Plant Science (PTSC)

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Degree Conferred:  
Ph.D. (PTSC)

Areas of Concentration: Horticulture, Plant Pathology.

Program Description: The doctoral program in Plant Science is an interdepartmental program involving the departments of Plant Pathology and Horticulture.

Primary Areas of Faculty Research: Biological control of plant diseases, breeding for disease resistance, fungal biology, diseases of crop plants, mycotoxicology, nematology, physiology of parasitism and resistance, plant disease control, phytophactiology, soil microbiology, virology, genetics and plant breeding of fruit or vegetable crops, physiology and culture of fruit, vegetable or ornamental plants, and physiology and management of turfgrasses.

Ph.D. in Plant Science with Horticulture Concentration

Prerequisites to Degree Program: In addition to the requirements for admission to the Graduate School, the student must submit to the Chair of Studies a statement of interest, three letters of recommendation, which evaluate the potential of the student to pursue advanced graduate studies, and scores from the Graduate Record Examinations. International students must submit TOEFL scores with their application. Approval by the Plant Science Steering Committee is also necessary for acceptance into the program of study leading to the Doctor of Philosophy degree.

Admissions Requirements for Entry: The requirements for admission to the plant science Ph.D. program include the following: completion of an M.S. degree in a relevant biological science with a cumulative grade-point average of 3.00 or better (4.00), submission of scores from the verbal, quantitative, and written Graduate Record Examinations (GRE), three letters of recommendation, and official transcripts from all institutions attended.

Requirements for Doctor of Philosophy Degree: Each candidate must present a doctoral dissertation based on original research. Course requirements are established by the student’s major adviser and the graduate advisory committee. The student must pass a candidacy examination at least two semesters before the expected conferral date of the degree. A final examination on the doctoral dissertation and cognate areas must be passed at least two weeks before the time of expected degree conferral. Students are expected to maintain a cumulative grade-point average of 2.85 or better (3.00 to graduate) as consistent with the policy of the Graduate School.

Students in the Plant Pathology concentration in the Plant Science program are required to complete three graduate credits in horticulture, six graduate credits in an area appropriate to their dissertation research, two credits in the Plant Science Colloquium, PLPA 5223, PLPA 5303, PLPA 5313, and PLPA 5404. In addition, students are expected to complete three of the four following courses: PLPA 5603, PLPA 6203, PLPA 6303 or PLPA 6503. All students in the plant pathology concentration are expected to attend seminars in both departments and are required to present at least four seminars (while enrolled for credit in PLPA 5001 Seminar) to include the following: a research proposal seminar, two topic seminars on subjects other than their research area and an exit seminar describing the results of their dissertation research.

All students will be expected to complete 18 hours of dissertation research.

Ph.D. in Plant Science with Plant Pathology Concentration

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Ph.D. in Plant Science with Plant Pathology Concentration

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Graduate Faculty

Bluhm, Burt H., Ph.D., M.S. (Purdue University), B.S. (University of Oklahoma), Associate Professor, 2008.
environmental factors interact to affect and control plant growth and development. A student completing this course should have a basic understanding of the foundations of plant science and biology. This course will focus on environmental and developmental processes of plants, including growth, development, and stress responses. It will cover conventional plant breeding methods and special techniques such as polyploidy, biotechnology, and tissue culture. The course will also explore the application of genetic principles to the improvement of crop plants, with an emphasis on sustainability and management of natural resources.

HORT 5013. Fruit Production Science and Technology. 3 Hours.
(Formerly HORT 4103.) The management technologies and cultural practices of fruit crops including (but not limited to) blueberries, blackberries, raspberries, strawberries, grapes, peaches, and apples will be presented. The underlying scientific principles of crop genetics, nutrition, and physiology will be presented as a basis for making management decisions in fruit crop productions. Graduate degree credit will not be given for both HORT 4103 and HORT 5113. Corequisite: Lab component. Prerequisite: HORT 2003.

