

# ASTROBIOLOGY

<b>Graduate Program Head</b>	Bradford Foley
<b>Program Code</b>	ABIOL
<b>Campus(es)</b>	University Park
<b>Degrees Conferred</b>	Dual-Title
<b>The Graduate Faculty</b>	View ( <a href="https://secure.gradsch.psu.edu/gpms/?searchType=fac&amp;prog=ABIOL">https://secure.gradsch.psu.edu/gpms/?searchType=fac&amp;prog=ABIOL</a> )

Students electing this degree program through participating programs earn a degree with a dual-title in the Ph.D., i.e., Ph.D. in (graduate program name) and Astrobiology. The following graduate programs offer dual-title degrees in Astrobiology:

- Astronomy and Astrophysics
- Biochemistry, Microbiology, and Molecular Biology
- Chemistry
- Geosciences
- Meteorology & Atmospheric Science

Astrobiology is a field devoted to the exploration of life outside of Earth and to the investigation of the origin and early evolution of life on Earth. This dual-title program enables students from several graduate programs to gain the perspectives, techniques, and methodologies of Astrobiology, while maintaining a close association with their primary graduate program.

## Admission Requirements

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-208-dual-titles/>).

Students must apply and be admitted to their primary graduate program and The Graduate School before they can apply for admission to the Astrobiology dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the Astrobiology dual-title program. Doctoral students must be admitted into the dual-title degree program in Astrobiology no later than the end of the fourth semester (not counting summer semesters) of entry into the graduate major program.

To apply for the Astrobiology dual-title, graduate students must submit transcripts of their undergraduate and graduate course work, a written personal statement indicating the career goals they hope to serve by attaining an Astrobiology dual title, and a statement of support from their dissertation adviser (or, if an adviser has not yet been chosen, from the Head of the student's graduate program). A strong undergraduate preparation in the basic sciences is expected, with evidence of an interest in multiple disciplines.

## Degree Requirements

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-208-dual-titles/>).

To qualify for a dual-title degree, students must satisfy the requirements of the major graduate program in which they are enrolled, in addition

to the minimum requirements of the Astrobiology program. The minimum requirements for the Astrobiology program include 3 credits of coursework in each of five different areas, specified as follows:

Code	Title	Credits
<b>Required Courses</b>		
3 credits of 500-level coursework related to the origin and evolution of life on Earth (GEO502 Evolution of the Biosphere, or approved substitute)		3
3 credits of 500-level coursework related to planetary formation, evolution, and exploration (ABIOL 574 Planetary Habitability, or approved substitute)		3
3 credits of 500-level coursework related to the astronomical search for life (ABIOL 576/ASTRO 576 The Search for Extraterrestrial Intelligence, ASTRO 577 Exoplanets, or approved substitute)		3
3 credits of ABIOL 590 Astrobiology seminar. The seminar course may include fieldwork, when such an option is offered.		3
3 credits of 400, 500, or 800 level, astrobiology-related coursework in field outside the student's major or 3 credits of 500-level coursework within their major (through consultation with their adviser). A list of pre-approved courses is available from the Program Coordinator; other courses must be approved by him/her.		3
<b>Total Credits</b>		<b>15</b>

The Qualifying Examination in the major area alone will satisfy the Qualifying Exam requirement for the dual-title program.

In addition to the general Graduate Council requirements for Ph.D. committees (<http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/phd-dissertation-committee-formation/>), the Ph.D. committee of an Astrobiology dual-title doctoral degree student must include at least one member of the Astrobiology Graduate Faculty. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. If the chair of the Ph.D. committee is not also a member of the Graduate Faculty in Astrobiology, the member of the committee representing Astrobiology must be appointed as co-chair. The Astrobiology representative on the student's Ph.D. committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their Ph.D. committee and reflects their original research and education in both their primary graduate program and Astrobiology. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the Ph.D. committee, the head of the graduate program, and the Graduate School.

## Minor

A graduate minor is available in any approved graduate major or dual-title program. The default requirements for a graduate minor are stated in Graduate Council policies listed under GCAC-600 Research Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>) and GCAC-700 Professional Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>), depending on the type of degree the student is pursuing:

- GCAC-611 Minor - Research Doctorate (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-611-minor-research-doctorate/>)

- GCAC-641 Minor - Research Master's (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-641-minor-research-masters/>)
- GCAC-709 Minor - Professional Doctorate (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-709-professional-doctoral-minor/>)
- GCAC-741 Minor - Professional Master's (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-741-masters-minor-professional/>)

## Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the Tuition & Funding (<https://gradschool.psu.edu/graduate-funding/>) section of The Graduate School's website. Students on graduate assistantships must adhere to the course load limits (<https://gradschool.psu.edu/graduate-education-policies/gsad/gsad-900/gsad-901-graduate-assistants/>) set by The Graduate School.

## Courses

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Astrobiology (ABIOL) Course List (<https://bulletins.psu.edu/university-course-descriptions/graduate/abiol/>)

## Learning Outcomes

1. **KNOW:** Students will develop and demonstrate advanced knowledge of a sub-specialty of geosciences, including understanding of, for example, historical and cutting-edge concepts, approaches, and techniques used in the field.
2. **ANALYZE & CREATE:** Students will demonstrate the ability to independently conceive a research hypothesis or question, and to contextualize the results of data collection and analysis.
3. **RESEARCH IMPLEMENTATION:** Students will demonstrate the ability to develop and implement scientific approaches, utilizing data collection, analysis, or numerical models, to address a question or hypothesis.
4. **COMMUNICATE:** Students will develop the ability to communicate their research findings to an audience of their peers in both written and oral form.
5. **QUANTIFY:** Students will develop the ability to incorporate quantitative analysis of data to support interpretations.
6. **CRITICAL THINKING:** Graduates will be able to critically analyze and assess work by others in their field of specialty.
7. **PROFESSIONAL PRACTICE:** Students will demonstrate knowledge of ethical standards in research and scholarship, and the ability to collaborate in a collegial and ethical manner with other professionals within their field or with diverse scientific backgrounds.

## Contact

<b>Campus</b>	University Park
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<b>Director of Graduate Studies (DGS) or Professor-in-Charge (PIC)</b>	Bradford James Foley
<b>Program Contact</b>	507 Deike Building University Park PA 16802
<b>Program Website</b>	View ( <a href="https://www.ems.psu.edu/academics/find-program-study/astrobiology-phddual-title/#:~:text=The20Astrobiology20dual2Dtitle20de">https://www.ems.psu.edu/academics/find-program-study/astrobiology-phddual-title/#:~:text=The20Astrobiology20dual2Dtitle20de</a> )