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Plant, Soil, and Agricultural Systems

The School of Agricultural Sciences offers a Master of Science degree in Plant, Soil, and Agricultural Systems with a concentration in crop science, soil science, or horticultural science. Students can also take courses emphasizing environmental studies in agriculture through each of these three concentrations. The concentrations in crop, soil, and horticultural science can be pursued with either a thesis option or a research paper (non-thesis) option. We also offer graduate work in agricultural education and information and agricultural technologies.

Supporting courses in education, communication, engineering, plant biology, microbiology, chemistry, statistics, and other areas essential to research in the student's chosen field may be selected. Supporting courses are selected on an individual basis by the student and the advisory committee. Once the general field has been selected, the research and thesis may be completed in any one of the many divisions of that field. In field crops, the research may be directed toward crop production, management and precision farming, weeds and pest control, or plant breeding, genetics, and biotechnology; in horticulture, the research and thesis may be in landscape design, vegetables, tree fruits, small fruits, floricultural and ornamental plants, plant tissue culture, or turf management; in soils, the research may relate to soil fertility, soil physics, soil microbiology, soil chemistry, or soil and water conservation; in environmental studies, the research may be directed toward water pollution, reclamation of strip-mined soil, or agricultural chemical pollution problems. Often, two of these more restricted areas can be combined into one thesis/research problem.

Agricultural education coursework is designed for instructors in secondary schools, for students preparing for employment at junior colleges, and for those desiring to continue their education by obtaining a Ph.D. degree. Agricultural information coursework is designed to provide graduate training for extension agents, agricultural communication professionals, product-education specialists, and others who are interested in agricultural information processing and transfer to a variety of non-student clientele. Agricultural technologies coursework is designed to offer students interested in technology-based systems the opportunity to study one or more of the following areas: (a) power and machinery; (b) product handling, processing, and storage; (c) farm equipment evaluation; and (d) precision farming. Each of these areas offers application in agricultural environmental studies.

Students interested in plant, soil, and agricultural sciences at the doctoral level can apply to Ph.D. programs in Agricultural Sciences, Plant Biology, or Environmental Resources and Policy at SIUC.

Admission

Application for admission must include an online application available at gradschool.siu.edu, a statement of interest, college transcripts, and four letters of recommendation. Letters should be requested from four persons who can evaluate the student's academic ability. Final admission to the program and a particular concentration administered by the Plant, Soil, and Agricultural Systems program is made by the program. Minimal admission requirements to the program are: a) completion of the plant, soil, and agricultural systems or agricultural systems undergraduate requirements and b) a minimal grade point average of 2.7 (A = 4.0) on the entire last undergraduate GPA earned at the time of application. The students who do not meet the requirement of completing the required courses in the undergraduate program in plant, soil, and agricultural systems or agricultural systems may apply to enroll as nondeclared students to make up these deficiencies. Undergraduate coursework taken to correct these deficiencies will not apply to the minimum requirements for the M.S. in Plant, Soil, and Agricultural Systems degree. Students entering the M.S. in Plant, Soil, and Agricultural Systems program with a GPA below 2.70 are accepted on a conditional basis and must enroll in 12 credit hours of structured courses at the 500 level and make a GPA of 3.0 or be suspended from the program.

This program requires a nonrefundable \$65 application fee that must be submitted with the application for Admissions to Graduate Study in Plant, Soil, and Agricultural Systems. Applicants must pay this fee by credit card.

Master of Science (M.S.) in Plant, Soil, and Agricultural Systems

Program Requirements

The crop, soil, and horticultural science concentrations can be pursued as a 30-credit hour with thesis program or a 40-credit hour with a research paper (non-thesis) option. These are described below:

Thesis Option

If the student submits a thesis, the minimum coursework requirements for the M.S. in Plant, Soil, and Agricultural Systems degree may be fulfilled by satisfactory completion of 30 hours of graduate credit. At least 20 hours of that credit must be from structured courses. 50% of course credit hours are required at the 500 level, of which up to 10 credit hours may be from unstructured courses. A graduate seminar is required but is not a structured course. Overall, at least 15 credit hours must be from program courses.

Research Paper (non-thesis option)

If the student submits a research paper (non-thesis option), minimum coursework requirements for the M.S. in Plant, Soil, and Agricultural Systems degree may be fulfilled by satisfactory completion of 40 hours of graduate credit. At least 30 hours of that credit must be from structured courses. At the 500 level, 18 hours of course credit are required, of which up to 10 credit hours may be from unstructured courses. A graduate seminar is required but is not a structured course. Overall, at least 25 credit hours must be from program courses.

Students who wish to teach in agriculture education must complete a minimum of 15 credit hours in agriculture (including agricultural education), six credit hours of research methods or statistics, and six credit hours in education or community development. M.S. in Plant, Soil, and Agricultural Systems students usually take four to six credit hours of research or thesis and complete the additional hours by taking courses in education or agriculture.

Each student, whether in the thesis or non-thesis option, will be assigned a mutually agreed upon major professor to direct the program. The major professor will serve as chair of the student's advisory committee, which will consist of at least two members from within the program and may include one member from another program. Each M.S. in Plant, Soil, and Agricultural Systems degree candidate must pass a comprehensive oral examination covering graduate work, including the thesis or research paper.

PSAS 590 Readings and PSAS 592 Special Problems are available for students who have completed a course for another degree and need additional coursework to fulfill 30 credit hours.

