SIU CARBONDALE Southern Illinois University

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Plant Biology

The School of Biological Sciences offers graduate programs leading to a Master of Science in Plant Biology, Master of Science in Biological Sciences, and the Doctor of Philosophy in Plant Biology. The first master's degree was granted in 1948, and the first Ph.D. degree in 1965.

An advisory committee of faculty members from plant biology as well as other programs helps design individualized programs to meet the specific educational goals and career aspirations of each student. The broadly diversified faculty of the program provide research emphases in ecology and environmental science, systematics and biodiversity, and molecular biology and physiology. Graduate degrees in plant biology will be awarded to students in recognition of their ability to do independent research as evidenced by the acceptance of a thesis or dissertation and the demonstration of competent scholastic ability.

The Plant Biology graduate program is housed in various major teaching and research facilities on the campus of Southern Illinois University Carbondale (SIUC) including Life Science II and Life Science III. Faculty members provide research and laboratory facilities for students. The program supplies centralized facilities including laboratories for basic specialized computing, a core facility for nutrient analyses, and molecular biology, as well as herbaria, growth chambers, field sites and greenhouses. Excellent cooperative research arrangements are available for activities including electron microscopy, chemical analyses and research photography. Southern Illinois University Carbondale is strategically located in the transition zones of several North American biomes and is within a one hour drive to spectacular natural areas including Pine Hills Research Natural Area, Cypress Creek Bioreserve, Garden of the Gods, and Little Grand Canyon.

Admission

Applications should be completed online, addressed to the Director of Graduate Studies of the program, and must include a completed application form, three letters of recommendation, official transcripts of all institutions of higher learning attended, and grade point average. Students must meet both Graduate School and program admission requirements. Financial assistance is available on a competitive basis. To be considered for financial support a financial assistance form must also be submitted. Acceptance to the program is contingent on availability of faculty to advise the student, research space and facilities, and satisfactory evidence of funding to complete the degree program (e.g., teaching assistantship, research assistantship, or fellowship). International students whose native language is not English must have a minimum of 80 on the internet-based TOEFL test or equivalent per Graduate School requirements.

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

Applicants must have a Bachelor's Degree (or equivalent) in a life science. A student who does not meet these requirements may petition for admission to the program, or register as a regular nondeclared graduate student. Either prior to admission or during their programs, students must complete a course in each of the following categories: 1) plant systematics or plant diversity; 2) plant physiology, cell biology or molecular biology; and 3) plant ecology or environmental science. A course in plant morphology or plant anatomy is strongly recommended. A student who does not meet these requirements may petition for admission to the program. All deficiencies, as determined by the student's advisory committee, must be removed during the first year by taking appropriate courses (graduate or undergraduate) with grades of *B* or better in each course. Criteria for admission include GPA (3.25/4.00 or higher) on the entire last undergraduate GPA earned at the time of application, letters of recommendation, transcripts and availability of faculty, space and facilities. To be admitted into the program, at least one faculty member must be willing to serve as major advisor or co-advisor if the student desires to work in the Forestry or Plant, Soil and Agricultural Systems programs. Students desiring financial assistance for Fall semester

admission should consult the Plant Biology website for the deadline. Application forms are available from the Director of Graduate Studies of Plant Biology or the Plant Biology website.

Accelerated Entry into the Doctoral Program

A student who enters a master's program in plant biology may, if deemed capable, be permitted to apply to be accelerated into a program leading directly to a Ph.D. in Plant Biology degree, subject to the following conditions and specifications. In order to qualify for consideration, each endorsed student must: (a) have been in the SIUC plant biology graduate program no less than one or more than two academic terms when proposed; (b) have a graduate grade point average of 3.75 or better; (c) have no grade in any course (conditional or otherwise) in his/her graduate record of less than *B*; and (d) be deemed by the Evaluation and Awards Committee as having superior capabilities.

Once advanced into the doctoral program by the Graduate School, the student shall be eligible to qualify for graduate assistance totaling no more than 60 months. Once in the doctoral program, the student is subject to all of the academic, retention, and exit requirements for a regular doctoral program.

If for any reason, a student who has been admitted into the accelerated entry program fails to complete the doctoral program successfully, that student shall not automatically be re-admitted into the master's program.

Advisement

Following admission to the program and before registration for course work, the student must consult a staff member representing the field of major interest or, if this is unknown, the Director of Graduate Studies of the program, for assistance in planning the first registration. At registration, deficiencies and specific program requirements must be considered first.