HORT 5143. Professional Landscape Management. 3 Hours.
Principles and practices of landscape management and maintenance. Topics include low maintenance and seasonal color design, pruning and hazard tree management, water and fertilizer management, pesticide use, and other maintenance activities. Basic elements of marketing, specifications and contracts, estimating, personnel management, and equipment selection and acquisition relevant for landscape services will be introduced. Preparatory training in agribusiness or business is suggested. Prerequisite: HORT 2003 and HORT 3103.

HORT 5203. Temperature Stress Physiology. 3 Hours.
This course will teach students how to apply biological, chemical and physical principles to models of how plants are damaged by temperature extremes and how they change to increase resistance. Student will apply these principles to better understand plant responses to other environmental challenges, including both biotic and abiotic stresses.

HORT 530V. Special Problems. 1-6 Hour.
(Formerly HORT 400V.) Original investigations on assigned problems in horticulture. Graduate degree credit will not be given for both HORT 400V and HORT 530V. May be repeated for up to 6 hours of degree credit.

HORT 5333. Professional Landscape Installation and Construction. 3 Hours.
(Formerly HORT 4033.) Principles and practices involved in landscape installation and construction. Topics covered include sequencing construction activities, protecting existing trees, landscape soils, selecting plants, transplanting plant materials, wood construction, cement and masonry construction, and low-voltage lighting. Lecture 3 hours per week. Preparatory training in agribusiness or business is suggested. Graduate degree credit will not be given for both HORT 4033 and HORT 5333. Prerequisite: HORT 2003.

HORT 5403. Plant Propagation. 3 Hours.
(Formerly HORT 4403.) Principles of plant propagation using seeds, cuttings, grafting, budding, layering, and tissue culture. The physiological basis of propagation is described. Knowledge of plant growth and physiology is needed. Lecture 2 hours, laboratory 2 hours per week. Graduate degree credit will not be given for both HORT 4403 and HORT 5403. Corequisite: Lab component. Prerequisite: BIOL 1613 and BIOL 1611L.

HORT 5413. Horticulture Physiology. 3 Hours.
(Formerly HORT 4413.) This course provides students with a background into the physiological processes of plants with an emphasis on horticultural crops and how the processes relate to horticultural crop production practices. Among the topics covered are photosynthesis, respiration, water relations and morphogenesis. Graduate degree credit will not be given for both HORT 4413 and HORT 5413. Prerequisite: HORT 2003 and CHEM 1073.

HORT 5503. Sustainable Nursery Production. 3 Hours.
(Formerly HORT 4503.) This course addresses issues and practices involved in production of quality woody nursery crops (e.g. trees and shrubs produced in open field and containerized systems). Graduate degree credit will not be given for both HORT 4503 and HORT 5503.
HORT 5701L. Greenhouse Management and Controlled Environment Horticulture Laboratory. 1 Hour.
(Formerly HORT 4701L.) Laboratory involving hands-on experiments designed to demonstrate principles discussed in the lecture section. Includes field trips. Graduate degree credit will not be given for both HORT 4701L and HORT 5701L. Corequisite: HORT 5703.

HORT 5703. Greenhouse Management and Controlled Environment Horticulture. 3 Hours.
(Formerly HORT 4703.) Operation and management of greenhouses and other controlled environments used in horticultural production. Emphasis on system design and construction, control of light intensity and photoperiod, heating and cooling systems, substrates, mineral nutrition, water quality and irrigation systems. Graduate degree credit will not be given for both HORT 4703 and HORT 5703. Prerequisite: HORT 2003 and CHEM 1073.

HORT 5801L. Greenhouse Crops Production Laboratory. 1 Hour.
(Formerly HORT 4801L.) Laboratory involving hands-on experiments designed to demonstrate principles discussed in the lecture section. Includes field trips. Graduate degree credit will not be given for both HORT 4801L and HORT 5801L. Corequisite: HORT 5803.

HORT 5803. Greenhouse Crops Production. 3 Hours.
(Formerly HORT 4803.) Principles and practices of production and marketing of crops commonly grown in controlled environments including flowering containerized herbaceous species, geophytes, annual and perennial bedding plants, hydroponic vegetables and herbs. Graduate degree credit will not be given for both HORT 4803 and HORT 5803. Prerequisite: HORT 4703 or HORT 5703 (formerly HORT 4703).