Plant, Soil, and Agricultural Systems Courses

PSAS400 - Trends in Soil Science and Agronomy A discussion session format will be employed as a means of acquainting students with recent literature and allowing them to remain current with latest developments in their area of specialty. Special approval needed from the program. Credit Hours: 3

PSAS401 - Agricultural Plant Pathology A study of macro and micro-organisms and environmental factors that cause disease in plants of agricultural importance; of the mechanisms by which these factors induce disease in plants; and of the methods for managing diseases and reduce the damage they cause. Special approval needed from the program. Credit Hours: 2

PSAS402A - Problems in Agricultural Education Designed to improve the techniques related to award programs and application processes of agricultural education specialists through discussion, application, organization, and assignment to problems in the field of agricultural education. Emphasis will be placed on conceptual understanding of FFA and Agricultural Education award programs,

applications, Supervised Agricultural Experience Program, and National Chapter Award Program, affiliated professional partnerships, and external sources for developing the entire Agricultural Education program. Credit Hours: 3

PSAS402B - Problems in Agricultural Technologies Designed to improve the techniques of agricultural mechanization workers through discussion, assignment, and special workshops on problems related to their field. Emphasis will be placed on new innovative and currently developed techniques for the field. A limit of six hours will be counted toward graduation in Master's degree program. Special approval needed from the program. Credit Hours: 1-6

PSAS403A - Field Crop Diseases A survey of major diseases of important field crops in the United States. Disease identification, cycles, and management strategies will be addressed. Special approval needed from the program. Credit Hours: 2

PSAS403B - Horticultural Crop Diseases A survey of major diseases of important horticultural crops in the United States. Disease identification, cycles, and management strategies will be addressed. Special approval needed from the program. Credit Hours: 2

PSAS403C - Turfgrass Diseases A survey of major diseases of important turfgrasses in the United States. Disease identification, cycles, and management strategies will be addressed. Special approval needed from the program. Credit Hours: 1

PSAS403D - Tree Diseases A survey of major diseases of important tree species in the United States. Disease identification, cycles, and management strategies will be addressed. Special approval needed from the program. Credit Hours: 1

PSAS404 - Writing Fact Sheets in Agronomy and Soil Science A thorough literature review, effective reading, evaluating facts, structuring a fact sheet, effective writing for layman audience, learning about writing a journal article, learning how to translate a journal article into an extension shorter version, and principles of PowerPoint presentation and teaching. Credit Hours: 2

PSAS405 - Plant Genetic Improvement The course focuses on the partitioning and manipulation of variation; different conventional and molecular selection methods; and the impact of plant improvement on agriculture, society, and environment. Prerequisite: CSEM 305 with a grade of C or better. Credit Hours: 3

PSAS408 - World Crop Production Problems Ecological and physiological factors influencing production in various areas of the world. Natural limitations on world crop production. Non-agricultural factors influence world crop output. Prerequisite: CSEM 200. Credit Hours: 3

PSAS409 - Crop Physiology Principles of basic plant physiology. Topics include cell structure, photosynthesis, respiration, water and mineral relations, vascular transport and plant growth regulators. Prerequisites: PLB 200, CHEM 140B. Course fee: \$50. Credit Hours: 3

PSAS410 - Urban Horticulture This class will provide students an understanding of growing edible and ornamental plants in urban landscapes. This course will focus on the value of horticulture in urban environments, and provide an overview of urban horticulture practices, with content focusing on the importance to ecosystem services and urban sustainability. The cultivation and management of both ornamental and edible plants will be discussed in context to using best management practices to create resilient urban ecosystems. Students will also learn the social and economic value of sustainable horticulture systems and implications of creating better communities through urban horticulture. A 3- to 4-day field trip will be required to observe and learn about various current horticulture practices in an urban setting. Prerequisite: HORT 220. Field trip and lab fee: \$195. Credit Hours: 3

PSAS411 - Human Resource Development Programs in Agriculture Principles and procedures of human resource development (HRD) programs in agriculture with emphasis on program determination and methods. Special approval needed from the program. Credit Hours: 3

PSAS412 - Methods of Agriculture Mechanization Theory and use of educational materials and devices adaptable to the needs and interests of educators involved in agricultural mechanization laboratories. There is a \$15 laboratory fee for this course. Credit Hours: 3

PSAS414 - Adult Education Procedures, Methods and Techniques Determining adult education needs and interests of the community. Securing and organizing the information needed for adult education programs and planning teaching activities. Credit Hours: 3

PSAS415 - Beginning Teacher Seminar The application in the professional field setting, of principles and philosophies of the education system. Includes application of principles of curricula construction, programming student and community needs. Special approval needed from the program. Credit Hours: 3

PSAS416 - Trends in Horticulture This course focuses on new emerging topics and trends in horticulture. Advances in technologies, cultivation and pest management practices, new variety development, new innovations, and other subject areas relevant to horticultural crop improvement and the horticulture industry will be discussed. A major part of this class will be student engagement in class discussion and presentations. Credit Hours: 3

PSAS417 - Horticulture Study Abroad Faculty led study abroad travel course designed to provide an international experience focused on horticulture. Students will gain hand-on learning experiences to directly observe, evaluate, and develop a better understanding of horticulture in another country. Students will be expected to analyze, critique, discuss, report, and describe their experiences. Oral and written documentation of the international horticultural experience will be required. Restricted to consent of instructor. Credit hours: 3. Credit Hours: 3

PSAS419 - Plant Molecular Biology (Same as PLB 419) A survey of molecular phenomena unique to plant systems. Topics will include: genome organization and synteny between plant genomes, transcriptional and post-transcriptional control of gene expression, signal transduction, epigenetics, plant-pathogen interactions and responses to biotic-and abiotic-stresses. Special approval needed from the program. Credit Hours: 3

PSAS420 - Crop Pest Control Study of field pests of forest, orchard, field and garden crops; pest control principles and methods; control strategy; and consequences of pest control operations. Special approval needed from the program. Lab fee: \$35. Credit Hours: 4