Within the first semester of the program, the student must select a faculty member who is willing to serve as the major adviser. The major adviser in consultation with the student will then select appropriate faculty members to comprise the advisory committee. For the M.S. in Plant Biology degree program, a minimum of three people shall make up the advisory committee, two of whom must be voting members of the Plant Biology program. The advisory committee for the Ph.D. in Plant Biology degree program will be composed of at least five people, three of whom must be voting members of the plant biology faculty and one who must be from outside the program. The Director of Graduate Studies is an ex-officio member of each graduate advisory committee. The duties of the advisory committee are to:

1. plan, approve and file with the Director of Graduate Studies the program of study, and advise the student on his/her research program especially during the first semester of the student's program;
2. read, evaluate and file with the Director of Graduate Studies the student's research prospectus by the end of the second semester of the student's program;
3. monitor the student's progress and make any necessary changes in the program, while providing advice and direction on the student's research problem;
4. annually assess the student's progress and file recommendations as to retention or dismissal from the program with the Evaluation and Awards Committee;
5. participate in and grade the written and oral preliminary examinations for the Ph.D. in Plant Biology degree;
6. read and evaluate the student's thesis or dissertation and make suggestions for improvement; and
7. administer the defense and final examination of the thesis or dissertation.

In either degree program, following establishment of the advisory committee and before advance registration for the second term, the student must meet with the advisory committee to discuss the program of courses for the degree and plans for research. In this regard, the committee is empowered to require work in areas with which the student's interests are allied. The advisory committee will advise the student on the selection of readings on general and historical topics of importance that may not be encountered in formal courses. Copies of the approved program of courses and the plans for research must be placed in the program files by the beginning of the second semester of study. An approved research prospectus must be completed and filed with the Director of Graduate Studies by the end of the second semester.

Research and Training Assignments

Research is required of each student in the program. In addition, each term the student must be engaged in a training assignment which supplements formal course work through professional activities such as research or teaching. The assignment varies according to the needs, professional goals, and competencies of the student, and increases in responsibility as the student progresses. The assignments require from 10 to twenty hours of service per week.

Academic Retention

The general regulations of the Graduate School with respect to academic retention shall be followed. In addition, no course in which the grade is below *C* shall count toward the degree or fulfillment of any requirement, but the grade will be included in the grade point average. No more than five credit hours of *C* work in graduate courses will count toward the degree.

All students are subject to regular review by the program's Evaluation and Awards committee. Those not attaining the minimum acceptable academic standards or who in any way fail to meet any other scheduled requirements or standards may be dropped from the program.

Appeals

Appeals for variations from the graduate program must be presented in writing to the plant biology graduate faculty meeting as a committee of the whole. Appeals must receive approval from a majority of the total plant biology graduate faculty.

Appeals for changes in the student's graduate advisory committee or changes in the original program must be approved in the following order: (1) approval from advisor; (2) approval from the remaining members of the student's advisory committee. Student appeals for change of major advisor must be presented in writing to the plant biology graduate faculty meeting as a committee of the whole. Appeals must receive approval from the Evaluation and Awards Committee.

Master of Science (M.S.) in Plant Biology

A minimum of 30 hours of graduate credit is required beyond the bachelor's degree. Fifty percent of courses counted towards the degree must be at the 500-level. Those 30 credit hours should include:

1. a minimum of 22 hours of graded credit hours in Plant Biology or related disciplines (nine of these 22 credit hours may be graded individualized instruction courses)
2. seminars as specified below (generally four credit hours)
3. at least four (maximum six) credit hours of thesis (PLB 599)

All M.S. in Plant Biology degree students must earn a minimum of two credit hours in graduate seminars during each year of residence. Students may take any seminar course approved by their committee, with the following constraints:

1. student must take PLB 590 their first fall term
2. student must take PLB 580 each spring semester of residency.

A graduate minor of at least 10 graduate credit hours may or may not be required; this is to be determined by the student and the advisory committee.

As noted in the admission requirements, students will take, either prior to or during their program, at least one course in each of the following categories:

1. plant systematics
2. plant physiology, cell biology, or plant molecular biology
3. ecology or environmental science

Courses in plant anatomy and genetics are strongly recommended also if they have not been taken prior to the program.

