

# Plant and Soil Sciences

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Graduate study offered in the Department of Plant and Soil Sciences leads to the Master of Science in Plant and Soil Sciences degree with concentrations in Agronomy, Horticulture, or Weed Science and also to the Doctor of Philosophy degree in Plant and Soil Sciences with a concentration in Agronomy, Horticulture, or Weed Science. The Horticulture concentration within the Plant and Soil Sciences degrees also offers a minor in Floral Management. The department has an extensive research program which provides a diversity of problems for thesis and dissertation research under the supervision of experienced and highly trained scientists. The Department of Plant and Soil Sciences offers graduate programs in Plant Breeding and Genetics, Molecular Biology, Crop Modeling, Agronomy, Soil Science, Crop Physiology, Weed Science, Turfgrass Science, Remote Sensing, and Horticulture. A Precision Agriculture Certificate is also offered.

Graduate programs are designed to develop skills in research techniques in reference to the individual needs of each student. This program is developed and administered by a departmental committee within the student's area of specialization and may include courses in mathematics and statistics, biology, chemistry, biochemistry, remote sensing, etc., as well as agronomic, horticultural, and weed science courses. Graduate assistantships are provided, subject to availability of funds. An undergraduate grade average of B or better is required to be eligible for an assistantship. Requests for additional information should be addressed to:

Department Head

Plant and Soil Sciences

Box 9555

Mississippi State, MS 39762

## Accelerated Program

Highly qualified undergraduates are encouraged to apply to an Accelerated Program which permits enrollment in graduate courses in Agronomy, Horticulture, or Weed Science during the student's final year of undergraduate studies. For complete information, see Accelerated Programs (<http://catalog.msstate.edu/archives/2021-22/graduate/colleges-degree-programs/>). This option is only available for students who plan to pursue a thesis-based Master of Science degree in Plant and Soil Sciences with a concentration in Agronomy, Horticulture, or Weed Science.

In addition to the University requirements, the Department of Plant and Soil Sciences also requires the following information from applicants:

1. Submission of a standard application for graduate studies in the Department of Plant and Soil Sciences
2. Three letters of recommendation from individuals familiar with the applicant's academic performance
3. Submission of scores from the Graduate Record Examination (GRE) General Test prior to enrolling in graduate courses
4. A statement of professional interests and goals from the applicant, including specification of one or more potential major professors

## Precision Agriculture Certificate

There is a need to train students in the broad array of precision agriculture technologies. This certificate program complements majors taught across College of Agriculture and Life Sciences (CALs) departments. This certificate features emerging technologies in decision-based agricultural planning and implementation. The certificate requires a minimum of 16 hours with at least 10 credit hours specific to Precision Agriculture coursework and 6 additional hours of electives or optional courses. Graduate requirements: PSS/ABE 2543 may be required as a leveling course and graduates may need a combination of Option 1 and Option 3 (below) to meet graduate credit requirements.

To obtain a Precision Agriculture Certificate, students are required to complete the following 16 hours:

PSS 2543 or ABE 2543	Precision Agriculture I Precision Agriculture I	3
PSS 4543	Precision Agriculture II (or PSS 6543 or ABE 4543/6543)	3
ECE 4411	Remote Sensing Seminar (or ECE 6411 or FO 4411/6411 or GR 4411/6411 or PSS 4411/6411)	1
ABE 4000	Directed Individual Study in Agricultural and Biological Engineering (or ABE 7000 or PSS 4000/7000)	3

Option 1: Choose from the following.

