

PhD in Plant, Insect and Microbial Sciences

Degree Requirements

To satisfy the course requirements for a doctoral degree, a student must complete:

- A minimum of 72 credit hours from courses numbered 7000-9000 (this includes dissertation research credit hours - i.e. PLNT_SCI 9090).
- 15 credit hours (towards the 72 hour requirement) must be from courses numbered at the 8000 or 9000 level, exclusive of dissertation research, problems or independent study.
- For the Horticulture Program Area, all Doctoral students will have successfully completed the requirements for a master's degree before beginning a doctoral program and no more than 30 hours of dissertation research may be counted towards the 72 hr minimum.
- Two semesters of PLNT_SCI 9087.
- Three semesters of PLNT_SCI 7087.

Crop, Soil and Pest Management

Core Requirements:

PLNT_SCI 8010	Professionalism and Ethics	2
PLNT_SCI 9087	Seminar in Plant Science (must enroll twice)	1
PLNT_SCI 7087	Seminar (must enroll three times)	1
PLNT_SCI 9090	Dissertation Research	1-10

Entomology

Core Requirements:

PLNT_SCI 7710	Systematic Entomology	5
PLNT_SCI 7820	Principles of Insect Physiology	4
PLNT_SCI 8010	Professionalism and Ethics	2
PLNT_SCI 9087	Seminar in Plant Science (must enroll twice. Only 1 credit will count towards the 15 credit hour at 8000/9000-level requirement.)	1
PLNT_SCI 7087	Seminar (must enroll three times)	1
PLNT_SCI 9090	Dissertation Research	1-10
PLNT_SCI 9810	Insect Ecology	3

Horticulture

Core Requirements:

PLNT_SCI 8010	Professionalism and Ethics	2
PLNT_SCI 9087	Seminar in Plant Science (must enroll twice. Only 1 credit will count towards the 15 credit hour at 8000/9000-level requirement.)	1
PLNT_SCI 7087	Seminar (must enroll three times)	1
PLNT_SCI 9090	Dissertation Research	1-10

Plant Breeding, Genetics, and Genomics

Core Requirements:

PLNT_SCI 8010	Professionalism and Ethics	2
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PLNT_SCI 9087	Seminar in Plant Science (must enroll twice. Only 1 credit will count towards the 15 credit hour at 8000/9000-level requirement.)	1
PLNT_SCI 7087	Seminar (must enroll three times)	1
PLNT_SCI 9090	Dissertation Research	1-10

Electives

Bridging Courses to Expand Your Background in Plant Biology

PLNT_SCI 7315	Crop Physiology	3
PLNT_SCI 7320	Molecular Plant Physiology	3
PLNT_SCI 7325	Advanced Plant Breeding	3
PLNT_SCI 7500	Biology and Pathogenesis of Plant-Associated Microbes	4
PLNT_SCI 7550	Plant Biotechnology	4

Elective Courses to Fulfill the Requirement for 15 Credit Hours at 8000 or 9000 Level

AN_SCI 8430	Introduction to Bioinformatics Programming	4
BIO_SC 8300	Advanced Plant Genetics	3
BIO_SC 8310	Fungal Genetics and Biology	3
PLNT_SCI 8330	Molecular Breeding and Genomic Technology	3
PLNT_SCI 8362	Introduction to Plant Metabolism	2
PLNT_SCI 8365	Introduction to Molecular Cell Biology	2
PLNT_SCI 9415	Advanced Plant Physiology	1-3
PLNT_SCI 9540	Genetics of Plant-Microorganism Interaction	3
PLNT_SCI 9810	Insect Ecology	3

Plant Stress Biology

Core Requirements:

PLNT_SCI 7320	Molecular Plant Physiology	3
or PLNT_SCI 7315	Crop Physiology	
PLNT_SCI 7500	Biology and Pathogenesis of Plant-Associated Microbes	4
PLNT_SCI 8010	Professionalism and Ethics	2
PLNT_SCI 8530	Research with Plant Stress Agents	3
PLNT_SCI 9087	Seminar in Plant Science (Must enroll twice. Only 1 credit will count towards 15 credit hour 8000/9000-level requirement)	1
PLNT_SCI 7087	Seminar (must enroll three times)	1
PLNT_SCI 9090	Dissertation Research	1-10
PLNT_SCI 7965	Readings in Plant Stress Biology (must take one of two courses each year.)	1-9
or PLNT_SCI 7970	Readings in Plant-Insect Interactions	

Elective Courses:

AN_SCI 8430	Introduction to Bioinformatics Programming	4
BIO_SC 8300	Advanced Plant Genetics	3
BIOCHM 8434	Signaling in Molecular Cell Biology	3
INFOINST 8005	Applications of Bioinformatics Tools in Biological Research	3
BIO_SC 8310	Fungal Genetics and Biology	3
PLNT_SCI 8330	Molecular Breeding and Genomic Technology	3
PLNT_SCI 8362	Introduction to Plant Metabolism	2
PLNT_SCI 8365	Introduction to Molecular Cell Biology	2
PLNT_SCI 9415	Advanced Plant Physiology	1-3

PLNT_SCI 9440	Applied Quantitative and Statistical Genetics	3
PLNT_SCI 9540	Genetics of Plant-Microorganism Interaction	3
PLNT_SCI 9810	Insect Ecology	3
Additional Entry Level Courses:		
PLNT_SCI 7550	Plant Biotechnology	4
PLNT_SCI 7400	Plant Anatomy	4
STAT 7070	Statistical Methods for Research	3

Teaching Requirement

All students must participate in an approved teaching opportunity or an approved extension program.