A program of study must be approved by the student's advisory committee and be submitted to the Director of Graduate Studiesby the end of the first semester of the student's program. Changes made after the first semester of the student's program must be approved by the student's advisory committee.

At the time of completion of the thesis, the student must schedule a public seminar presentation of the thesis material and a comprehensive examination over the thesis and related subject matter.

Doctor of Philosophy (Ph.D.) in Plant Biology

Course work for the Ph.D. in Plant Biology degree shall include:

1. a minimum of 20 graded credit hours in plant biology or related disciplines
2. minimum of two tools courses (generally 6 to 12 graded credit hours)
3. seminar credits as specified below (generally 8 to 10)
4. minimum of 30 credit hours of dissertation research (PLB 600)

All Ph.D. in Plant Biology students must earn a minimum of two credit hours in graduate seminars each year until they advance to candidacy. Students may take any seminar course approved by their committee, with the following constraints:

1. student must take PLB 590 their first fall term
2. student must take PLB 580 each spring semester until they advance to candidacy

As noted in the admission requirements, students will take, either prior to or during their program, courses in all of the following categories:

1. plant systematics
2. plant physiology; cell biology or plant molecular biology
3. ecology or environmental science

Courses in plant anatomy and genetics are strongly recommended if they have not been taken prior to starting the program.

A program of study must be approved by the student's advisory committee and be submitted to the Director of Graduate Studies by the end of the first semester of the student's program. Changes made after the first semester of the student's program must be approved by the student's advisory committee.

Tools

The Ph.D. in Plant Biology student shall demonstrate knowledge in two research tools approved by the student's advisory committee. A tool is defined as training in laboratory (or field) methods, instrumentation, technology, or communication skills including languages that are integral to the pursuance of research. Specific tool requirements will be determined by the student's advisory committee. Courses used to satisfy tools requirements shall not be applied toward the total number of credit hours required for the degree. A foreign language tool can be met by earning a grade of *B* or better in appropriate 400-level course (Latin, French, German, Spanish or Russian). The tool can also be met by passing an Educational Testing Service (ETS) examination in French, German, Spanish or Russian. The ETS passing level for French and German is 465 and for Russian and Spanish it is 440. A statistical tool requirement can be satisfied by earning a *B* or better in one or more graduate level statistics courses. Course recommendations for statistical tools include Biostatistics (PLB 557) and Advanced Biostatistics (PLB 558). Other courses can be used to satisfy a statistical tool requirement if deemed acceptable by the student's advisory committee. Tool requirements other than language or statistics may be completed by earning a *B* or better in courses approved by the student's advisory committee, including courses from outside the program.

Concentration in Ecology

Students opting to declare ecology as a concentration shall follow the same program as students in the Ph.D. in Plant Biology degree program that do not declare a concentration, subject to the following courses: Course work for the concentration in ecology shall consist of a minimum of 20 credit hours at the seminar, readings, research, dissertation, and research tool requirements. The Seminar in Plant Biology

Ecology (PLB 589A) or equivalent must be taken every Fall and Spring semester until student achieves candidacy. The student's advisory committee shall consist of at least five members with a majority from Plant Biology and at least two members from outside of Plant Biology. For the preliminary examination, the field of expertise shall be ecology. One of the two research tools will be statistics, and the other should demonstrate knowledge defined as training in laboratory (or field) methods, instrumentation, technology, or communication skills including language that is integral to the pursuance of ecological research.

Preliminary Examination

The preliminary examination will consist of two parts: a written examination and an oral examination. The written and oral examinations shall emphasize competence in:

1. One of the fields of expertise within the Program: plant systematics and plant diversity; plant physiology, cell biology and molecular biology; or ecology.
2. The student's designated area of specialization (as determined by the advisory committee), and
3. The student's research tools (see above) and a basic, general knowledge of Plant Biology (as defined by the PLB Faculty).

These three components of the written examination will be administered as separate entities. Subject matter covered in the two specialization examinations may be excluded from the general component at the discretion of the advisory committee.

The student, with the approval of his/her graduate advisory committee, will register with the Director of Graduate Studies to take the examination. The Director of Graduate Studies will then appoint a faculty member who is not on the student's advisory committee to chair the examination committee (EC) and administer both the written and oral examinations. The Chair of the examination committee will solicit questions from the student's advisory committee and from the faculty at large. Upon receipt of these questions, the Chair of the examination committee will call the committee together to construct and plan the written part of the examination. The student will be allocated one eight-hour block of time to complete each of the three components of the examination. The student may request additional time.