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ABE 4483	Introduction to Remote Sensing Technologies (or ABE 6483 or ECE 4483/6483 or PSS 4483/6483)	
ABE 3513	The Global Positional System and Geographic Information Systems in Agriculture and Engineering	
FO 4471/6471	(and GIS for Natural Resource Management)	
FO 4472/6472		
PSS 4373/6373	Geospatial Agronomic Management	
GR 4303/6303	Principles of GIS	
GR 3303	Survey of Geospatial Technologies	
Option 2 (Community/Junior College AGT courses) : Any TWO transfer courses from the following in a Precision Agriculture Technology Concentration with the Postsecondary Agriculture Business and Management Technology program		6-8
AGT 1163 Introduction to Spatial Information Systems		
AGT 2154 Geographic Information Systems I		
AGT 1254 GPS Data Collection		
AGT 2164 Variable Rate Technology		
AGT 1354 Remote Sensing		
AGT 2474 Site Specific Pest Management		
OR Completion of the UAV Training Program coursework at Hinds Community College		
Option 3: Discipline Specific Electives		6-8
ABE 3413	Bioinstrumentation I	
ABE 4163	Agricultural and Off-Road Machinery Management	
or ABE 6163	Machinery Management for Agro-Ecosystems	
ABE 4263/6263	Soil and Water Management	
ABE 4844/6844		
ABE 6423	Bioinstrumentation II	
AEC 3413	Introduction to Food Marketing	
AEC 3513	Economics of Food and Fiber Production	
AEC 4113/6113	Agribusiness Firm Management	
AEC 4133/6133	Analysis of Food Markets and Prices	
AEC 4343/6343	Advanced Farm Management	
BIO 4214	General Plant Physiology	
EPP 3124	Forest Pest Management	
EPP 4163/6163	Plant Disease Management	
EPP 4214/6214	Diseases of Crops	
EPP 4234/6234	Field Crop Insects	
EPP 4263/6263	Principles of Insect Pest Management	
FIN 3123	Financial Management	
PSS 3301	Soils Laboratory	
PSS 3303	Soils	
PSS 3133	Introduction to Weed Science	
PSS 4113/6113	Agricultural Crop Physiology	
PSS 4313/6313	Soil Fertility and Fertilizers	
PSS 4333/6333	Soil Conservation and Land Use	
PSS 4343/6343	Controlled Environment Agriculture	
PSS 4813/6813	Herbicide Technology	
PSS 4823/6823	Turfgrass Weed Management	

## Departmental Admission Criteria

**M.S.** and **Ph.D.** in Plant and Soil Sciences with concentrations in Agronomy, Horticulture, or Weed Science:

- GPA—
  - For Master of Science: 2.75
  - For Doctor of Philosophy: 3.00 on graduate work

- TOEFL (Test of English as a Foreign Language) or IELTS (International English Language Testing Systems) score—  
**Agronomy:** TOEFL score of 500 PBT (61 iBT) or IELTS score of 5.5  
**Horticulture:** TOEFL score of 500 PBT (61 iBT) or IELTS score of 5.5  
**Weed Science:** TOEFL score of 550 PBT (79 iBT) or IELTS score of 6.5
- GRE—All graduate programs require submission of GRE scores.
- A non-thesis M.S. does not qualify toward admission to a Ph.D. program in the Department of Plant and Soil Sciences at Mississippi State University.

## Provisional Admission

An applicant who has not fully met the GPA requirement stipulated by the University may be admitted on a provisional basis. The provisionally-admitted student is eligible for a change to regular status after receiving a 3.00 GPA on the first 9 hours of graduate courses at Mississippi State University (with no grade lower than a C). The first 9 hours of graduate courses must be within the student's program of study. Courses with an S grade, transfer credits, or credits earned while in Unclassified status cannot be used to satisfy this requirement. If a 3.00 is not attained, the provisional student **shall** be dismissed from the graduate program. Academic departments may set higher standards for students to fulfill provisional requirements; a student admitted with provisional status should contact the graduate coordinator for the program's specific requirements. **While in the provisional status, a student is not eligible to hold a graduate assistantship.**

## Leveling Courses

The Department of Plant and Soil sciences recognizes that many students who hold bachelor degrees from other educational areas may wish to study toward an advanced degree within the department. These students may come from areas with different requirements than those normally associated with Agronomy, Horticulture, or Weed Science. To increase the possibility of success in attaining the advanced degree, the department requires all graduate students to have a fundamental understanding of soil and plant science. To this end, all graduate students must have had at least one course in soil science equivalent to Soils (PSS 3303), a plant science course covering basic plant physiology, college mathematics, college chemistry, and college-level biology. Graduate students who do not possess these courses upon acceptance will be required to complete these courses during the first or second semester of their attendance at Mississippi State University.

