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/). 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/dregeworks/).) Students and their academic advisors should identify and clearly document the courses to be taken.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td></td>
<td><strong>Total Credit Hours Required for the Major in Earth, Environmental, and Planetary Sciences</strong></td>
<td>68-71</td>
</tr>
<tr>
<td></td>
<td><strong>Total Credit Hours Required for the BS Degree with a Major in Earth, Environmental, and Planetary Sciences</strong></td>
<td>120</td>
</tr>
</tbody>
</table>

### Degree Requirements

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<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td></td>
<td><strong>Core Requirements</strong></td>
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</tbody>
</table>

- **MATH 101** SINGLE VARIABLE CALCULUS I 3
- or **MATH 105** AP/OTH CREDIT IN CALCULUS I
- **MATH 102** SINGLE VARIABLE CALCULUS II 3
- or **MATH 106** AP/OTH CREDIT IN CALCULUS II
- **MATH 211** ORDINARY DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA 3
- **CHEM 121** GENERAL CHEMISTRY I 3
- or **CHEM 111** AP/OTH CREDIT IN GENERAL CHEMISTRY I
- **CHEM 122** GENERAL CHEMISTRY II 3
- or **CHEM 112** AP/OTH CREDIT IN GENERAL CHEMISTRY II
- **CHEM 124** GENERAL CHEMISTRY LABORATORY I 1
- or **CHEM 114** AP/OTH CREDIT IN GENERAL CHEMISTRY LAB II
- Select 1 from the following: 4
  - **PHYS 101** MECHANICS (WITH LAB) & **PHYS 103** and MECHANICS DISCUSSION
  - **PHYS 111** HONORS MECHANICS (WITH LAB)
- Select 1 from the following: 4
  - **PHYS 102** ELECTRICITY & MAGNETISM (WITH LAB) & **PHYS 104** and ELECTRICITY AND MAGNETISM DISCUSSION
  - **PHYS 112** HONORS ELECTRICITY & MAGNETISM (WITH LAB)
- Select 1 course from the following: 3-4
  - **EEPS 101** THE EARTH
  - **EEPS 107** THE SCIENCE OF CLIMATE CHANGE
  - **EEPS 108** NATURAL DISASTERS
  - **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
  - **EEPS 220** INTRODUCTION TO COMPUTATION IN THE EARTH, ENVIRONMENT AND PLANETARY SCIENCES
  - or **CAAM 210** INTRODUCTION TO ENGINEERING COMPUTATION
- **EEPS 321** EARTH AND PLANETARY SURFACE ENVIRONMENTS 4
Bachelor of Science (BS) Degree with a Major in Earth, Environmental, and Planetary Sciences

**Elective Requirements**

Select at least 1 course from each of the following 5 fields (see course lists below):

- Deformation and Dynamics
- Geophysics
- Petrology, Geochemistry, and Materials Characterization
- Surface Processes

**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.

**Elective Requirements**

Select a minimum of 2 courses from the following:

- INTRODUCTORY BIOLOGY I
- INTRODUCTORY BIOLOGY II
- ORGANIC CHEMISTRY I
- ORGANIC CHEMISTRY II
- GEOLGY FIELD CAMP

**Additional Credit Hours to Complete Degree Requirements**

- 18-21

**University Graduation Requirements**

- 31

**Total Credit Hours Required for the Major in Earth, Environmental, and Planetary Sciences**

- 68-71

**Bachelor of Science (BS) Degree with a Major in Earth, Environmental, and Planetary Sciences**

**Elective Requirements**

Select at least 1 course from each of the following 4 fields (see course lists below):

- Deformation and Dynamics
- Geophysics
- Petrology, Geochemistry, and Materials Characterization
- Surface Processes

**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.
Bachelor of Science (BS) Degree with a Major in Earth, Environmental, and Planetary Sciences

Any course at the 300-level (or above) from the following subject codes: BIOS, CAAM, CEVE, CHEM, ENVS, MATH, MECH, PHYS, or STAT

Total Credit Hours 21-23

Footnotes and Additional Information
1 Students following the Geoscience area of specialization must complete EEPS 445 in addition to 1 course (minimum of 3 credit hours) from the Geophysics field. See course lists below.

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEPS 460</td>
<td>GLOBAL TECTONICS</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 461</td>
<td>STRUCTURE AND EVOLUTION OF TECTONIC SYSTEMS</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 462</td>
<td>TECTONOPHYSICS</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 464</td>
<td>INTRODUCTION TO THE HEAT AND MASS TRANSFORM PROCESSES OF PLANETARY INTERIORS</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 465</td>
<td>ROCK DEFORMATION AND RHEOLOGY</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 467</td>
<td>GEOMECHANICS</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 468</td>
<td>VOLCANOES</td>
<td>3</td>
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Deformation and Dynamics

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>EEPS 450</td>
<td>GEOPHYSICAL DATA ANALYSIS: DIGITAL SIGNAL PROCESSING</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 451</td>
<td>GEOPHYSICAL DATA ANALYSIS: INVERSE METHODS</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 454</td>
<td>INTRODUCTION TO SEISMIC INTERPRETATION: STRUCTURAL STYLES AND SEISMIC STRATIGRAPHY</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 458</td>
<td>ENVIRONMENTAL &amp; APPLIED ROCK PHYSICS</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 459</td>
<td>WELL LOGGING AND PETROPHYSICS</td>
<td>3</td>
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Environmental Geochemistry and Geophysics