The student must pass all parts of the written examination to proceed to the oral examination. Pass means that the student has demonstrated through clear written statements a clear understanding of the topics presented in the written examination. A vote of the EC to pass or fail must be taken immediately following the grading of the written examination. Passing of the written examination will be determined by simple majority vote of the EC. If the student fails one or more of the three components of the examination, he/she must be reexamined on the failed components. If the student fails any part(s) of the general examination, he or she must be reexamined on the failed part(s). In consultation with the advisory committee, the EC chair will schedule and administer the reexamination. The reexamination may not be taken during the same academic term. The student must pass the written examination by the second attempt to continue in the program.

Following passage of the written portion of the examination, the EC chair will schedule and administer the oral portion of the examination. The oral examination must be scheduled not sooner than 10 working days nor more than 30 working days from the completion date of the written examination. The EC chair will not participate in the questioning of the student and does not have a vote regarding the proceedings. The oral preliminary examination must be announced at least 10 working days before the examination is to be given. The examination may only be scheduled when classes are in session, including finals week. The examination shall last at least two hours and not more than four hours and should be scheduled to allow attendance of a maximum number of faculty members from the student's program and all of the preliminary examination committee members. The student's answers to the written examination will be made available to the graduate faculty (upon request) before the oral part of the preliminary examination. All attending graduate faculty members will be given the opportunity to express their opinion on the examination. A vote on performance in the oral examination must be taken immediately following completion of the examination. A pass requires a vote with no more than one dissenting member of the preliminary examination committee, and may have conditions. If the vote is pass, then two levels may be recognized: Pass and Pass with Distinction. A student will be allowed two attempts to pass the oral preliminary examination. Should a student fail a second attempt to pass the preliminary examination, he/she will be dropped from the program. Doctoral students entering the program with a master's degree must take the preliminary exam by the end of 30 months and must pass the preliminary examination and be admitted to candidacy by the end of 36 calendar months after first registering in the doctoral program.

Final Examination (Dissertation Defense)

The final examination will be oral. It must be preceded during that semester by a public seminar on the student's research findings. The student's advisory committee will notify the Director of Graduate Studies of its recommendation for the date of the final examination at least two weeks prior to the seminar. The seminar and examination must be announced at least 10 working days before the seminar and examination. The seminar and examination must be held when classes are in session, including finals week. The final examination shall last for no more than three hours. It is to cover the dissertation and related subject matter. Passage of the final oral examination should be construed to mean there shall be no more than one dissenting vote of the advisory committee. Should a student fail a second attempt to pass the final examination, they will be dropped from the program.

Plant Biology Courses

PLB400 - Plant Morphology and Anatomy This course is an introduction to the differentiation, diversification and structure of plant tissues, organs and external forms, with emphasis on seed plants. Laboratory will include instruction in basic techniques of microscopy used in the study of plant structure. Two lectures and two laboratories per week. Prerequisite: BIOL 213 or PLB 200 with grades of C- or better. Lab fee: $50. Credit Hours: 4

PLB401 - Curation of Collections This course will be an introduction to the curation of biological collections and strongly involve experiential learning through participatory activities with collections. This will involve an overview of museums, collection procedures, and the long-term features of high quality curation of specimens and will examine how a broad range of organisms is curated. Lab/Field trip fee: $50. Credit Hours: 2

PLB408 - Plant Systematics and Identification This course covers the principles of plant classification including history, nomenclature, specimen collection and preservation, current systematic methodologies, and a survey of major plant families. Two lectures and four hours of lab per week. Prerequisites: BIOL 213 or PLB 200 with grades of C- or better. Lab fee: $50. Credit Hours: 4

PLB416 - Limnology (Same as ZOOL 415) Lakes and inland waters; the organisms living in them, and the factors affecting these organisms. Two lectures and one 4-hour laboratory alternate weeks. Prerequisite: BIOL 307 with a grade of C- or better. Laboratory/Field Trip fee: $15. Credit Hours: 3

PLB419 - Plant Molecular Biology (Same as PSAS 419, CSEM 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. Prerequisite: BIOL 305 or CSEM 305. Restricted to 3rd Year standing. Credit Hours: 3

PLB425 - 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

PLB427 - Plant Biochemistry (Same as CSEM 427 and PSAS 427) Exploration of fundamental biochemical pathways in plants with an emphasis upon carbon and nitrogen metabolism. Prerequisite: PLB 320 or consent of instructor. Lab fee: $35. Credit Hours: 5