HORT 5903. Golf and Sports Turf Management. 3 Hours.
(Formerly HORT 4903.) Turf management techniques for golf courses, and athletic fields including species selection, root-zone construction and modification, fertilization, mowing, irrigation and pest control. Graduate degree credit will not be given for both HORT 4903 and HORT 5903. Corequisite: Lab component. Prerequisite: CSES 2203 and CSES 2201L and (HORT 2303 or HORT 3403).

HORT 5913. Rootzone Management for Golf and Sports Turf. 3 Hours.
(Formerly HORT 4913.) An overview of the fundamental concepts of the physical and chemical properties of rootzones as related to construction and turfgrass management. Graduate degree credit will not be given for both HORT 4913 and HORT 5913. Prerequisite: HORT 2303.

HORT 5921. Golf Course Operations. 1 Hour.
(Formerly HORT 4921.) This course is designed to cover specific aspects of golf course operations that would not be included in traditional turfgrass management courses. Topics will include budgeting, personnel management, tournament setup and operation, dealing with golf club committees, communication, and other relevant topics related to managing a golf course maintenance operation. Graduate degree credit will not be given for both HORT 4921 and HORT 5921. Prerequisite: HORT 4903 or HORT 5903 (formerly HORT 4903).

HORT 5932. Turf Best Management Practices. 2 Hours.
(Formerly HORT 4932.) The course covers the impacts of turfgrass management practices on turf quality and the environment. In addition, the identification, biology, and control practices for the major insects, diseases, and weeds that infest turf will be covered. Emphasis will be placed on management strategies that include both chemical and non-chemical approaches to the prevention and control of common turfgrass pests. Graduate degree credit will not be given for both HORT 4932 and HORT 5932. Prerequisite: HORT 2303 and 6 hours selected from CSES 2003, PLPA 3004, and ENTO 3013.

HORT 600V. Master’s Thesis. 1-6 Hour.
Master’s Thesis. Prerequisite: Graduate standing. May be repeated for degree credit.

HORT 602V. Special Topics in Horticulture. 1-3 Hour.
Discussion and advanced studies on selected topics in genetics, plant breeding, physiology and culture of horticultural crops. Prerequisite: Graduate standing. May be repeated for degree credit.

HORT 6033. Molecular Plant Breeding. 3 Hours.
In-depth study of genetic improvement and techniques. Covers both current and classical literature. Topics to be discussed: haploidy, genetic control of pairing, somatic instability, tissue culture and protoplast fusion, and male sterility. Lecture discussion 3 hours per week. Prerequisite: BIOL 2323 and BIOL 2321L (or ANSC 3123 and CSES 4103 or equivalent).

Plant Pathology Courses

PLPA 5001. Seminar. 1 Hour.
Review of scientific literature and oral reports on current research in plant pathology. Prerequisite: Graduate standing. May be repeated for up to 4 hours of degree credit.

PLPA 502V. Special Problems Research. 1-6 Hour.
Original investigations of assigned problems in plant pathology. Prerequisite: Graduate standing.

PLPA 504V. Special Topics. 1-18 Hour.
Lecture topics of current interest not covered in other courses in plant pathology or other related areas. Prerequisite: Graduate standing. May be repeated for up to 18 hours of degree credit.

PLPA 5223. Plant Disease Control. 3 Hours.
(Formerly PLPA 4223.) Principles, methods and mechanics of plant disease control. Emphasis is given to the integration of control measures and epidemiology of plant diseases. Lecture 3 hours per week. Graduate degree credit will not be given for both PLPA 4223 and PLPA 5223.

PLPA 5303. Advanced Plant Pathology: Host-Pathogen Interactions. 3 Hours.
Presentation of important contemporary concepts relative to disease resistance and the physiology, biochemistry, and molecular biology of plant-pathogen interactions. Lecture 3 hours per week. Prerequisite: PLPA 3004 or equivalent and graduate standing.

