

## EARTH, ATMOSPHERIC, AND PLANETARY SCIENCES (COURSE 12)

Department of Earth, Atmospheric, and Planetary Sciences (<http://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, or 12.003, 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
<b>Total GIR Subjects Required for SB Degree</b>	<b>17</b>

#### 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 two of the following: <sup>1</sup>	24
12.001 Introduction to Geology	
12.002 Introduction to Geophysics and Planetary Science	
12.003 Introduction to Atmosphere, Ocean, and Climate Dynamics	
12.007 Geobiology: History of Life on Earth	
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) <sup>2</sup>	
12.307	Weather and Climate Laboratory (CI-M) <sup>3</sup>	
12.335	Experimental Atmospheric Chemistry (CI-M) <sup>3</sup>	
12.410[J]	Observational Techniques of Optical Astronomy (CI-M) <sup>4</sup>	

**Concentration Subjects 60-63**

**Supporting Subjects 36-42**

**Units in Major 144-156**

**Unrestricted Electives 48-72**

Units in Major That Also Satisfy the GIRs (12-36)

**Total Units Beyond the GIRs Required for SB Degree 180-192**

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

<sup>1</sup> With approval of the advisor, one subject may be counted toward concentration coursework if not taken as a General Departmental Requirement.

<sup>2</sup> Recommended for concentration area 1. May also be applicable to areas 3 and 4.

<sup>3</sup> Recommended for concentration areas 2 and 4.

<sup>4</sup> Recommended for concentration area 3.

#### Areas of Concentration <sup>1</sup>

##### Area 1—Geoscience: Geology, Geochemistry, Geophysics, Geobiology <sup>2</sup>

Select 60-63 units:

12.104	Geochemistry of Natural Waters	12
12.108	Structure of Earth Materials	12
12.109	Petrology	15
12.110A	Sedimentary Environments	6
12.110B	Sedimentology in the Field	9
12.113	Structural Geology	12
12.117A	Field Geobiology I	6
12.117B	Field Geobiology II	9
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
12.214	Essentials of Field Geophysics	12
12.421	Physical Principles of Remote Sensing	12

**Area 2—Atmospheres, Oceans, and Climate**<sup>3</sup>

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

Select 48 units:

12.009[[]]	Nonlinear Dynamics: The Natural Environment	12
12.086	Modeling Environmental Complexity	12
12.300[[]]	Global Change Science	12
12.306	Atmospheric Physics and Chemistry	12
12.315	Atmospheric Radiation and Convection	12
12.320A[[]]	Introduction to Hydrology and Water Resources	6
12.320B[[]]	Introduction to Hydrology Modeling	6
12.336[[]]	Air Pollution and Atmospheric Chemistry	12
12.338	Aerosol and Cloud Microphysics and Chemistry	12
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**<sup>4</sup>

12.420	Essentials of Planetary Science	12
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Select 48-51 units:

12.006[[]]	Nonlinear Dynamics: Chaos	12
12.104	Geochemistry of Natural Waters	12
12.108	Structure of Earth Materials	12
12.109	Petrology	15
12.177	Astrobiology, Origins and Early Evolution of Life	12
12.421	Physical Principles of Remote Sensing	12
12.422	Planetary Atmospheres	12
12.425[[]]	Extrasolar Planets: Physics and Detection Techniques	12
12.43[[]]	Space Systems Engineering	12

**Area 4—Environmental Systems**<sup>5</sup>

Select 60-63 units:

12.009[[]]	Nonlinear Dynamics: The Natural Environment	12
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12.021	Earth Science, Energy, and the Environment	12
12.031[[]]	Fundamentals of Ecology	12
12.086	Modeling Environmental Complexity	12
12.110A	Sedimentary Environments	6
12.110B	Sedimentology in the Field	9
12.117A	Field Geobiology I	6
12.117B	Field Geobiology II	9
12.119	Harnessing Power from Environmental Microbes and Chemical Gradients	9
12.158	Molecular Biogeochemistry	9
12.163	Geomorphology	12
12.177	Astrobiology, Origins and Early Evolution of Life	12
12.301	Climate Science	12
12.346[[]]	Global Environmental Negotiations	6
12.348[[]]	Global Climate Change: Economics, Science, and Policy	9
12.349	Mechanisms and Models of the Global Carbon Cycle	12
12.377	The History of Earth's Climate	12
12.385	Science, Politics, and Environmental Policy	9
12.421	Physical Principles of Remote Sensing	12

<sup>1</sup> With approval of the academic advisor, students may count one subject from list of General Department Requirements as long as it is also not counting toward the General Department Requirement. Students may also substitute one subject from off of the degree chart if approved by the academic advisor.

<sup>2</sup> Recommended supporting subjects: 5.60, 5.12, 7.05, 18.03 or 18.06.

<sup>3</sup> Recommended supporting subjects: 5.60, 8.03, 18.03.

<sup>4</sup> Recommended supporting subjects: 8.03, 8.04, 8.044, 18.03.

<sup>5</sup> Recommended supporting subjects: 5.12, 6.8711[[]], 8.03, 18.03 or 18.06.

**Supporting Subjects**

Select 36-42 units:

1.060A	Fluid Mechanics I	6
1.061A & 1.106	Transport Processes in the Environment I and Environmental Fluid Transport Processes and Hydrology Laboratory	12
1.080	Environmental Chemistry	12
2.001	Mechanics and Materials I	12
2.016	Hydrodynamics	12
3.010	Structure of Materials	12
3.020	Thermodynamics of Materials	12

or 5.60	Thermodynamics and Kinetics	
5.12	Organic Chemistry I	12
6.100A & 6.100B	Introduction to Computer Science Programming in Python and Introduction to Computational Thinking and Data Science	12
6.8711[J]	Computational Systems Biology: Deep Learning in the Life Sciences	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
8.09	Classical Mechanics III	12
12.010	Computational Methods of Scientific Programming	12
12.012	MatLab, Statistics, Regression, Signal Processing	12
12.320A[J] & 12.320B[J]	Introduction to Hydrology and Water Resources and Introduction to Hydrology Modeling	12
14.01	Principles of Microeconomics	12
18.03	Differential Equations <sup>1</sup>	12
18.05	Introduction to Probability and Statistics	12
18.06	Linear Algebra	12
18.300	Principles of Continuum Applied Mathematics	12

<sup>1</sup> 18.032 *Differential Equations* is also an acceptable option.