PLB433 - Introduction to Agricultural Biotechnology (Same as AGSE 433, ANS 433, CSEM 433, HORT 433, PSAS 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

PLB435 - Pollination Ecology (Same as ZOOL 435) This course will be an evolutionary and ecological examination of the interactions between plants and pollinators. Topics include pollination syndromes, plant breeding systems, pollinator foraging, learning, and behavior, specialized vs. generalized relationships, coevolution/cospeciation, chemical ecology, honey beekeeping & agricultural pollination, and conservation implications of pollinator relationships. Labs will provide hands-on experience in methods of investigating plant breeding systems, plant reproductive ecology, pollinator behavior and efficacy, pollen analysis, floral scent chemistry, and floral phenology. Prerequisite: BIOL 307 (General Ecology) with a grade of C- or better or equivalent. For graduate students and 4th Year students. Lab fee: $75. Credit Hours: 3

PLB438 - Plant and Animal Molecular Genetics Laboratory (Same as AGSE 438, CSEM 438, PSAS 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

PLB440 - Grassland Ecology This course examines grassland structure and function in relation to various biotic and abiotic factors. Field trips will visit local grasslands. Two lectures and one 4-hour lab per week. Prerequisite: BIOL 307 or consent of instructor. Lab fee: $50. Credit Hours: 3

PLB444 - Ecological Analysis of Communities (Same as ZOOL 444) Includes concepts and methods pertaining to the analysis of ecological data. Approaches will include a variety of methods for analyzing multivariate ecology, diversity, pattern, and spatial data. Laboratory will include the computer application of these concepts and methods to field situations. Two lectures and one 4 hour lab per week. Prerequisite: PLB/ZOOL 360, BIOL 307. Lab fee: $15. Credit Hours: 4

PLB451 - Flora of Southern Illinois Exposure to the major upland and lowland communities of southern Illinois with an emphasis on the identification, distribution and ecology of the natural and introduced floristic components. This is a field-based course wherein the students travel to local areas for plant identification. Each week, 4-8 hours per weekly session is spent in field work and travel to specific field sites is required via a university vehicle. Prerequisite: PLB 408 with a grade of C- or better or consent of instructor. Field Trip fee not to exceed $160. Credit Hours: 3

PLB452 - Plant Population Ecology This course covers principles and research techniques of plant population ecology including the spatial, age, size and genetic structures of plant populations. The origin of these different aspects of population structure, their influences upon each other and their temporal dynamics are also examined. Two lectures and one 4-hour lab per week. Prerequisite: BIOL 307 or consent of instructor. Lab fee: $35. Credit Hours: 4

PLB471 - Introduction to Systems Biology (Same as ZOOL 472) The bioinformatic analysis of large genomic and post-genomic data sets. Integration of gene regulation, protein interaction, metabolite and hormonal signaling provides an understanding of basic cellular circuitry networks. Examine redundancy, robustness and decision making in biological systems. Lab includes databases, tools, and manipulation of large data sets. Prerequisite: BIOL 305 or CS 330. Lab fee: $15. Credit Hours: 3

PLB475 - Advanced Cell Biology Cell structure at molecular and cytological levels. Includes discussions of research methods, plasma membrane, cell exterior and recognition, the endomembrane system and related organelles, self-replicating organelles, the cytoskeleton, nuclear structure and function in cell replication, cell differentiation and response, and eukaryotic cell evolution. Prerequisite: BIOL 306 or equivalent. Credit Hours: 3

PLB476 - Advanced Cell Biology Laboratory Laboratory course to accompany Plant Biology 475. Light and electron microscopy, cell culturing, biochemical methods, and experimental protocols are used to study the structure of cell membranes, intracellular organelles, including the Golgi apparatus, ER,

mitochondria, plastids, lysosomes, the cytoskeleton, and nucleus. Prerequisite: PLB 475 or concurrent enrollment. Credit Hours: 2

PLB490 - Energetics, Food Webs, and Ecosystems (Same as ZOOL 490) This course places conservation of particular species into the context of community and ecosystem management. Approaches to quantifying energy needs of individual species will be extended to models of trophic networks among multiple species. Food web structure and function, species interactions, and resilience to species loss species invasions, and environmental changes will be examined in light of landscape processes. Prerequisite: BIOL 307 or consent of instructor. Credit Hours: 3