PSAS421 - Turf Management Issues and Strategies Issues in environment, technology, management, society, politics, business, and sports that interact with turf management. Students will utilize periodicals and other references for preparing papers addressing these issues. Prerequisite: HORT 322 or permission of instructor. Lab fee: \$25. Credit Hours: 3

PSAS422 - Turfgrass Science and Professional Management Basic concepts of physiology, growth, and nutrition of turfgrasses and their culture. Application of turfgrass science to management of special areas, such as golf courses, athletic fields, sod farms, and to the turfgrass industry. Prerequisite: CSEM 240 and HORT 322 or equivalent or consent of instructor. Lab fee: \$50. Credit Hours: 3

PSAS423 - Greenhouse Management Principles of greenhouse management controlling environmental factors influencing plant growth; greenhouses and related structures; and greenhouse heating and cooling systems. Prerequisite: HORT 220 or consent of instructor. Laboratory fee: \$40. Credit Hours: 3

PSAS424 - Floriculture Production, timing and marketing of the major floricultural crops grown in the commercial greenhouse. Each student will have an assigned project. Special approval needed from the program. Laboratory fee: \$40. Credit Hours: 4

PSAS425 - Advanced Plant Physiology and Ecophysiology Advanced topics in plant physiology. Abiotic factors such as light, water, temperature, and nutrients, as well as emerging man-made pollutants such as nanoparticle contamination. Biotic factors such as plant-microbe signaling and the rhizosphere microbiome, plant-plant signaling, and competition for resources. These topics are covered at molecular and organismal levels, as well as the physiological ecology of these processes on a larger scale. This course offers a perspective of how these processes work in nature, as well as how they are or might be manipulated for crop or agriculture practice improvement. Undergraduate Prerequisite: PLB 320 or PSAS 409. Lab fee: \$35. Credit Hours: 5

PSAS426 - Genomic and Bioinformatics The course is designed to introduce students from a variety of backgrounds and departments to the scope and methodology of genomic and bioinformatic sciences. Real problems and solutions from genome data analysis are studied in this course to see how high

throughput genomics is driving bioinformatics, and changing the biological sciences in revolutionary ways. Special approval needed from the program. Credit Hours: 4

PSAS427 - Plant Biochemistry (Same as PLB 427) Exploration of fundamental biochemical pathways in plants with an emphasis upon carbon and nitrogen metabolism. Special approval needed from the program. Lab fee: \$35. Credit Hours: 5

PSAS428 - Advanced Landscape Design I Development of the design process, graphics and verbal communication of landscape projects. Emphasis on large-scale projects and residential design. Special approval needed from the program. Laboratory fee: \$50. Credit Hours: 3

PSAS429 - Advanced Landscape Design II Development of the design process, graphics and verbal communication of landscape projects. Emphasis on construction details, color rendering and portfolio development. Special approval needed from the program. Laboratory fee: \$25. Credit Hours: 3

PSAS430 - Plant Propagation Fundamental principles of asexual and sexual propagation of horticultural plants. Actual work with seeds, cuttings, grafts and other methods of propagation. Prerequisite: HORT 220. Field trip costs approximately \$5. Lab fee: \$80. Credit Hours: 4

PSAS431 - Landscape Construction An introduction course in the basic elements of landscape construction dealing with wood, concrete, masonry and stone. Emphasis will be placed on safety, construction interpretation of construction drawings, specifications for specific structures, materials selection, cost estimation, site preparation, and construction techniques. Prerequisite: HORT 220. Laboratory fee: \$170. Credit Hours: 4

PSAS432 - Garden Center and Nursery Management Principles and practices in both field and container production of ornamental landscape materials and the marketing of landscape plant materials at the nursery and retail garden center. Business management of both nurseries and garden centers will be included. Special approval needed from the program. Laboratory fee: \$50. Credit Hours: 4

PSAS433 - Introduction to Agricultural Biotechnology (Same as ANS 433, PLB 433) This course will cover the basic principles of plant and animal biotechnology using current examples; gene mapping in breeding, transgenic approaches to improve crop plants and transgenic approaches to improve animals will be considered. Technology transfer from laboratory to marketplace will be considered. An understanding of gene mapping, cloning, transfer, and expression will be derived. Credit Hours: 3-7

PSAS434 - Woody Plant Maintenance Care and management of ornamental shrubs and trees commonly used in the landscape. Topics to include trimming, pruning, fertilization, transplanting and diagnosis of woody plant problems. Special approval needed from the program. Credit Hours: 3

PSAS435 - Agricultural Molecular Biotechnology Seminar Molecular Biology is rapidly making important contributions to agricultural science through biotechnology. An appreciation of the techniques of molecular biology and their application to plant improvement is important to all in agriculture and biology. The relationships between plant molecular biology and the biotechnology industry will be discussed. Presentations on particular research problems will be made. Graded S/U only. Credit Hours: 1-4

PSAS436 - Successful Fruit Growing Learn how to grow and use temperate fruit trees for your pleasure and/or economic benefit. Learn to use the basic principles of plant-environment interaction to understand and solve common problems found in the culture of tree fruit crops in the landscape, garden or orchard. Master the secrets of fruit growing through emphasis on hands-on experiential laboratories. Focus on Midwest culture of tree fruit and nut crops. One-day field trip. Required textbooks mandatory. Special approval needed from the program. Laboratory fee: \$135. Credit Hours: 4

PSAS437 - Vegetable Production Culture, harvesting, and marketing of vegetables; with morphological and physiological factors as they influence the crops. Special approval needed from the program. Laboratory fee: \$25. Credit Hours: 4