## General Department Completion Requirements

**M.S.--** A thesis and an oral thesis defense are required. The graduate committee must approved the thesis topic, research proposal, program of study, and final thesis. A thesis defense is required.

**M.S. Non-Thesis --** A research paper approved by the student's graduate committee and an oral comprehensive exam are required.

**Ph.D. --** The dissertation is required of all candidates for the doctorate degree. Original research, a written examination, an oral preliminary examination, and an oral dissertation defense and examination are required. At least one semester of teaching experience is strongly encouraged. The graduate committee must approved the dissertation topic, research proposal, program of study, and final dissertation.

## Academic Performance

Students in the M.S. and Ph.D. degree programs must maintain a 3.00 GPA after admission to the program. No grade below C will be accepted for graduate credit. More than two grades of C or below not exceeding 8 credit hours constitute grounds for dismissal. Note: A C grade for a course that is retaken and in which the student earns a grade of B or higher will not be included in the 8 total hours. However, the original grade is included as part of the calculation of the GPA. At any time, the student will lose any departmental assistantship should his/her cumulative drop below a 3.00. Students with alternative sources of funding (scholarships, fellowships, etc.) must follow the rules and regulations of the funding source.

## Master of Science in Plant and Soil Sciences with Agronomy Concentration - Thesis

**Prerequisites** - as stipulated by the major professor, the departmental graduate coordinator, and the dean.

Graduate-level coursework		12
PSS 8811	Seminar <sup>1</sup>	1
ST 8114	Statistical Methods (or other graduate-level statistics course) <sup>2</sup>	4
8000-level coursework <sup>3</sup>		7
Research/thesis <sup>4</sup>		6
<b>Total Hours</b>		<b>30</b>

- 1 An exit seminar describing the thesis research is required as part of the credit hours.
- 2 A graduate-level statistics course is required as part of the credit hours.
- 3 The total 8000-level coursework credits must equal a minimum of 12 hours.
- 4 A thesis defense is required.

## Master of Science in Plant and Soil Sciences with Agronomy Concentration - Non-Thesis

**Prerequisites** - as stipulated by the major professor, the departmental graduate coordinator, and the dean.

Graduate-level coursework		12
PSS 7000	Directed Individual Study in Plant and Soil Sciences <sup>1</sup>	3
PSS 8811	Seminar <sup>2</sup>	1
ST 8114	Statistical Methods (or other graduate-level statistics course) <sup>3</sup>	4
Additional 8000-level coursework <sup>4</sup>		10
<b>Total Hours</b>		<b>30</b>

<sup>1</sup> The student must develop a research paper approved by the student's graduate committee. In addition, a comprehensive examination over coursework is required.

<sup>2</sup> An exit seminar describing the thesis research is required as part of the credit hours.

<sup>3</sup> A graduate-level statistics course is required as part of the credit hours.

<sup>4</sup> The total 8000-level coursework must equal a minimum of 15 hours.

## Doctor of Philosophy in Plant and Soil Sciences with Agronomy Concentration

**Prerequisites** - as stipulated by the major professor, the departmental graduate coordinator, and the dean.

PSS 8821	Seminar <sup>1</sup>	1
PSS 8831	Seminar <sup>2</sup>	1
ST 8114	Statistical Methods (or other graduate-level statistics course) <sup>3</sup>	4
Additional graduate-level coursework <sup>4, 5</sup>		14
PSS 9000	Dissertation Research /Dissertation in Plant and Soil Sciences	20
<b>Total Hours</b>		<b>40</b>

<sup>1</sup> The first seminar should be done within the first year of the student's program and should present the research proposal and include a review of relevant literature.

<sup>2</sup> An exit seminar will describe the results of the student's dissertation research.

<sup>3</sup> A graduate-level statistics course is required as part of the credit hours.

<sup>4</sup> The minimum coursework required for a PhD in Plant and Soil Sciences is 20 hours beyond the Master's degree requirements.

