

# PLANT BIOLOGY

<b>Graduate Program Head</b>	Teh-Hui Kao
<b>Program Code</b>	PLBIO
<b>Campus(es)</b>	University Park (Ph.D., M.S.)
<b>Degrees Conferred</b>	Doctor of Philosophy (Ph.D.) Master of Science (M.S.)
<b>The Graduate Faculty</b>	View ( <a href="https://secure.gradsch.psu.edu/gpms/?searchType=fac&amp;prog=PLBIO">https://secure.gradsch.psu.edu/gpms/?searchType=fac&amp;prog=PLBIO</a> )

The Intercollege Graduate Degree Program in Plant Biology includes faculty from ten departments in the College of Agricultural Sciences, College of Engineering, and Eberly College of Science. Each student becomes associated with the adviser's department, which may provide financial support, research facilities, and office space. Applicants are encouraged to explore opportunities by contacting faculty who may be prospective advisers.

The objective of this program is to educate and train plant biologists using the most modern techniques available today. Graduates from this program have gone on to a diverse range of careers, including positions in colleges and universities, research institutes, industry, and government. Research interests of the program faculty span the breadth of scientific areas ranging from molecular, cell, and evolutionary biology, biochemistry, biophysics, genetics, and functional genomics to whole-plant physiology and ecology. Student training includes a comprehensive set of team-taught courses that reflects this breadth of scientific approaches.

## Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission (<https://gradschool.psu.edu/graduate-admissions/how-to-apply/>). Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions Policies (<https://gradschool.psu.edu/graduate-education-policies/>).

Students with a 3.00 junior/senior grade-point average (on a 4.00 scale) and with appropriate course background will be considered for admission. The best-qualified applicants will be accepted up to the number of spaces available for new students. Students entering this program should have a strong foundation in the biological sciences, including biochemistry, general physics, and college mathematics through calculus. Students with limited deficiencies may be admitted but must make up their deficiencies concurrently with their graduate studies. B.S.-level applicants with good academic records who have had strong training in plant biology and related courses, including research experience, are generally admitted directly into the Ph.D. program. GRE scores are not required for admission.

## Degree Requirements

### Master of Science (M.S.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (<https://gradschool.psu.edu/graduate-education-policies/>)

All M.S. degree candidates will be required to complete 31 credits of course work at the 400, 500, 600, or 800 level, with at least 18 credits at the 500 and 600 level, combined. All students must complete the core courses:

Code	Title	Credits
<b>Required Courses</b>		
PLBIO 512	Plant Resource Acquisition and Utilization	4
PLBIO 513	Integrative Plant Communication and Growth	4
MCIBS 591	Ethics, Rigor, Reproducibility and Conduct of Research in the Life Sciences	2
PLBIO 590	Colloquium	1
<b>Electives</b>		
Elective credits may be chosen from a list of approved electives maintained by the program office.		14
<b>Culminating Experience</b>		
PLBIO 600 or PLBIO 610	Thesis Research Thesis Research Off Campus	6
<b>Total Credits</b>		<b>31</b>

Students are required to write a thesis, and at least 6 credits in thesis research (PLBIO 600 or PLBIO 610) must be taken in conjunction with completing the thesis. The thesis must be accepted by the advisers and/or committee members, the head of the graduate program, and the Graduate School, and the student must pass a thesis defense.

### Doctor of Philosophy (Ph.D.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (<https://gradschool.psu.edu/graduate-education-policies/>)

Students in the Ph.D. program must successfully pass the qualifying, comprehensive, and final oral examinations required by Graduate Council. To earn the Ph.D. degree, doctoral students must also write a dissertation that is accepted by the Ph.D. committee, the head of the graduate program, and the Graduate School.