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>EEPS 418</td>
<td>ISOTOPE GEOCHEMISTRY</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 420</td>
<td>ORGANIC GEOCHEMISTRY</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 458</td>
<td>ENVIRONMENTAL &amp; APPLIED ROCK PHYSICS</td>
<td>3</td>
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Geophysics 1

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>EEPS 445</td>
<td>EARTH AND PLANETARY INTERIORS</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 446</td>
<td>SEISMOLOGY I</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 448</td>
<td>EXPLORATION GEOPHYSICS</td>
<td>4</td>
</tr>
<tr>
<td>EEPS 450</td>
<td>GEOPHYSICAL DATA ANALYSIS: DIGITAL SIGNAL PROCESSING</td>
<td>3</td>
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<td>EEPS 458</td>
<td>ENVIRONMENTAL &amp; APPLIED ROCK PHYSICS</td>
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</tr>
<tr>
<td>EEPS 459</td>
<td>WELL LOGGING AND PETROPHYSICS</td>
<td>3</td>
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Modeling and Computation

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<thead>
<tr>
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<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>EEPS 471</td>
<td>EARTH SYSTEMS MODELING I: PHILOSOPHY AND FUNDAMENTALS</td>
<td>3</td>
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Total Credit Hours 21-23

Course Lists to Satisfy Requirements

Breadth in Environmental Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>CEVE 310</td>
<td>PRINCIPLES OF ENVIRONMENTAL ENGINEERING</td>
<td>3</td>
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<tr>
<td>CEVE 434</td>
<td>FATE AND TRANSPORT OF CONTAMINANTS IN THE ENVIRONMENT</td>
<td>3</td>
</tr>
<tr>
<td>CEVE 444</td>
<td>ENVIRONMENTAL MICROBIOLOGY AND MICROBIAL ECOLOGY</td>
<td>3</td>
</tr>
<tr>
<td>CEVE 518</td>
<td>ENVIRONMENTAL HYDROGEOLOGY</td>
<td>3</td>
</tr>
<tr>
<td>EEPS 307 / CEVE 307 / ENST 307</td>
<td>ENERGY AND THE ENVIRONMENT</td>
<td>3</td>
</tr>
</tbody>
</table>
Bachelor of Science (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/), 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/). 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 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://earthscience.rice.edu/academics/undergraduate-program/

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/) (summa cum laude, magna cum laude, and cum laude) and Distinction in Research and Creative Work (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 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 Distinction in Research and Creative Work. 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.

Footnotes and Additional Information

1. Students following the Geoscience area of specialization must complete EEPS 445 in addition to 1 course (minimum of 3 credit hours) from the Geophysics field.

2. For university’s academic history at Rice. For information on university honors, please see Latin Honors (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/university/). Some departments have department-specific Honors awards or designations.

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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/), 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/), students may not major and minor in the same subject.

Transfer Credit

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Undergraduate Independent Research

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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. 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 credits.

Criteria for Participating in Undergraduate Honors Thesis Research

- Strong performance in ESCI courses, in particular, EEPS 321, EEPS 322, EEPS 323, EEPS 324, and EEPS 334
- Letter of recommendation of a faculty research mentor
- Brief research proposal

Requirements and Recommendations for Completing an Undergraduate Honors Thesis

Spring Semester of Junior Year

Students are encouraged to choose their honors thesis research topic during their junior year. Each candidate should identify a faculty research advisor, and initiate independent research. The student should select a thesis committee, consisting of a faculty advisor, one member of the honors thesis committee, and one other faculty member of their choosing. By the end of their spring semester, candidates are expected to turn in a preliminary written proposal (2 pages), accompanied by a formal application, both of which will be evaluated by the honors thesis committee for consideration of acceptance into the honors thesis program in their senior year. Recommended courses:

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<tr>
<th>Code</th>
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<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>EEPS 401</td>
<td>SEMINAR: UNDERGRADUATE HONORS THESIS</td>
<td>1</td>
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</table>

If they have already identified a research project by the beginning of the semester, they may also take:

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<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEPS 481</td>
<td>UNDERGRADUATE RESEARCH IN EARTH SCIENCE</td>
<td>1-6</td>
</tr>
</tbody>
</table>

Fall Semester of Senior Year

Students accepted into the honors thesis program continue to develop and refine their proposed research in concert with their research advisor and thesis committee. Students 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. Students will give oral presentations of their research proposals in public by mid-semester, in the presence of their examining committee. 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:

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<tr>
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<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEPS 401</td>
<td>SEMINAR: UNDERGRADUATE HONORS THESIS</td>
<td>1</td>
</tr>
</tbody>
</table>

Spring Semester of Senior Year

Students continue and complete their research. 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:

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<thead>
<tr>
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<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEPS 401</td>
<td>SEMINAR: UNDERGRADUATE HONORS THESIS</td>
<td>1</td>
</tr>
<tr>
<td>EEPS 481</td>
<td>UNDERGRADUATE RESEARCH IN EARTH SCIENCE</td>
<td>1-6</td>
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</table>

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://earthscience.rice.edu/academics/undergraduate-program/honors-thesis/).

Application Process

Students must apply and be accepted to participate in the senior honors research program. The application form can be downloaded from Department of Earth, Environmental, and Planetary Sciences website (https://earthscience.rice.edu/academics/undergraduate-program/honors-thesis/), and should be submitted along with an approximately two page thesis proposal at the end of the spring semester of the junior year.

Other Points of Consideration

Students who are accepted into the 'RUSP Rice Undergraduate Scholars Program' 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://earthscience.rice.edu/academics/undergraduate-program/