PSAS438 - Plant and Animal Molecular Genetics Laboratory (Same as PLB 438, ZOOL 438) Arabidopsis and Drosophila model organisms, lab-based training in laboratory safety, reagent preparation, phenotype analysis, genetics, DNA and RNA analysis, PCR, cDNA construction, cloning and sequencing of genes. Includes plant and bacterial transformation, and a population level analysis of genetic variation using RAPD markers in grasses and Alu insertion in humans. Two 2-hr labs and one 1-

hr lecture per week. Prerequisite: BIOL 305 or equivalent or consent of instructor. Lab fee: \$30. Credit Hours: 3

PSAS439 - Introduction to Landscape Design Software Introduces students to a popular software program used to create landscape designs. Emphasis is on learning the software program rather than learning the design process. Prerequisite: HORT 328A and HORT 328B. Credit Hours: 3

PSAS440 - Applied Greenhouse Management (Same as HORT 440) Faculty led work experience at the SIUC Horticulture Greenhouses. The student can acquire practical professional training to complement their academic course work. Greenhouse management operations manual preparation will be a significant component of this course. Study will include: traditional greenhouse practices, green (living) walls & green roofs, nutrient film techniques, crop scheduling, biological pest control, pesticide application & safety. Prerequisite: HORT 423 or PSAS 423 with a grade of C or better or consent of instructor. HORT 423 or PSAS 423 may be taken concurrently. Lab fee: \$75. Credit Hours: 3

PSAS445 - Irrigation Principles and Practices This course will cover basic principles of irrigation sciences; water requirements of crops; soil water relationship; water application methods including flooding, sprinkler and drip (or trickle) systems; water conveyance, distribution and measurement; evaluation of irrigation efficiency; and irrigation scheduling. Considerations will also include crop production effects and economic aspects of irrigation. Special approval needed from the program. Credit Hours: 3

PSAS446 - Soil and Water Conservation Covers the principles of hydrologic processes and soil erosion. Consideration will be given to the occurrence of soil erosion as it affects humans, food production and the environment. The methods and technologies for protecting against and controlling of erosion will also be discussed. Special approval needed from the program. Credit Hours: 3

PSAS447 - Fertilizers and Soil Fertility Recent trends in fertilizer use and the implications of soil fertility build up to sufficiency and/or toxicity levels; the behavior of fertilizer material in soils and factors important in ultimate plant uptake of the nutrients; the plant-essential elements in soils and ways of assessing their needs and additions; tailoring fertilizer for different uses and management systems; implication of excessive fertilization in our environment. Concurrent enrollment in PSAS 448 required. Special approval needed from the program. Credit Hours: 3

PSAS448 - Soil Fertility Evaluation A laboratory course designed to acquaint one with practical soil testing and plant analysis methods useful in evaluating soil fertility and plant needs. One hour lecture, two hours laboratory. Concurrent enrollment in PSAS 447 required. Special approval needed from the program. Laboratory fee: \$15. Credit Hours: 2

PSAS450 - Controlled Environment Agriculture Students learn basics of intensive, high-value crop production such as cannabis in artificial/controlled growing environments (e.g., greenhouse, high tunnel, or other indoor environment). Course covers greenhouse structures, their basic operation & fundamental environmental management, plant growth & maintenance, diseases & pests, and crop scheduling & production of high value, intensively grown plants. Course fee of \$142 is required for supplies associated with hands-on laboratory exercises and travel expenses. Participation in six all-day Saturday field trip visits to industry production facilities is required. Credit Hours: 3

PSAS454 - Soil Microbiology (Same as MICR 454) A study of microbial numbers, characteristics and biochemical activities of soil microorganisms with emphasis on the transformation of organic compounds, nitrogen phosphorus, sulfur, iron and other plant essential nutrients. Prerequisite: CSEM 240 or MICR 301. Lab fee: \$15. Credit Hours: 4

PSAS455 - Biology of Plant-Microbe Interactions The molecular basis of post-pathogen interactions and disease development in plants is examined with a critical review of original and current literature focusing on the mechanisms of pathogenesis, virulence, disease development and resistance, and response mechanisms in plants. Special approval needed from the program. Credit Hours: 3

PSAS463 - Agricultural Electrical Systems Electrical knowledge and basics skills are developed and implemented with practical exercises and projects. Electrical circuits will be planned and constructed, with emphasis on convenience, codes and safety. Laboratory fee: \$40. Credit Hours: 3

PSAS466 - Vine and Small Fruit Culture Study of the developmental patterns and environmental responses of important vine and small fruit crops; strawberries, brambles, blueberries, grapes and exotic crops. Learn to adapt these crops to profitable culture for the amateur or professional with a Midwest focus. Practical hands-on experience in the classroom and the field. Two one-day field trips required. Required textbooks mandatory. Special approval needed from the program. Lab fee: \$150. Credit Hours: 4

PSAS467 - Wines of the World Varieties, terroir, culture and connoisseurship. Study the impact of varieties, terroir and culture on important wines from regions around the world. Learn wine geography and its effect on wine character with practical hands-on experience and expand connoisseurship skills. A team approach to wine appellation presentations and a term project involved in the wine trade will teach industry production, marketing and networking skills. Meet once a week for 4 hours; 2 hr lecture, 2 hr lab. Meeting time arranged for convenience of majority interested in taking the class, with instructor approval. Prerequisite is successful completion of HORT 333, From the Vine to its Wine, with a grade of C or better. Must be 21 years of age prior to the beginning of class to enroll. Proof of age and signature on informed consent form required at first class meeting. Purchase and use of required textbook mandatory. Laboratory fee of \$192. Credit Hours: 3

PSAS468 - Weeds - Their Control Losses due to weeds, weed identification and distribution, methods of weed dissemination and reproduction, mechanical, biological and chemical control of weeds. State and Federal legislation pertaining to weed control herbicides. Herbicide commercialization. Special approval needed from the program. Field Trips costing approximately \$5. Credit Hours: 3

