

BACHELOR OF SCIENCE (BS) DEGREE WITH A MAJOR IN EARTH, ENVIRONMENTAL AND PLANETARY SCIENCES

Program Learning Outcomes for the BS Degree with a Major in Earth, Environmental and Planetary Sciences

Upon completing the BS degree with a major in Earth, Environmental and Planetary Sciences, students will be able to:

1. Demonstrate comprehensive knowledge of how the Earth system operates over geologic and modern timescales.
2. Demonstrate the ability to make and record observations in the field, and to analyze and interpret these data in the context of the geologic history.
3. Demonstrate effective oral and written communication skills.
4. Demonstrate the ability to apply critical thinking and problem-solving skills to evaluate published research in the Earth, Environmental and Planetary sciences.
5. Demonstrate an understanding of the scientific method and its application to the study of Earth, Environmental and Planetary sciences.

Requirements for the BS Degree with a Major in Earth, Environmental and Planetary Sciences

For general university requirements, see [Graduation Requirements \(https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/\)](https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/). Students pursuing the BS degree with a major in Earth, Environmental and Planetary Sciences must complete:

- A minimum of 22-24 courses (68-71 credit hours), depending on course selection, to satisfy major requirements.
- A minimum of 120 credit hours to satisfy degree requirements.
- A minimum of 10-12 courses (30-36 credit hours), depending on course selection, taken at the 300-level or above.
- The requirements for one area of specialization (see below for areas of specialization). The BS degree with a major in Earth, Environmental and Planetary Sciences offers three areas of specialization:
 - [Environmental Earth Science](#) (p. 2), *or*
 - [Geoscience](#) (p. 2), *or*
 - [Planetary Science](#) (p. 3).

The courses listed below satisfy the requirements for this major. In certain instances, courses not on this official list may be substituted upon approval of the major's academic advisor, or where applicable, the department's Director of Undergraduate Studies. (Course substitutions must be formally applied and entered into Degree Works by the major's Official Certifier (<https://registrar.rice.edu/facstaff/degreeworks/officialcertifier/>)). Students and their academic advisors should identify and clearly document the courses to be taken.

Summary

Code	Title	Credit Hours
Total Credit Hours Required for the Major in Earth, Environmental and Planetary Sciences		68-71
Total Credit Hours Required for the BS Degree with a Major in Earth, Environmental and Planetary Sciences		120

Degree Requirements

Code	Title	Credit Hours
Core Requirements		
MATH 101 or MATH 105	SINGLE VARIABLE CALCULUS I AP/OTH CREDIT IN CALCULUS I	3
MATH 102 or MATH 106	SINGLE VARIABLE CALCULUS II AP/OTH CREDIT IN CALCULUS II	3
MATH 211	ORDINARY DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	3
CHEM 121 or CHEM 111	GENERAL CHEMISTRY I AP/OTH CREDIT IN GENERAL CHEMISTRY I	3
CHEM 123 or CHEM 113	GENERAL CHEMISTRY LABORATORY I AP/OTH CREDIT IN GENERAL CHEMISTRY LAB I	1
CHEM 122 or CHEM 112	GENERAL CHEMISTRY II AP/OTH CREDIT IN GENERAL CHEMISTRY II	3
CHEM 124 or CHEM 114	GENERAL CHEMISTRY LABORATORY II AP/OTH CREDIT IN GENERAL CHEMISTRY LAB II	1
<i>Select 1 from the following:</i>		4
PHYS 101 & PHYS 103	MECHANICS (WITH LAB) and MECHANICS DISCUSSION	
PHYS 111	HONORS MECHANICS (WITH LAB)	
PHYS 141	CONCEPTS IN PHYSICS I	
<i>Select 1 from the following:</i>		4
PHYS 102 & PHYS 104	ELECTRICITY & MAGNETISM (WITH LAB) and ELECTRICITY AND MAGNETISM DISCUSSION	
PHYS 112	HONORS ELECTRICITY & MAGNETISM (WITH LAB)	
PHYS 142	CONCEPTS IN PHYSICS II	
<i>Select 1 course from the following:</i>		3-4
EEPS 101	THE EARTH	
EEPS 106	INVESTIGATING EARTH'S SURFACE	
EEPS 107 / ENST 201	CLIMATE CHANGE AND EXTREME WEATHER	
EEPS 108	NATURAL DISASTERS	
EEPS 109	OCEANOGRAPHY	
EEPS 110	THE EARTH SYSTEM, ENVIRONMENT, AND SOCIETY	
EEPS 111	INHABITING PLANET EARTH	
EEPS 115	THE PLANETS	
EEPS 116	THE EARTH AND THE SOLAR SYSTEM	
<i>Select 1 course from the following:</i>		3
EEPS 220	INTRODUCTION TO COMPUTATION IN THE EARTH, ENVIRONMENT AND PLANETARY SCIENCES	

