

HORTICULTURE

Graduate Program Head	Erin Connolly
Program Code	HORT
Campus(es)	University Park (Ph.D., M.S.)
Degrees Conferred	Doctor of Philosophy (Ph.D.) Master of Science (M.S.) Dual-Title Ph.D. and M.S. in Horticulture and International Agriculture and Development
The Graduate Faculty	View (https://secure.gradsch.psu.edu/gpms/index.cfm?searchType=fac&prog=HORT)

The Horticulture program is administered in the Department of Plant Science, College of Agricultural Sciences. Each student will be associated with an adviser who may provide financial support, research facilities, and/or office space. Applicants are encouraged to explore, study, and research opportunities by contacting faculty who may be prospective advisers.

This program provides opportunities for students interested in Horticulture to become a professional leader and an independent scholar. Faculty in this program are competent to prepare candidates in the subfields of Horticulture including

- crop production and marketing
- integrated crop management
- plant genetics and breeding
- horticultural plant physiology
- postharvest physiology
- plant molecular biology and biotechnology, and
- horticultural ecology.

Admission Requirements

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

Scores from the Graduate Record Examinations (GRE), or from a comparable substitute examination accepted by the Horticulture graduate program, are required for admission. At the discretion of the graduate program officer, a student may be admitted for graduate study in a program without these scores.

Prerequisites for admission vary according to the area of specialization, but basic courses in physical sciences, mathematics, biological sciences, communication skills, and social sciences and humanities are required. Students who lack prerequisite courses may be provisionally admitted (<http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-300/provisional-admission>) but are required to make up deficiencies without degree credit.

Students with a 3.00 junior/senior average (on a 4.00 scale) and with appropriate course backgrounds will be considered for admission. The

best-qualified applicants will be accepted up to the number of spaces that are available for new students.

Degree Requirements

Master of Science (M.S.)

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

A minimum of 30 credits at the 400, 500, 600, or 800 level is required, with least 18 credits at the 500 and 600 level, combined, including:

Code	Title	Credits
12 credits of 400- or 500-level formal courses in the major field (at least 6 credits at the 500-level)		12
3 credits in statistical methods at the 500-level		3
AGRO 501	Graduate Student Dialogue	1
HORT 590	Colloquium	2
AGRO 555	Effective Scientific Communications	2
6 credits of minor/general studies courses (400- or 500-level)		6
HORT 600	Thesis Research	6
	or HORT 610 Thesis Research Off Campus	
Total Credits		32

All M.S. degree candidates must complete at least 2 credits of HORT 602; however, these 2 credits cannot be counted towards the minimum credits required for the degree. A thesis is required for the M.S. degree. 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 Requirements. (<http://gradschool.psu.edu/graduate-education-policies>)

The communication requirement for the Ph.D. degree may be satisfied by completing at least 6 graduate credits in an area of communications skills approved by the student's advisory committee.

Students must complete 55-60 credits of formal course work beyond the baccalaureate, plus additional seminar, teaching, and research credits. A minimum of 12 credits of 500 level formal courses beyond the bachelor's degree is required. Courses will be chosen by the student and dissertation adviser in consultation with the doctoral committee. Ph.D. students must complete:

Code	Title	Credits
AGRO 501	Graduate Student Dialogue	1
HORT 590	Colloquium (3 credits are required, including 1 credit from the master's)	3
Statistics course (6 credits required, at least 3 credits must be at the 500-level)		6
HORT 600	Thesis Research	12
Select 3 credits of English communication skills and related studies ¹		3
HORT 602	Supervised Experience in College Teaching ²	2
Total Credits		27

¹ Either (1) one 3-credit 400- or 500- level course of advanced English technical composition; (2) one 3-credit 400- or 500- level course chosen from a list maintained by the graduate program office; or (3) one 3-credit 400- or 500-level writing intensive course.

² These 2 credits cannot be counted towards the minimum credits required for the degree.

The qualifying examination may be given after at least 18 credits have been earned in graduate courses beyond the baccalaureate, and must be taken within three semesters (excluding summer sessions) of entry into the doctoral program. Within one semester after passing the qualifying examination, the student's dissertation committee, with the dissertation adviser in charge, will have the program planning meeting. The purposes of this meeting are to

1. determine the student's strengths and weaknesses in pertinent subject matter areas;
2. guide the student in developing a plan of study; and
3. review and discuss the proposed dissertation research.

The comprehensive examination, composed of both written and oral parts, will be given when, in the student's and adviser's opinion, the student is ready for the examination, and when the English competence requirement and essentially all courses have been completed.

Ph.D. candidates are required to write and orally defend a dissertation on a topic that is approved in advance by their dissertation committee and reflects their original research and education in Horticulture. 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 dissertation committee, the head of the graduate program, and the Graduate School.