PSAS469 - Organic Gardening This class will focus on the philosophical background of organic farming, as well as the biological, environmental and social factors involved in organic food production. The student will learn the basic principles of successful organic gardening without the need to use man-made synthetic chemical sprays and fertilizers. Topics covered will include soils and organic fertilizers, composting and mulches, companion planting and crop rotation, organic cultivation of fruit, vegetable and ornamental flowers/shrubs, organic pest and disease control, permaculture, and organic garden planning design and maintenance. Credit Hours: 3

PSAS470 - Post Harvest Handling of Horticultural Commodities Fundamental principles of post harvest physiology, handling, and evaluation of horticultural commodities will be covered. Specific details will be given on vegetable, fruit, ornamental and floricultural commodities. Prerequisite: HORT 220 and PLB 320. Field trip costing approximately \$30. Credit Hours: 2

PSAS472 - Precision Agriculture A study of the core components of Precision Agriculture including the Global Positioning System (GPS), multispectral and hyperspectral remote sensing technology, Geographic Information Systems (GIS), soil sampling, yield monitoring, and analysis & decision making systems applied for site specific management of production agriculture resources. Laboratory fee: \$5. Credit Hours: 3

PSAS473 - Agricultural Automation This course introduces students to topics such as power distribution, programmable controllers, sensors and components, ladder control circuits and diagrams, and motor controls. The lab will address automation issues for different industrial processes such as pasteurization. Lab fee: \$20. Credit Hours: 3

PSAS475 - Golf Course Green Installation and Maintenance This course will mainly focus on the requirements, installation, care and maintenance of the rooting media of golf course putting green and turfgrass on disturbed soils. Prerequisite: CSEM 240. Credit Hours: 4

PSAS476 - Agricultural Safety and Health Analysis of safety and health issues important to managers and supervisors in agricultural operations. Topics include agricultural accident data, causes and effects of accidents, hazard identification, strategies for accident prevention, response to accidents and health risks and safeguards. Development and documentation of accident and illness prevention activities in the workplace. Special approval needed from the program. Credit Hours: 3

PSAS480 - Designing Outdoor Spaces This course will instruct and challenge the student to design outdoor spaces that cultivate a sense of place as related to the site and the user. The course will review

fundamental landscape planning process including principles and elements of design with an emphasis on "green" decision making. Special approval needed from the program. Credit Hours: 3

PSAS481 - Cannabis Production Students will learn the entire process of cannabis production from seed, clone, or transplant to harvest. Also, students will gain an understanding of the cannabinoids and non-cannabinoids (terpenes and flavonoids) synthesis/degradation process. This course will also teach essential management techniques that will allow students to develop a solid understanding of the best practices for cannabis commercial production. Required field lab transportation and equipment/supply fee: \$90. Credit Hours: 3

PSAS483 - Agricultural Processing Systems This course provides students with an understanding of the design principles, equipment, procedures and processes utilized in handling, processing and storing agricultural products. Prerequisite: AGSE 371. Credit Hours: 3

PSAS484 - Cannabis Supply Chain This course provides an in-depth exploration of the cannabis supply chain, focusing on the unique challenges and opportunities within the industry. Students will learn about the processing (harvest, drying, and curing), distribution, and retail aspects of the cannabis supply chain, as well as the legal and regulatory frameworks that impact its operations. The course will also teach essential management techniques that will allow students to develop a solid understanding of the best practices for cannabis commercial production and extraction. Prerequisite: PSAS 481 or consent of instructor. Lab fee: \$90. Credit Hours: 3

PSAS486 - Invasive Plant Ecology and Management (Same as FOR 486) Ecology and evolution of invasive plant species, with a focus on land management, including characteristics and biology, introduction and spread, population dynamics, community impacts and ecological interactions, and invasive plant evolution and adaptation, as well as management techniques and considerations, including biological, chemical, and mechanical control. Prerequisite: BIOL 307 or consent of instructor. Restricted to junior standing. Credit Hours: 3

PSAS487 - Soil Health Soil Health is a hands-on training course which provides an understanding of soil physical, chemical, and biological properties of soil health and interpret the results. This course also discusses role of healthy soils in crop production, environment and farm economics and their tradeoffs. Prerequisite: Students must pass CSEM 240 prior to taking this course. Credit Hours: 3

PSAS488 - Food Engineering Technology This course introduces the basic principles of facilities planning for larger operations and complexes of the food processing industry, and to gain management/technology insight in food engineering technology. Special approval needed from the instructor. Credit Hours: 3

PSAS495 - Food and Pharmaceutical Packaging Applied packaging and food engineering principles used in packaging, storing, preserving, and transporting food and drug products. Topics include packaging functions, graphic design, printing, sterilization, and food safety. Utilization of paper, glass, plastics, laminates, and metals. Applications of machinery and equipment. Prerequisite: AGSE 371. Credit Hours: 3

PSAS497 - Agricultural Operations Management A capstone course in product support, interpretation of financial reports, preparing and monitoring budgets, time and process management, critical thinking, advanced problem solving. Prerequisites: AGSE 318, 371, 375. Credit Hours: 3

PSAS499 - Agriculture Information for K-12th Grade Teachers A general inquiry into the agriculture literacy appropriate for K-12th grade students. A framework for evaluating content appropriate for K-12th grade students in the pursuit of agriculture literacy will be developed. Special approval needed from the instructor. Credit Hours: 3

PSAS500 - Agricultural Systems Research Methodology Research methodology for agricultural education and agricultural systems technology including defining research problems, preparing project proposals and sources of data. Special approval needed from the program. Credit Hours: 3