<sup>5</sup> Mississippi State University requires all students earn at least 53 hours graduate credit beyond the bachelor's level to include a minimum of 20 dissertation credits.

A qualifying examination may be administered at the beginning of the student's program. The student must successfully complete a program of study as approved by the major advisor and graduate committee. The student must pass a preliminary examination. A written and oral preliminary examination will be administered by the graduate committee after completion or within 6 hours of completing coursework. Original research and a dissertation are required of all candidates for the doctoral degree.

## Master of Science in Plant and Soil Sciences with Horticulture Concentration - Thesis

**Prerequisites** - as stipulated by the major professor, the departmental graduate coordinator, and the dean. In addition, graduate students accepted into the Horticulture concentration are expected to have complete a course in General Plant Physiology or will be required to include this course on their graduate program of study.

Graduate-level coursework		12
PSS 8811	Seminar <sup>1</sup>	1
ST 8114	Statistical Methods (or other graduate-level statistics course) <sup>2</sup>	4
Additional 8000-level coursework <sup>3</sup>		7
Research/thesis <sup>4</sup>		6
<b>Total Hours</b>		<b>30</b>

<sup>1</sup> An exit seminar describing the thesis research is required as part of the credit hours.

<sup>2</sup> A graduate-level statistics course is required as part of the credit hours.

<sup>3</sup> The total 8000-level coursework must equal a minimum of 12 hours.

<sup>4</sup> A thesis defense is required.

## Master of Science in Plant and Soil Sciences with Horticulture Concentration - Non-Thesis

**Prerequisites** - as stipulated by the major professor, the departmental graduate coordinator, and the dean. In addition, graduate students accepted into the Horticulture concentration are expected to have complete a course in General Plant Physiology or will be required to include this course on their graduate program of study.

Graduate-level coursework		7
PSS 7000	Directed Individual Study in Plant and Soil Sciences <sup>1</sup>	3
PSS 8811	Seminar <sup>2</sup>	1
ST 8114	Statistical Methods <sup>3</sup>	4
Additional 8000-level coursework <sup>4</sup>		15
<b>Total Hours</b>		<b>30</b>

<sup>1</sup> The student must develop a research paper approved by the student's graduate committee. An oral comprehensive examination is required.

<sup>2</sup> An exit seminar describing the thesis research is required as part of the credit hours.

<sup>3</sup> A graduate-level statistics course is required as part of the credit hours.

<sup>4</sup> The total 9000-level coursework must equal a minimum of 15 hours.

## Doctor of Philosophy in Plant and Soil Sciences with Horticulture Concentration

**Prerequisites** - as stipulated by the major professor, the departmental graduate coordinator, and the dean. In addition, graduate students accepted into the Horticulture concentration are expected to have complete a course in General Plant Physiology or will be required to include this course on their graduate program of study.

BCH 6013	Principles of Biochemistry	3
PSS 8821	Seminar <sup>1</sup>	1
PSS 8831	Seminar <sup>2</sup>	1
ST 8214	Design and Analysis of Experiments (or other graduate-level statistics course) <sup>3</sup>	4
Additional graduate-level coursework <sup>4, 5</sup>		15
PSS 9000	Dissertation Research /Dissertation in Plant and Soil Sciences	20
<b>Total Hours</b>		<b>44</b>

<sup>1</sup> The first seminar should be done within the first year of the student's program and should present the research proposal and include a review of relevant literature.

<sup>2</sup> An exit seminar will describe the results of the student's dissertation research.

<sup>3</sup> A graduate-level statistics course is required as part of the credit hours; two graduate-level statistics courses beyond the B.S. degree are required for the Ph.D. in the Horticulture concentration.

<sup>4</sup> The minimum coursework required for a PhD in Plant and Soil Sciences with a Horticulture concentration is 24 hours beyond the master's degree requirements.

<sup>5</sup> Mississippi State University requires all students earn at least 53 graduate credit hours beyond the bachelor's level to include a minimum of 20 hours dissertation credits.