Dual-Titles

Dual-Title M.S. and Ph.D. in International Agriculture and Development

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

Admission Requirements

Students must apply and be admitted to the graduate program in Horticulture and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the INTAD dual-title program. Refer to the Admission Requirements section of the INTAD Bulletin page (<http://bulletins.psu.edu/graduate/programs/majors/international-agriculture-development>). Doctoral students must be admitted into the dual-title degree program in INTAD prior to taking the qualifying examination in their primary graduate program.

Degree Requirements

To qualify for the dual-title degree, students must satisfy the degree requirements for the degree they are enrolled in Horticulture. In addition, students must complete the degree requirements for the dual-title in INTAD, listed on the INTAD Bulletin page (<http://bulletins.psu.edu/graduate/programs/majors/international-agriculture-development>).

The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from Horticulture and must

include at least one Graduate Faculty member from the INTAD program. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both Horticulture and INTAD. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed one semester beyond the normal period allowable

In addition to the general Graduate Council requirements for dissertation committees (<http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/phd-dissertation-committee-formation>), the dissertation committee of a Horticulture and INTAD dual-title Ph.D. student must include at least one member of the INTAD Graduate Faculty. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. If the chair of the dissertation committee is not also a member of the Graduate Faculty in INTAD, the member of the committee representing INTAD must be appointed as co-chair. The INTAD representative on the student's dissertation 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 dissertation committee and reflects their original research and education in Horticulture and INTAD. 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 dissertation committee, the head of the graduate program, and the Graduate School.

Student Aid

Graduate assistantships available to students in this program and other forms of student aid are described in the Tuition & Funding (<http://gradschool.psu.edu/graduate-funding>) section of The Graduate School's website. Students on graduate assistantships must adhere to the course load limits (<http://gradschool.psu.edu/graduate-education-policies/gsad/gsad-500/gsad-501-credit-loads-graduate-assistants>) set by The Graduate School.

Students who wish to compete for fellowships should be sure that their application materials are complete by January 15 for entry the following fall semester.

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.

Horticulture (HORT) Course List (<https://bulletins.psu.edu/university-course-descriptions/graduate/hort>)

Learning Outcomes

Master of Science (M.S.)

Know: Graduates of the Agronomy or Horticulture M.S. degree programs will demonstrate mastery of the principles

and common research methods within the field of agronomy or horticulture. The demonstration will cover mastery of biotechnology, sustainability, profitability, weed mgt. and herbicide resistance, nutrient mgt., food safety, and/or turfgrass science.

Create/Apply: Graduates of the Agronomy or Horticulture M.S. degree programs will be able to assimilate essential concepts and literature in agronomy and horticulture, create hypotheses, develop tests of hypotheses, and develop solutions to agronomic and horticultural problems. M.S. graduates will also be able to carry out applied research projects that address problems in the field of agronomy or horticulture.

Communicate: Graduates of the Agronomy or Horticulture M.S. degree programs will be able to effectively communicate technical knowledge, research findings, and current topics in agronomy or horticulture verbally and in writing to scientists and lay people.

Critical thinking: Graduates of the Agronomy or Horticulture M.S. degree programs will be able to critically analyze research performed by others and evaluate agronomic or horticultural problems and formulate solutions to problems.

Professional practice: M.S. graduates of the Agronomy or Horticulture Graduate Programs will demonstrate ability to collaborate in a collegial manner and demonstrate high ethical standards, values, and best practices.

Doctor of Philosophy (Ph.D.)

Know: Graduates of the Agronomy/Horticulture Ph.D. Programs will demonstrate in-depth knowledge of essential theories and research methods within the fields of agronomy or horticulture. The demonstration areas will cover the application of biotechnology, sustainability, profitability, weed mgt. and herbicide resistance, nutrient mgt., food safety, and/or turfgrass science.

Create/Apply: Graduates of the Agronomy/Horticulture Ph.D. Programs will be able to assimilate essential theory and literature in agronomy to generate new ideas and develop creative solutions to agronomic and horticultural problems. Graduates of the program will also be able to conduct original research in an independent manner that addresses problems in the fields of agronomy or horticulture.

Communicate: Graduates of the Agronomy/Horticulture Ph.D. Programs will be able to convey ideas, arguments, and current topics in agronomy or horticulture verbally and in writing to scientists and lay people.

Critical thinking: Graduates of the Agronomy/Horticulture Ph.D. Programs will be able to critically analyze research performed by others in the fields of agronomy or horticulture.

Professional practice: Graduates of the Agronomy/Horticulture Ph.D. Programs will demonstrate the ability to work with others in a collegial manner and demonstrate the highest ethical standards, values, and best practices in their field.

Contact

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Director of Graduate Studies (DGS) or Professor-in-Charge (PIC)	Jonathan Paul Lynch
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Program Website	View (http://plantscience.psu.edu/graduateprograms)