PSAS501 - Recent Research in Agricultural Education A study of recent research and development in agricultural education. The course includes an analysis of regional and national scholarly publications, procedures and products. Special approval needed from the program. Credit Hours: 3

PSAS507 - Science Writing and Scientific Communication Course will teach "survival skills" in scientific reading, writing, communicating, and publishing for new graduate students. Topics will include database search, analysis of journal articles, abstracts, figures, and tables, Powerpoint presentations, proposals, posters, thesis writing, and preparation of journal submissions. Enrollment is open to graduate students in agriculture and the sciences and is by permission of the instructor. Credit Hours: 2

PSAS518 - Principles of Herbicide Action Chemistry and mode of action of herbicides. Nature of herbicidal action. Illustrates the various types of chemical weed control procedures in current use. The physiology of herbicidal action examined using the different mechanisms established for various chemical groups of herbicides. Prerequisite: PSAS 468, PLB 320. Credit Hours: 3

PSAS520 - Growth and Development of Plants (Same as PLB 520) Physiological control of developmental processes. Emphasis on exogenous growth-regulating compounds and their behavior in plants. Special approval needed from the program. Credit Hours: 3

PSAS524 - Gene Regulatory Networks (Same as PLB 524) An examination of the integration of genes into networks including developmental, abiotic stress response, metabolic and photoreceptor gene regulatory networks. Includes motif discovery, cis-regulatory elements, discussion of transcription factor families, RNA interference, network theory, feedback loops, cytoplasmic inheritance, maternal effect, post-transcriptional and post-translational regulation. Includes 2 lectures and a 2 hr computational bioinformatics lab per week. Prerequisite: PLB 471 or permission of instructor. Credit Hours: 3

PSAS525 - Program Development in Agricultural Education Analysis and appraisal of current trends in agricultural education program development. Attention is given to implications for educators at the high school, post-secondary and in extension education positions. Offered each year, alternating spring and summer semesters. Credit Hours: 3

PSAS526 - Cytogenetics Special approval needed from the program. Credit Hours: 4

PSAS527 - Professional Development in Agricultural Education Recent developments and trends in agricultural education are presented for review and discussion. The role of the agricultural instructor in determining educational priorities is emphasized. Offered each year, alternating fall and summer semesters. Credit Hours: 3

PSAS531 - International Agricultural Systems Introduction to world agriculture, farming systems, world crops, agricultural trade, and food production and processing. Influence of population and climate. Ethical issues surrounding rain forests, global agriculture, finance, world trade, crops and livestock, and the environment. Appropriate technologies and their social and economic impact on developing countries. Special approval needed from the program. Credit Hours: 3

PSAS543 - Soil Geomorphology A study of the interactions between geomorphic and pedogenic processes. How geomorphology influences soil formation and how soils influence geomorphology as well as how soils can be used to interpret geomorphic history. Historical development of soil geomorphology as a field. Prerequisite: CSEM 489, PSAS 589 or GEOL 489/589 with a grade of C or better. Credit Hours: 3

PSAS544 - Soils and Human Health Exploration of the ways that soils, and to a lesser extent air and water, influence human health both positively and negatively. Soil properties and processes that control this interaction. Techniques used to explore the soil-human health relationship and needs for future advancement. Prerequisite: CSEM 240 or GEOG 303I or FOR 352 with a grade of C or better. Credit Hours: 3

PSAS545 - History and Philosophy of Soil Science An in-depth examination of what soil science is, what makes it unique as a scientific discipline, and where it fits within the scientific world. History of soil science including major scientists who influenced soil science and major points in the discipline's development. The role that soils play in addressing the world's major challenges and ways for scientists to communicate with non-scientists. Restricted to graduate student status in an agricultural or science degree program or permission of the instructor. Credit Hours: 3

PSAS547 - Soil and Environmental Quality A study of the interaction between plants and soil-water, and their effects on soil and water pollution. Reactions and processes governing the solubility and mobility

of metals, organic compounds and nutrients in soil, sustainable management practices, and soil/water resource remediation improving environmental quality will be discussed Prerequisite: CSEM 240 or consent of instructor. Credit Hours: 2

PSAS548 - Fundamentals in Urban Soils Study of the function, structure, and management of soils and engineered soils in the urban environment. Emphasis is on urban horticulture, turf, urban forests, landscape plants and urban settings. Course will focus on understanding and implementation of basic soil concepts, with an emphasis on sustainability and management of urban soils to minimize maintenance and maximize utility. Credit Hours: 2

PSAS550 - Plant Disease Management and Epidemiology This course will provide understanding of approaches to managing plant diseases, strategies for developing and implementing integrated disease management programs, and methods for monitoring and analyzing epidemics. Credit Hours: 3

PSAS551 - Plant Nematology This course will provide an understanding of plant parasitic nematode anatomy and morphology, identification, life cycles, and management strategies. Emphasis will be placed on practical or applied aspects of information presented. Special approval needed from the program. Credit Hours: 4

PSAS555 - Nanotechnology for Agricultural and Food Industries This course will cover fundamentals and application of nanotechnology applied to the agri-food sector. Novel techniques such as encapsulation and delivery of agricultural and food molecules, diagnostics and sensing for plant and animal health will be covered. Application in production, processing and packaging of food and feed, to improving safety, quality and security will also be covered by student participation and guest lecturers. Prerequisite: basic undergraduate physics and chemistry or consent of instructor. Credit Hours: 4

PSAS560A - Field Plot Technique Design of field plot and greenhouse experiments including appropriate statistical analyses for each of the designs. Data interpretation. Prerequisite: ZOOL 557 or PLB 360. Credit Hours: 3