Reasonable Rate of Progress

A reasonable rate of progress toward the degree is required. A Ph.D. student must successfully complete the comprehensive exam within 5 years of their first semester of enrollment as a Ph.D. student. In addition, the remaining program for the doctoral degree must be completed within 5 more years after passing the Comprehensive Exam.

Sample Plan of Study

There are several areas of study within the PhD in Plant, Insect and Microbial Sciences degree. A student can select training from a wide range of courses and research programs to prepare for a career in research, teaching, industry and extension work. Note: Areas of Study will not appear on transcripts or diplomas. Each program area emphasizes a customized approach towards the course of study. Each student will work with their advisor and graduate committee to develop a course of study best suited to the student's educational and career goals.

Doctoral Committee

Once accepted by the Graduate School and the division, the student and his/her Major Advisor should plan for the Qualifying Exam (see below). A Doctoral Committee should be formed. The Committee must consist of at least four members including: the Major Advisor, two members from the Division of Plant Sciences, and one member from outside the division. Two members of the Committee must be members of the Doctoral Faculty.

Qualifying Examination

Once Committee members have agreed to serve, a date for the Qualifying Examination should be set and the Exam conducted. The Qualifying Exam must be scheduled for not later than the end of the second full semester of residence. The purpose of the Qualifying Exam is to ascertain the general background of the student. Students should expect questions in the exam that are related to any prior coursework and are appropriate for their program area. To assist their committee in development of questions, the student should provide transcripts to their committee two weeks before the exam. The Qualifying Exam is strictly an oral exam. Based on the results of the Qualifying Exam, the committee will make recommendations on coursework for the student's Plan of Study.

A student will be considered to have passed the Qualifying Exam if all members, or all but one, of the Advisory Committee vote affirmatively. A student failing the Qualifying Exam will be given a second opportunity to pass. However, a student who fails the second exam shall terminate his/

her course of study in the division not later than the end of the semester in which the examination was failed.

Comprehensive Examination Process

The Comprehensive Examination is a major milestone in the Ph.D. candidate's progress towards completion of the degree requirements. The candidate is expected to clearly demonstrate his/her knowledge and understanding of the principles and concepts of the chosen Graduate Program Area, related biological sciences, and the scientific method. The Comprehensive Exam should be scheduled when the student has essentially completed the required plan of study. The Comprehensive Exam must be completed at least seven months before the final examination (defense). The Comprehensive Exam Committee is the same as the Doctoral Committee.

The Comprehensive Exam requires both written and oral performance by the student to achieve candidacy. The student's advisor will select either Track I or Track II for the format of the exam. The student arranges the written and oral portion of the Comprehensive Exam with each member of the Committee.

Dissertation Defense

A dissertation is required of every Ph.D. Candidate in the Division of Plant Sciences. This is to be a substantial scholarly manuscript of original research conducted by the student. The dissertation should reflect the depth of understanding, independent thought, and original work worthy of a Ph.D.

The Dissertation Defense consists of a research seminar and final examination. It is the student's responsibility to check the Graduate School's graduation deadlines when scheduling the exam. The seminar will be presented by the student for division faculty, staff, students, committee members, and other interested persons. The student may choose to present the seminar as part of the Division Seminar Series. It must summarize the dissertation research conducted by the student during the Doctoral program. The seminar will be followed by the final, oral examination administered by the Doctoral Committee. Although the general protocol followed during the oral examination shall be at the discretion of the Major Advisor, a typical oral examination lasts about 2 hours and is divided between discussion of the dissertation and related, dissertation subject matter. The research seminar should be scheduled the same day (preferably) or during the week preceding the remainder of the final examination.

Admissions

Applicants are required to meet two sets of minimum qualifications for admission: the requirements of the PhD in Plant, Insect, and Microbial Sciences (<https://gradschool.missouri.edu/degreecategory/plant-insect-microbial-sciences/>) and the minimum requirements of the Graduate School (<https://gradschool.missouri.edu/admissions/eligibility-process/>). Because requirements vary, you *must* refer to a degree program's graduate admission page to learn about specific admission criteria, application deadlines, eligibility and application process. Your application materials will be reviewed by both the Graduate School and the degree program to which you've applied before official admission to the University of Missouri.

Financial Aid from the Program

Financial assistance is available to qualified students at both the MS and PhD levels, as either fellowships or research assistantships. Some

programs require an extra form or statement from those who wish to be considered for internal assistantships, fellowships or other funding packages.