A qualifying examination may be administered at the beginning of the student's program. The student must successfully complete a program of study as approved by the major advisor and graduate committee. The student must pass a preliminary examination. A written and oral preliminary examination will be administered by the graduate committee after completion or within 6 hours of completing coursework. Original research and a dissertation are required of all candidates for the doctoral degree.

## Horticulture (Floral Management) Graduate Minor

PSS 6013	Principles of Floral Design	3
PSS 6023	Floral Management	3
PSS 6033	Case Studies in Floral Management	3
PSS 6043	International Horticulture	3
<b>Total Hours</b>		<b>12</b>

The Horticulture concentration within the Plant and Soil Sciences degrees also offers a minor in Floral Management. The minor is available for graduate students seeking training in this field to complement their graduate degree. Students seeking the minor are required to complete the 12-hour program. The student's graduate committee must include a minor committee member from the Department of Plant and Soil Sciences.

## Master of Science in Plant and Soil Sciences with Weed Science Concentration - Thesis

**Prerequisites** - as stipulated by the major professor, the departmental graduate coordinator, and the dean.

Graduate-level coursework		12
PSS 8811	Seminar <sup>1</sup>	1
ST 8114	Statistical Methods (or other graduate-level statistics course) <sup>2</sup>	4
Additional 8000-level coursework <sup>3</sup>		7
Research/thesis <sup>4</sup>		6
<b>Total Hours</b>		<b>30</b>

- 1 An exit seminar describing the thesis research is required as part of the credit hours.
- 2 A graduate-level statistics course is required as part of the credit hours.
- 3 The total 8000-level coursework must equal a minimum of 12 hours. Up to 9 hours of PSS 8701-8771. Current Topics in Weed Science may be included to meet these requirements.
- 4 A thesis defense is required.

## Master of Science in Plant and Soil Sciences with Weed Science Concentration - Non-Thesis

**Prerequisites** - as stipulated by the major professor, the departmental graduate coordinator, and the dean.

Graduate-level coursework		12
PSS 7000	Directed Individual Study in Plant and Soil Sciences <sup>1</sup>	3
PSS 8811	Seminar <sup>2</sup>	1
ST 8114	Statistical Methods <sup>3</sup>	4
Additional 8000-level coursework <sup>4</sup>		10
<b>Total Hours</b>		<b>30</b>

- 1 The student must develop a research paper approved by the student's graduate committee. A comprehensive examination is required.
- 2 An exit seminar describing the thesis research is required as part of the credit hours.
- 3 A graduate-level statistics course is required as part of the credit hours.
- 4 The total 8000-level coursework must equal a minimum of 15 hours.

## Doctor of Philosophy in Plant and Soil Sciences with Weed Science Concentration

**Prerequisites** - as stipulated by the major professor, the departmental graduate coordinator, and the dean.

PSS 8821	Seminar <sup>1</sup>	1
PSS 8831	Seminar <sup>2</sup>	1
ST 8114	Statistical Methods (or other graduate-level statistics course) <sup>3</sup>	4
Additional graduate-level coursework <sup>4, 5</sup>		14
PSS 9000	Dissertation Research /Dissertation in Plant and Soil Sciences	20
<b>Total Hours</b>		<b>40</b>

- 1 To be done in the early stages will present the research proposal and include a review of relevant literature.
- 2 Exit seminar will describe the dissertation research.
- 3 A graduate-level statistics course is required as part of the credit hours.
- 4 The minimum coursework required for a PhD in Plant and Soil Sciences is 20 hours beyond the master's degree requirements. Up to 9 hours of PSS 8701-8771. Current Topics in Weed Science may be included to meet these requirements.
- 5 Mississippi State University requires all students earn at least 53 hours graduate credit beyond the bachelor's level to include a minimum of 20 hours dissertation credits.

A qualifying examination may be administered at the beginning of the student's program. The student must successfully complete a program of study as approved by the major advisor and graduate committee. The student must pass a preliminary examination. a written and oral preliminary exam will be administered by the graduate committee after completion or within 6 hours of completing coursework. Original research and a dissertation are required of all candidates for the doctoral degree.

### **Weed Science Concentration Prerequisite and Core Courses**

As specified by the student's major professor and graduate committee.