PSAS560B - Field Plot Technique Each of the designs discussed in (A) will be illustrated with a type problem and solved by computer processes using primarily MINITAB and SAS software programs. Prerequisite: PSAS 560A or concurrent enrollment or consent of instructor. Credit Hours: 2

PSAS561 - Control Programming Course in the logic and procedures of computer programming for automating, controlling, and monitoring of agricultural processes. Students will analyze problems, design solutions, develop software and test solutions. Students will be expected to develop a control, monitoring, and automated data collection project related to their research interests. Special approval needed from the program. Laboratory fee: \$10. Credit Hours: 3

PSAS562 - Sustainable Landscape Practices Landscape practices designed and maintained with respect to natural systems offer ecological benefits, functional solutions and aesthetic value to outdoor spaces. This course will introduce best practices and construction methods of sustainable landscape features as green roofs, green walls, and permeable pavers with an emphasis on construction details, material selection and case studies. Students will expand critical thinking skills as applied to landscape planning. Credit Hours: 3

PSAS563 - Plants for the Ecological Landscape Introduction to alternative plant selections for the urban landscape associated with the use of native plants and creating edible landscapes. Emphasis is placed on site location, whether on the ground, in containers or on a green roof, to determine best practices and appropriate choices in urban environments. Credit Hours: 3

PSAS564 - Growing Fruit in the Urban Environment Learn why and how to grow perennial fruit crops in limited and special spaces in the urban environment. The potential uses of temperate perennial fruit plants in the urban landscape are examined. Theoretical obstacles to successful fruit growing are explored. The unique advantages and disadvantages of growing long-lived perennial plants in urban landscape are examined. Methods of developing practical crop scheduling for intended outcomes (low vs. high inputs) are talked about. Efficient utilization of urban meso-climate niches are covered. Credit Hours: 3

PSAS565 - Bee Management in Urban Spaces Study of the role of bees in the urban landscape. Behavior, biology and pests of bees will be examined. Practical management of bees will be explained in connection with maintaining healthy bee ecosystems. The demonstrator species will be the honey bee *Apis mellifera*. Credit Hours: 1

PSAS571 - Genomics of Eukaryotes: Bioinformatics (Same as PLB 571) Genomics, Proteomics and Bioinformatics are rapidly making important contributions to the Life Science through biotechnology. An appreciation of the genomic tools is important to all in agriculture and biology. The relationships between molecular biology bioinformatics and the biotechnology industry will be explored. Short independent practical projects in genomics, proteomics or bioinformatics will be pursued. Credit Hours: 4

PSAS572 - Current Research in Agricultural Systems A study and analysis of current problems, research findings and innovations in agricultural systems. Technical reports and journal articles will be discussed and analyzed. Students will select articles related to their own research interests and begin writing a thesis or research proposal. Special approval needed from the program. Credit Hours: 3

PSAS574 - Soil Physical Properties A study of the physical properties of soils with special emphasis on soil and water relationships, chemical transport, and methods of physical analysis. Prerequisite: CSEM 240 or GEOL 220 or FOR 352 with a grade of C or better. Credit Hours: 3

PSAS575 - Introduction to Agricultural Systems Operational functions and processes that are integrated to accomplish a designated, well-defined purpose in production and processing. Topics include planning and evaluating reliability, manpower, scheduling, economy, packaging, human and animal factors. Prerequisites: AGSE 318, 371, or instructor approval. Lab fee: \$10. Credit Hours: 3

PSAS580A - Colloquium in Bioinformatics for Computer Engineers Bioinformatics makes important contributions to the Life Sciences through biotechnology. The use of Bioinformatics is important to all in agriculture, biology, computer engineering and computer science involved in the analysis of genes; proteins; and genomes by computers and networks. Short independent practical projects in bioinformatics or computer networking may be pursued. Graduate Student status required. Sections A, B, and C. May be taken online. Credit Hours: 3

PSAS580B - Colloquium in Bioinformatics for Computer Engineers Bioinformatics makes important contributions to the Life Sciences through biotechnology. The use of Bioinformatics is important to all in agriculture, biology, computer engineering and computer science involved in the analysis of genes; proteins; and genomes by computers and networks. Short independent practical projects in bioinformatics or computer networking may be pursued. Graduate Student status required. Sections A, B, and C. May be taken online. Credit Hours: 3

PSAS580C - Colloquium in Bioinformatics for Computer Engineers Bioinformatics makes important contributions to the Life Sciences through biotechnology. The use of Bioinformatics is important to all in agriculture, biology, computer engineering and computer science involved in the analysis of genes; proteins; and genomes by computers and networks. Short independent practical projects in bioinformatics or computer networking may be pursued. Graduate Student status required. Sections A, B, and C. May be taken online. Credit Hours: 3

PSAS581 - Seminar Individual presentations on subjects and problems relating to soils, field and horticultural crops, education, information, and technologies and other phases of plant, soil and general agriculture. Graded S/U only. Credit Hours: 1-4

PSAS581A - Seminar Individual presentations on subjects and problems relating to soils, field and horticultural crops, education, information, and technologies and other phases of plant, soil and general agriculture. Graded S/U only. Credit Hours: 1-4

PSAS581B - Seminar Individual presentations on subjects and problems relating to soils, field and horticultural crops, education, information, and technologies and other phases of plant, soil and general agriculture. Graded S/U only. Credit Hours: 1-4

PSAS582A - Colloquium in Plant and Soil Science-Genetics and Plant Breeding Recent developments and trends in specialized areas of plant and soil science will be discussed in genetics and plant breeding. Credit Hours: 2

PSAS582B - Colloquium in Plant and Soil Science-Research Methods Recent developments and trends in specialized areas of plant and soil science will be discussed in research methods. Credit Hours: 2