PLPA 5313. Advanced Plant Pathology: Ecology and Epidemiology. 3 Hours.
Presentation of important contemporary concepts relative to the ecology and epidemiology of foliar and soil-borne plant pathogens. Lecture 3 hours per week. Prerequisite: PLPA 3004 and graduate standing.

PLPA 5324. Applied Plant Disease Management. 4 Hours.
(Formerly PLPA 4304.) A plant pathology course emphasizing practical understanding of the concepts and principles of agronomic and horticultural crop disease management, including disease diagnosis, monitoring, and using models to forecast disease events. Graduate degree credit will not be given for both PLPA 4304 and PLPA 5324.

PLPA 5333. Biotechnology in Agriculture. 3 Hours.
(Formerly PLPA 4333.) Discussion of the techniques, applications, and issues of biotechnology as it is being used in modern agriculture. Coverage includes the basics of molecular biology, production of transgenic plants and animals, and new applications in the agricultural, food, and medical marketplace. Lecture and discussion, 3 hours per week. Graduate degree credit will not be given for both PLPA 4333 and PLPA 5333.

PLPA 5404. Diseases of Economic Crops. 4 Hours.
Diagnosis and management of important diseases of cotton, fruits, rice, trees, soybeans, wheat, and vegetables will be covered in a lecture, laboratory, and field format. Lecture 2 hours, laboratory 4 hours per week. Four 1-day field trips will be involved. Corequisite: Lab component. Prerequisite: PLPA 3004.
PLPA 5603. Plant Pathogenic Fungi. 3 Hours.
Plant Pathogenic Fungi is structured as an integrated lecture/laboratory class designed for students that are interested in developing an understanding and appreciation for taxonomy, biology, and ecology of plant pathogenic fungi and related saprophytic fungi. Corequisite: Lab component. Prerequisite: PLPA 3004 or BIOL 4424 or graduate standing.

PLPA 600V. Master’s Thesis. 1-6 Hour.
Master’s Thesis. Prerequisite: Graduate standing. May be repeated for degree credit.

PLPA 6203. Plant Virology. 3 Hours.
Lecture emphasizing discussion of recent advances in plant virology. Laboratory concerned with techniques and equipment used in plant virus studies, including transmission of viruses, characterization utilizing ultracentrifugation, spectrophotometry, electrophoresis, electron microscopy, and serology. Lecture 2 hours, laboratory 3 hours per week. Corequisite: Lab component. Prerequisite: CHEM 5813 or CHEM 5843 or CHEM 6873 or consent of instructor.

PLPA 6303. Plant Nematology. 3 Hours.
Nematodes and their relationship to plant diseases, with consideration of identification, morphology, biology, distribution, association with disease complexes and control. Lecture 2 hours, laboratory 2 hours per week. Corequisite: Lab component. Prerequisite: Graduate standing.

PLPA 6503. Plant Bacteriology. 3 Hours.
Current concepts and techniques in plant bacteriology, including taxonomic, ecological and molecular aspects of plant pathogenic bacteria and their interactions with hosts. Lecture 2 hours, laboratory 2 hours per weeks. Corequisite: Lab component. Prerequisite: BIOL 2013 and BIOL 2011L. May be repeated for up to 3 hours of degree credit.

Plant Sciences Courses
PTSC 6101. Colloquium in Plant Sciences. 1 Hour.
Advanced discussion of topics in plant science on a participatory basis. Topics in plant pathology, horticulture and forestry will be treated. Prerequisite: Graduate standing. May be repeated for up to 2 hours of degree credit.

PTSC 6203. Laboratory Instrumentation in Plant Science. 3 Hours.
Principles, capabilities, and operation of laboratory instrumentation utilized in plant science research. Lecture 2 hours, laboratory 3 hours per week. Corequisite: Lab component.

PTSC 700V. Doctoral Dissertation. 1-18 Hour.
Doctoral Dissertation. Prerequisite: Graduate standing. May be repeated for degree credit.