Ph.D. candidates must complete a minimum of 18 credits, including the following courses:

Code	Title	Credits
<b>Required Courses</b>		
PLBIO 512	Plant Resource Acquisition and Utilization	4
PLBIO 513	Integrative Plant Communication and Growth	4
PLBIO 514	Modern Techniques and Concepts in Plant Ecophysiology	2
PLBIO 515	Modern Techniques and Concepts in Plant Cell Biology	2
PLBIO 516	Modern Techniques and Concepts in Plant Molecular Biology	2
MCIBS 591	Ethics, Rigor, Reproducibility and Conduct of Research in the Life Sciences	2
PLBIO 590	Colloquium	2
Two biochemistry courses <sup>1</sup>		
<b>Total Credits</b>		<b>18</b>

<sup>1</sup> A list of courses approved to count towards the biochemistry course requirement is maintained by the graduate program office.

Upon consultation with the head of the graduate program, equivalent courses taken at another university may be substituted for some of the above requirements. Based on the results of the qualifying examinations,

the student's adviser and Ph.D. committee will determine other course requirements.

One of the main goals of the qualifying examination is to determine the potential of a student to successfully obtain a Ph.D. degree, and it is intended to be a rigorous test of a student's abilities prior to the major investment in time and effort necessary to pass the comprehensive examination. Students enrolled in the Ph.D. program must pass a written English competency evaluation based on the dossier of papers written for PLBIO 512 and PLBIO 513. This evaluation is done at the end of the student's first year. The oral qualifying examination is based on two of the papers, jointly chosen by the student and the Qualifying Examination Committee, and must be passed by the end of the student's third semester.

## 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.

In most participating departments, Plant Biology applicants are eligible for departmental teaching or research assistantships, and other assistantships supported by grant funds of individual faculty who make the award decisions. More detailed and up-to-date information about student aid may be found in the Plant Biology Student and Faculty Handbook (<https://www.huck.psu.edu/content/graduate-programs/plant-biology/requirements/>), which is updated annually during the summer.

## 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.

Plant Biology (PLBIO) Course List (<https://bulletins.psu.edu/university-course-descriptions/graduate/plbio/>)

## Learning Outcomes

### Master of Science (M.S.)

1. **Know:** Students will demonstrate broad knowledge of essential background and recent developments in diverse areas of plant biology, and familiarity with modern techniques and methodologies used in the chosen area of research.
2. **Apply/Create:** Students will demonstrate ability to conduct research in the chosen area of plant biology, including formulating hypotheses based on previous work in the field, designing experimental approaches, carrying the project to completion, and assembling the findings into a written work that advances understanding in the field.
3. **Communicate:** Students will demonstrate ability to disseminate the findings of their research in well-organized writing, as well as in formal research seminars/talks.
4. **Think:** Students will demonstrate ability to critically analyze published work by others in their specialty area.
5. **Professional Practice:** Students will demonstrate knowledge and comprehension of research ethics issues, including ethical principles related to authorship, research reporting, data fabrication, plagiarism, conflicts of interest, peer review, and data sharing.

### Doctor of Philosophy (Ph.D)

1. **Know:** Students will demonstrate in-depth knowledge of essential background and key developments in diverse areas of plant biology, and demonstrate knowledge of modern techniques/methodologies used in plant biology research.
2. **Apply/Create:** Students will demonstrate ability to design and carry out a major research project in the chosen area of plant biology, including formulating hypotheses based on previous work in the field, and assembling new findings into a written work that advances understanding in the field.
3. **Think:** Students will demonstrate ability to critically analyze work by others in their specialty area.
4. **Communicate:** Students will demonstrate ability to convey scientific ideas and results in clear, concise, and well-organized writing, as well as in formal oral or poster presentations at professional conferences/meetings.
5. **Professional Practice:** Students will demonstrate knowledge and comprehension of research ethics issues, including ethical principles related to authorship, research reporting, data fabrication, plagiarism, conflicts of interest, peer review, data sharing.
6. **Teach:** Students will demonstrate effective skills in undergraduate teaching using effective pedagogical practice.

## Contact

<b>Campus</b>	University Park
<b>Graduate Program Head</b>	Teh-Hui Kao
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<b>Program Website</b>	View ( <a href="https://www.huck.psu.edu/graduate-programs/plant-biology/">https://www.huck.psu.edu/graduate-programs/plant-biology/</a> )