or CMOR 22(INTRODUCTION TO ENGINEERING COMPUTATION		
EEPS 321	EARTH AND PLANETARY SURFACE ENVIRONMENTS	4
EEPS 322	EARTH AND PLANETARY CHEMISTRY AND MATERIALS	4
EEPS 323	EARTH AND PLANETARY STRUCTURE AND DYNAMICS	4
EEPS 325	OCEANS, ATMOSPHERES AND CLIMATE	4
EEPS 334	THE EARTH LABORATORY	3
Areas of Specialization		
<i>Select 1 from the following Areas of Specialization (see Areas of Specialization below):</i>		21-23
Environmental Earth Science		
Geoscience		
Planetary Science		
Total Credit Hours Required for the Major in Earth, Environmental and Planetary Sciences		71-74
Additional Credit Hours to Complete Degree Requirements *		18-21
University Graduation Requirements (https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/) *		31
Total Credit Hours		120

Footnotes and Additional Information

* **Note:** [University Graduation Requirements](https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/) include 31 credit hours, comprised of Distribution Requirements (Groups I, II, and III), FWIS, and LPAP coursework. In some instances, courses satisfying FWIS or distribution requirements may additionally meet other requirements, such as the Analyzing Diversity (AD) requirement, or some of the student's declared major, minor, or certificate requirements. [Additional Credit Hours to Complete Degree Requirements](https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/) include general electives, coursework completed as upper-level, residency (hours taken at Rice), and/or any other additional academic program requirements.

Areas of Specialization

To fulfill the remaining Earth, Environmental and Planetary Sciences major requirements, students must complete one of the following areas of specialization. Students are encouraged to discuss course selection with their academic advisor. Course lists to satisfy requirements are listed below the areas of specialization.

Area of Specialization: Environmental Earth Science

To fulfill the remaining Earth, Environmental and Planetary Sciences major requirements, students pursuing the Environmental Earth Science area of specialization must complete a minimum of 7 courses (21-23 credit hours, depending on course selection) as listed below.

Code	Title	Credit Hours
Area of Specialization: Environmental Earth Science		
<i>Select at least 1 course from each of the following 5 fields (see course lists below):</i>		15
Breadth in Environmental Science		
Climate, Atmosphere, and Water		
Environmental Geochemistry and Geophysics		
Modeling and Data Analysis		
Surface Processes		

Elective Requirements		
<i>Select a minimum of 2 courses from the following:</i>		6-8
Any course from Earth, Environmental and Planetary Sciences departmental (EEPS) course offerings between course numbers EEPS 407:480, EEPS 482:490, EEPS 492:499		
BIOS 201	INTRODUCTORY BIOLOGY I	
BIOS 202	INTRODUCTORY BIOLOGY II	
CHEM 211 & CHEM 213	ORGANIC CHEMISTRY I and ORGANIC CHEMISTRY DISCUSSION I	
EEPS 390 or EEPS 391	GEOLOGY FIELD CAMP or EARTH SCIENCE FIELD EXPERIENCE	
MATH 212 or MATH 232	MULTIVARIABLE CALCULUS or HONORS MULTIVARIABLE CALCULUS	
PHYS 201	WAVES, LIGHT, AND HEAT	
STAT 280 or STAT 180	ELEMENTARY APPLIED STATISTICS or AP/OTH CREDIT IN STATISTICS	
Any course at the 300-level (or above) from the following subject codes: BIOS, CEVE, CHEM, CMOR, ENVS, MATH, MECH, PHYS, or STAT		
Total Credit Hours		21-23

Area of Specialization: Geoscience

To fulfill the remaining Earth, Environmental and Planetary Sciences major requirements, students pursuing the Geoscience area of specialization must complete a minimum of 7 courses (21-23 credit hours, depending on course selection) as listed below.