PSAS582C - Colloquium in Plant and Soil Science-Physiology and Ecology Recent developments and trends in specialized areas of plant and soil science will be discussed in physiology and ecology. Credit Hours: 2

PSAS583 - Urban Ecological Landscape Practicum Critical analysis and innovative design/solutions of urban landscape practices and urban agriculture from an ecological perspective. This practicum culminates the objective of integrating natural systems in the design and practice of sustainable landscape systems including urban food production. Learning opportunities will be presented through site visits and case studies. Students will demonstrate practical application of theories and systems through discussions and presentations. Credit Hours: 3

PSAS588 - International Graduate Studies Residential graduate study programs abroad. Approval of program required both for the nature of program and number of hours of credit. Special approval needed from the program. Graded S/U only. Credit Hours: 1-8

PSAS589 - Soil Genesis, Morphology, and Classification Development, characteristics, and identification of soils, study of profiles, and interpretation and utilization of soil survey information in land use planning. Prerequisite: CSEM 240 or GEOL 220 or FOR 352 with a grade of C or better. Credit Hours: 3

PSAS590 - Readings Contemporary books and periodicals on selected subjects within the fields of plant, soil and agricultural systems. Special approval needed from the program. Credit Hours: 1-4

PSAS592 - Special Problems Directed study of specialized areas of crop production, horticulture, soils or agricultural systems depending on the program of the student. Discussion, seminars, readings and instruction in research techniques. Special approval needed from the program. Credit Hours: 1-3

PSAS593 - Individual Research Directed research on approved projects investigating selected fields of plant, soil and agricultural systems. Special approval needed from the program. Credit Hours: 1-6

PSAS595 - Agricultural Occupation Internship Prepares coordinators to fulfill their responsibilities in selected areas in agricultural related occupations through an internship in the area of specialization and through orientation to related technical information. Special approval needed from the program. Credit Hours: 1-4

PSAS599 - Thesis At least three hours of thesis credit is required for the Master's degree under the thesis option. Special approval needed from the program. Credit Hours: 1-6

PSAS601 - Continuing Enrollment For those graduate students who have not finished their degree programs and who are in the process of working on their dissertation, thesis or research paper. The student must have completed a minimum of 24 hours of dissertation research, or the minimum thesis, or research hours before being eligible to register for this course. Concurrent enrollment in any other course is not permitted. Graded S/U or DEF only. Credit Hours: 1

Plant, Soil, and Agricultural Systems Faculty

Bond, Jason P., Professor, Ph.D., Louisiana State University, 1999; 2000. Nematology and plant pathology.

Choudhary, Ruplal, Professor, Ph.D., Oklahoma State University, 2004; 2008. Biosystems Engineering.

Fakhoury, Ahmad M., Professor, Ph.D., Purdue University, 2001; 2003. Molecular plant pathology and fungal genetics.

Gage, Karla, Assistant Professor, Ph.D., Southern Illinois University, 2006; 2013.

Henry, Paul H., Associate Professor, Ph.D., North Carolina State University, 1991; 1992. Ornamental horticulture.

Jones, Karen L., Professor and Chair, Ph.D., Texas A&M University, 1996; 1999.

Kantartzi, Stella, Professor, Ph.D., Aristotle University of Thessaloniki, 2006; 2008. Plant breeding and genetics.

Meksem, Khalid, Professor, Ph.D., University of Cologne, Germany, 1995; 2000. Genomics, plant genetics, plant molecular biology and biotechnology.

Midden, Karen L., Professor, M.L.A., University of Georgia, 1983; 1988. Landscape design and sustainable landscape practices.

Pense, Seburn L., Professor, Ph.D., Oklahoma State University, 2002; 2003. Agricultural education.

Sadeghpour, Amir, Assistant Professor, Ph.D., University of Massachusetts Amherst, 2008, 2014.

Still, Steven, Assistant Professor, Ph.D., University of Illinois, 2010; 2015. Agricultural Systems and Education.

Taylor, Bradley H., Associate Professor, Ph.D., Ohio State University, 1982; 1982. Fruit production.

Walters, S. Alan, Professor, Ph.D., North Carolina State University, 1997, 1998. Vegetable production.

Emeriti Faculty

Chong, She-Kong, Professor, Emeritus, Ph.D., University of Hawaii, 1979; 1979.

Diesburg, Kenneth L., Assistant Professor, Emeritus, Ph.D., Iowa State University, 1987; 1989.

Doerr, William A., Associate Professor, Emeritus, Ph.D., Southern Illinois University Carbondale, 1973; 1965.

Klubek, Brian P., Professor, Emeritus, Ph.D., Utah State University, 1977; 1978.

Legacy, James, Professor, Emeritus, Ph.D., Cornell University, 1976; 1977.

McGuire, James M., Professor, Emeritus, Ph.D., North Carolina State University, 1961; 1993.

Olsen, Farrel J., Professor, Emeritus, Ph.D., Rutgers University, 1961; 1971.

Preece, John E., Professor, Emeritus, Ph.D., University of Minnesota, 1980; 1980.

Schmidt, Michael, Associate Professor, Emeritus, Ph.D., Southern Illinois University Carbondale, 1994; 1979.

Shoup, W. David, Professor, Emeritus, Ph.D., Purdue University, 1980; 1999.

Stitt, Thomas R., Professor, Emeritus, Ph.D., Ohio State University, 1967; 1967.

Stucky, Donald J., Professor, Emeritus, Ph.D., Purdue University, 1963; 1970.

Tweedy, James A., Professor, Emeritus, Ph.D., Michigan State University, 1966; 1966.

Varsa, Edward C., Professor, Emeritus, Ph.D., Michigan State University, 1970; 1970.

Wolff, Robert L., Professor, Emeritus, Ph.D., Louisiana State University, 1971; 1972.

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