology	12
12.177	Astrobiology, Origins and Early Evolution of Life	12
12.301	Climate Science	12
12.348[J]	Global Climate Change: Economics, Science, and Policy	9
12.349	Mechanisms and Models of the Global Carbon Cycle	12
12.373	Field Oceanography	15
12.377	The History of Earth's Climate	12
12.384[J]	Living Dangerously: Environmental Problems from 1900 to Today	12
12.385	Science, Politics, and Environmental Policy	9
12.386[J]	Environment and History	12
12.387[J]	People and the Planet: Environmental Governance and Science	9
12.421	Physical Principles of Remote Sensing	12

1.   *With approval of the academic advisor, one Course 12 subject not in the concentration area may count as a concentration subject as long as it is not otherwise being used to fulfill the degree requirements.*

2.   *Recommended supporting subjects: 5.601 & 5.602, 5.12, 7.05, 18.03, or 18.06.*

3.   *Recommended supporting subjects: 5.601 & 5.602, 8.03, 18.03.*

4.   *Recommended supporting subjects: 8.03, 8.04, 8.044, 18.03.*

5.   *Recommended supporting subjects: 5.12, 6.8711[J], 8.03, 18.03, or 18.06.*

Supporting Subjects

Select 36 units:

1.C01 & 6.C01	Machine Learning for Sustainable Systems and Modeling with Machine Learning: from Algorithms to Applications	12
1.060	Fluid Mechanics	12
1.060A	Fluid Mechanics I	6
1.061A & 1.106	Transport Processes in the Environment I and Environmental Fluid Mechanics Lab	12
1.080	Chemicals in the Environment	12
2.001	Mechanics and Materials I	12
2.016	Hydrodynamics	12
3.010	Structure of Materials	12
3.020	Thermodynamics of Materials	12
5.601 & 5.602	Thermodynamics I and Thermodynamics II and Kinetics	12
6.8711[J]	Computational Systems Biology: Deep Learning in the Life Sciences	12
6.1010	Fundamentals of Programming	12
6.1200[J]	Mathematics for Computer Science	12
6.3000	Signal Processing	12
6.3700	Introduction to Probability	12
6.3800	Introduction to Inference	12
6.3900	Introduction to Machine Learning	12
6.9080	Introduction to EECS via Robotics	12
7.05	General Biochemistry	12
8.03	Physics III	12
8.04	Quantum Physics I	12
8.044	Statistical Physics I	12
8.07	Electromagnetism II	12
8.223	Classical Mechanics II	6
12.320A[J] & 12.320B[J]	Introduction to Hydrology and Water Resources and Introduction to Hydrology Modeling	12
14.01	Principles of Microeconomics	12

18.C06[J]	Linear Algebra and Optimization	12
18.C20[J]	Introduction to Computational Science and Engineering	6
18.03	Differential Equations [1]	12
18.05	Introduction to Probability and Statistics	12
18.06	Linear Algebra	12
18.300	Principles of Continuum Applied Mathematics	12

1.   *With approval of the academic advisor, one subject from the computational requirement may be counted as a supporting subject so long as it is not also counting for the computational requirement.*

2.   *18.032 is also an acceptable option.*