Code	Title	Credit Hours
Area of Specialization: Geoscience		
<i>Select at least 1 course from each of the following 5 fields (see course lists below):</i>		15
Deformation and Dynamics		
Geophysics		
Modeling and Data Analysis		
Petrology, Geochemistry, and Materials Characterization		
Surface Processes		
Elective Requirements		
<i>Select a minimum of 2 courses from the following:</i>		6-8
Any course from Earth, Environmental and Planetary Sciences departmental (EEPS) course offerings between course numbers EEPS 407:480, EEPS 482:490, EEPS 492:499		
BIOS 201	INTRODUCTORY BIOLOGY I	
BIOS 202	INTRODUCTORY BIOLOGY II	
BIOS 211	INTERMEDIATE EXPERIMENTAL CELLULAR AND MOLECULAR BIOSCIENCES	
CHEM 211 & CHEM 213	ORGANIC CHEMISTRY I and ORGANIC CHEMISTRY DISCUSSION I	
EEPS 390 or EEPS 391	GEOLOGY FIELD CAMP or EARTH SCIENCE FIELD EXPERIENCE	
MATH 212 or MATH 232	MULTIVARIABLE CALCULUS or HONORS MULTIVARIABLE CALCULUS	
PHYS 201	WAVES, LIGHT, AND HEAT	

STAT 280	ELEMENTARY APPLIED STATISTICS or STAT 180 AP/OTH CREDIT IN STATISTICS
Any course at the 300-level (or above) from the following subject codes: BIOS, CEVE, CHEM, CMOR, ENVS, MATH, MECH, PHYS, or STAT	

Total Credit Hours 21-23

Area of Specialization: Planetary Science

To fulfill the remaining Earth, Environmental and Planetary Sciences major requirements, students pursuing the Planetary Science area of specialization must complete a minimum of 7 courses (21-23 credit hours, depending on course selection) as listed below.

Code	Title	Credit Hours
Area of Specialization: Planetary Science		
<i>Select at least 1 course from each of the following 5 fields (see course lists below):</i>		15
Breadth in Planetary Sciences		
Deformation and Dynamics		
Modeling and Data Analysis		
Petrology, Geochemistry, and Materials Characterization		
Surface Processes		

Elective Requirements

Select a minimum of 2 courses from the following: 6-8

Any course from Earth, Environmental and Planetary Sciences departmental (EEPS) course offerings between course numbers EEPS 407:480, EEPS 482:490, EEPS 492:499	
EEPS 390	GEOLOGY FIELD CAMP or EEPS 391 EARTH SCIENCE FIELD EXPERIENCE
MATH 212	MULTIVARIABLE CALCULUS or MATH 23:HONORS MULTIVARIABLE CALCULUS
PHYS 201	WAVES, LIGHT, AND HEAT
PHYS 231	ELEMENTARY PHYSICS LAB
STAT 280	ELEMENTARY APPLIED STATISTICS or STAT 180 AP/OTH CREDIT IN STATISTICS
Any course at the 300-level (or above) from the following subject codes: ASTR, CHEM, CMOR, MATH, MECH, PHYS, or STAT	

Total Credit Hours 21-23

Course Lists to Satisfy Requirements

Code	Title	Credit Hours
Breadth in Environmental Science		
CEVE 310	PRINCIPLES OF ENVIRONMENTAL ENGINEERING	3
CEVE 434	FATE AND TRANSPORT OF CONTAMINANTS IN THE ENVIRONMENT	3
CEVE 444	ENVIRONMENTAL MICROBIOLOGY AND MICROBIAL ECOLOGY	3
CEVE 518	ENVIRONMENTAL HYDROGEOLOGY	3
EEPS 307 / CEVE 307 / ENST 307	ENERGY AND THE ENVIRONMENT	3

EEPS 437	EARTH'S NATURAL RESOURCES FOR THE ENERGY TRANSITION	3
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Code **Title** **Credit Hours**

Breadth in Planetary Sciences

ASTR 230	ASTRONOMY LAB	3
ASTR 243	LIVING WITH A STAR: THE PHYSICS OF THE SUN-EARTH CONNECTION	3
EEPS 445	EARTH AND PLANETARY INTERIORS	3

Code **Title** **Credit Hours**

Climate, Atmosphere, and Water

CEVE 411	ATMOSPHERIC CHEMISTRY AND CLIMATE	3
CEVE 412	HYDROLOGY AND WATER RESOURCES ENGINEERING	3
EEPS 432	QUANTITATIVE HYDROGEOLOGY	3
EEPS 433	CLIMATE DYNAMICS	3
EEPS 434	CLIMATE OF THE COMMON ERA	3
EEPS 543	EARTH'S ATMOSPHERE	3

Code **Title** **Credit Hours**

Deformation and Dynamics

EEPS 460	GLOBAL TECTONICS	3
EEPS 461	STRUCTURE AND EVOLUTION OF TECTONIC SYSTEMS	3
EEPS 462	TECTONOPHYSICS	3
EEPS 463	THE PHYSICS OF FAULTING AND EARTHQUAKES	3
EEPS 464	HEAT AND MASS TRANSPORT ON EARTH AND PLANETS	3
EEPS 465	ROCK DEFORMATION AND RHEOLOGY	3
EEPS 467	GEOMECHANICS	3
EEPS 468	VOLCANOES	3

Code **Title** **Credit Hours**

Environmental Geochemistry and Geophysics

EEPS 418	TRACE ELEMENT AND ISOTOPE GEOCHEMISTRY	3
EEPS 420	ORGANIC GEOCHEMISTRY	3
EEPS 437	EARTH'S NATURAL RESOURCES FOR THE ENERGY TRANSITION	3
EEPS 438	THE SCIENCE OF NATURE-BASED CARBON SEQUESTRATION	3
EEPS 458	ENVIRONMENTAL & APPLIED ROCK PHYSICS	3

Code **Title** **Credit Hours**

Geophysics

EEPS 445	EARTH AND PLANETARY INTERIORS	3
EEPS 446	SEISMOLOGY I	3
EEPS 448	EXPLORATION GEOPHYSICS	4

EEPS 450	GEOPHYSICAL DATA ANALYSIS: DIGITAL SIGNAL PROCESSING	3
EEPS 454	INTRODUCTION TO SEISMIC INTERPRETATION: STRUCTURAL STYLES AND SEISMIC STRATIGRAPHY	3
EEPS 458	ENVIRONMENTAL & APPLIED ROCK PHYSICS	3
EEPS 459	WELL LOGGING AND PETROPHYSICS	3

Code	Title	Credit Hours
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Modeling and Data Analysis

ASTR 408	STATISTICAL METHODS IN PHYSICS AND ASTRONOMY	3
EEPS 433	CLIMATE DYNAMICS	3
EEPS 451	GEOPHYSICAL DATA ANALYSIS: INVERSE METHODS	3
EEPS 471	EARTH SYSTEMS MODELING I: PHILOSOPHY AND FUNDAMENTALS	3
EEPS 472	EARTH SYSTEMS MODELING: NUMERICAL TECHNIQUES AND APPLICATIONS	3

Code	Title	Credit Hours
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Petrology, Geochemistry, and Materials Characterization

EEPS 410	OPTICAL MINERALOGY AND PETROGRAPHY	3
EEPS 411	CHARACTERIZATION OF EARTH, ENVIRONMENTAL, AND PLANETARY MATERIALS	3
EEPS 412	ADVANCED PETROLOGY	3
EEPS 413	ADVANCED PETROLOGY II	3
EEPS 418	TRACE ELEMENT AND ISOTOPE GEOCHEMISTRY	3
EEPS 437	EARTH'S NATURAL RESOURCES FOR THE ENERGY TRANSITION	3

Code	Title	Credit Hours
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Surface Processes

EEPS 415	GEOCHEMISTRY OF EARTH'S SURFACE	3
EEPS 425	PLANETARY SURFACE PROCESSES	3
EEPS 426	GEOMORPHOLOGY	3
EEPS 427	MECHANICS OF SEDIMENT TRANSPORT	3
EEPS 430	APPLIED STRATIGRAPHIC METHODS	3
EEPS 435	REMOTE SENSING	3
EEPS 436	GIS FOR SCIENTISTS AND ENGINEERS	3
EEPS 439	GEOMICROBIOLOGY	3
EEPS 527	CARBONATE SEDIMENTS: DEPOSITIONAL SYSTEMS AND PROCESSES	3
EEPS 530	SILICICLASTIC SEDIMENTS: DEPOSITIONAL SYSTEMS AND PROCESSES	3

Policies for the BS Degree with a Major in Earth, Environmental and Planetary Sciences

Program Restrictions and Exclusions

Students pursuing the BS Degree with a Major in Earth, Environmental and Planetary Sciences should be aware of the following program restrictions:

- As noted in [Majors, Minors, and Certificates \(https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/\)](https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/), under *Declaring Majors, Minors and Certificates*, students may not obtain both a BA and a BS in the same major. Students pursuing the BS Degree with a Major in Earth, Environmental and Planetary Sciences may not additionally pursue the BA Degree with a Major in Earth, Environmental and Planetary Sciences.
- As noted in [Majors, Minors, and Certificates \(https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/\)](https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/), students may not major and minor in the same subject.

Transfer Credit

For Rice University's policy regarding transfer credit, see [Transfer Credit \(https://ga.rice.edu/undergraduate-students/academic-policies-procedures/transfer-credit/\)](https://ga.rice.edu/undergraduate-students/academic-policies-procedures/transfer-credit/). Some departments and programs have additional restrictions on transfer credit. The Office of Academic Advising maintains the university's official list of [transfer credit advisors \(https://oaa.rice.edu/advising-network/transfer-credit-advisors/\)](https://oaa.rice.edu/advising-network/transfer-credit-advisors/) on their website: <https://oaa.rice.edu>. Students are encouraged to meet with their academic program's transfer credit advisor when considering transfer credit possibilities.

Departmental Transfer Credit Guidelines

Students pursuing the major in Earth, Environmental and Planetary Sciences should be aware of the following departmental transfer credit guidelines:

- Requests for transfer credit will be considered by the program director (and/or the program's official transfer credit advisor) on an individual case-by-case basis.

Additional Information

For additional information, please see the Earth Environmental and Planetary Sciences major page, on the Department of Earth, Environmental and Planetary Sciences website: <https://eeps.rice.edu/undergraduate/>

Opportunities for the BS Degree with a Major in Earth, Environmental and Planetary Sciences

Academic Honors

The university recognizes academic excellence achieved over an undergraduate's academic history at Rice. For information on university honors, please see [Latin Honors \(https://ga.rice.edu/undergraduate-students/honors-distinctions/university/\)](https://ga.rice.edu/undergraduate-students/honors-distinctions/university/) (*summa cum laude*, *magna cum laude*, and *cum laude*) and [Distinction in Research and Creative Work \(https://ga.rice.edu/undergraduate-students/honors-distinctions/\)](https://ga.rice.edu/undergraduate-students/honors-distinctions/)

university/). Some departments have department-specific Honors awards or designations.

Undergraduate Independent Research

The department encourages, but does not require, Earth, Environmental and Planetary Sciences (EEPS) undergraduate majors to pursue independent supervised research in EEPS 481. This can also be carried out as part of the Earth, Environmental and Planetary Sciences Honors Thesis Program (described below), or independently with a faculty mentor. Undergraduates enrolled in the Honors Research program automatically will be eligible for consideration for the university honor, the [Distinction in Research and Creative Work](https://ga.rice.edu/undergraduate-students/honors-distinctions/university/) (<https://ga.rice.edu/undergraduate-students/honors-distinctions/university/>). Other students who wish to be considered for this honor within the EEPS majors should discuss with an EEPS major advisor at the beginning of their senior year.

Honors Research

Undergraduates are encouraged to embark on an undergraduate honors thesis. The purpose of the honors thesis is for students to develop and demonstrate their creative and independent research potential. Students are recommended to begin in the fall of their junior year to provide ample time for research projects to be developed, executed, and written. However, honors theses must commence during the fall semester of senior year. Students are expected to enroll in at least two semesters of the course EEPS 481, spanning their senior year. Juniors who have identified a research project and mentor can also enroll in EEPS 481. Students should sign up for EEPS 481 for 3 credit hours.

Requirements and Recommendations for Completing an Undergraduate Honors Thesis

Fall Semester of Senior Year

At the beginning of the fall semester, seniors interested in the honors thesis program must identify a thesis advisor, a thesis topic, and enroll in the required courses. During the semester, students will participate in meetings with other honors thesis candidates to discuss basic research protocols and philosophies, and meet independently with their chosen scientific advisor, and generate data, experiments or models. At the end of the semester, students must submit final versions of their proposals, describing motivation, hypothesis, methodology, and preliminary results. The honors thesis committee will evaluate the proposals, and if approved, students can continue in the honors thesis program. Required courses:

Code	Title	Credit Hours
EEPS 401	SEMINAR: UNDERGRADUATE HONORS THESIS	1
EEPS 481	UNDERGRADUATE RESEARCH IN EARTH SCIENCE	1-6

Spring Semester of Senior Year

A mid-semester progress report must be submitted to the thesis committee for feedback. At the end of the spring semester, students submit their final theses, and give public oral exit talks. To complete the honors thesis program, student theses must be approved by the honors thesis committee. Required courses:

Code	Title	Credit Hours
EEPS 401	SEMINAR: UNDERGRADUATE HONORS THESIS	1

EEPS 481	UNDERGRADUATE RESEARCH IN EARTH SCIENCE	1-6
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Further details about the program, and expectations and criteria for the thesis proposal and final thesis can be found on the Department of Earth, Environmental and Planetary Sciences website (<https://eeps.rice.edu/eeps-honor-thesis/>).

Other Points of Consideration

Students who are accepted into the Rice Undergraduate Scholars Program (RUSP) can substitute EEPS 481 courses for semesters 2 and 3 with HONS 470 and HONS 471. However, the students will have to meet all other requirements of the honors thesis set by the department.

Additional Information

For additional information, please see the Earth, Environmental and Planetary Sciences major page, on the Department of Earth, Environmental and Planetary Sciences website: <https://eeps.rice.edu/undergraduate/>