PLB492 - Honors in Plant Biology Individual research problems available to qualified 3rd Year and 4th Year students. Special approval needed from the department chair. Credit Hours: 2-6

PLB493A - Research Topics in Plant Biology-Ecology Individual laboratory or field research under supervised direction. Does not count for thesis (PLB 599) or dissertation (PLB 600) credit. Special approval needed from the departmental chair. Credit Hours: 1-4

PLB493B - Research Topics in Plant Biology-Systematics Individual laboratory or field research under supervised direction. Does not count for thesis (PLB 599) or dissertation (PLB 600) credit. Special approval needed from the departmental chair. Credit Hours: 1-4

PLB493C - Research Topics in Plant Biology-Physiology/Molecular Biology Individual laboratory or field research under supervised direction. Does not count for thesis (PLB 599) or dissertation (PLB 600) credit. Special approval needed from the departmental chair. Credit Hours: 1-4

PLB501A - Research Transmission Electron Microscopy (See SCI 501A) Credit Hours: 2

PLB501B - Research Transmission Electron Microscopy (See SCI 501B) Credit Hours: 2

PLB502A - Research Scanning Electron Microscopy (See SCI 502A) Credit Hours: 2

PLB502B - Research Scanning Electron Microscopy Lab (See SCI 502B) Credit Hours: 2

PLB520 - Plant Growth and Development (Same as PSAS 520) Physiological control of developmental processes. Emphasis on exogenous growth-regulating compounds and their behavior in plants. Prerequisite: PLB 320 or consent of instructor. Credit Hours: 3

PLB524 - Gene Regulatory Networks (Same as PSAS 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

PLB525 - Cell Biology Research Techniques A special techniques course designed for graduate students specializing in cell studies. Provides instrumentation training, with emphasis on application of the method to a research project. (a) Quantitative Cytology. (b) Immuno-Labelling and Qualitative Histochemistry. (c) Deep Etching Techniques in Electron Microscopy. (d) Cell Fractionation and Biochemical Techniques. Course fee: $50. Credit Hours: 2-4

PLB525A - Cell Biology Research Techniques-Quantitative Cytology A special techniques course designed for graduate students specializing in cell studies. Provides instrumentation training, with emphasis on application of the method to a research project. Credit Hours: 2-4

PLB525B - Cell Biology Research Techniques-Immuno-Labeling and Qualitative Histochemistry A special techniques course designed for graduate students specializing in cell studies. Provides instrumentation training, with emphasis on application of the method to a research project. Credit Hours: 2-4

PLB525C - Cell Biology Research Techniques-Deep Etching Techniques in Electron Microscopy A special techniques course designed for graduate students specializing in cell studies. Provides

instrumentation training, with emphasis on application of the method to a research project. Credit Hours: 2-4

PLB525D - Cell Biology Research Techniques-Cell Fractionation and Biochemical Techniques A special techniques course designed for graduate students specializing in cell studies. Provides instrumentation training, with emphasis on application of the method to a research project. Credit Hours: 2-4

PLB542 - Evolution in the Anthropocene This graduate level course focuses on our contemporary understanding of the impacts of expanding urban and agricultural environments, climate change, and other major components of the Anthropocene on the evolution of wild populations. It is more critical than ever for scientists to examine how anthropogenic factors impact natural populations. This is a conceptually broad course which covers topics ranging from landscape genetics, ecological genetics, evolutionary ecology, and phylogenetics. Credit Hours: 3

PLB547 - Tropical Studies in Costa Rica Credit for field courses taken under the jurisdiction of the Organization for Tropical Studies in Costa Rica. Courses and credits will vary. Prerequisite: approval of OTS Advisory Committee at Southern Illinois University Carbondale. Credit Hours: 3-8

PLB554 - Evolution Seminar (Same as ANTH 554) Advanced topics in evolutionary biology including genetics & development, evolutionary ecology, phylogeny, paleontology, biogeography, population genetics, molecular ecology, speciation, molecular evolution, and macroevolution. Topics will vary each semester. Seminar format group discussions and student presentations. Graded S/U. Special approval needed from the instructor. Credit Hours: 1

PLB556 - Phylogenetics (Same as ANTH 556, MBBS 556, ZOOL 556) An advanced introduction to modern methods of phylogenetic inference, emphasizing both theoretical background concepts and numerical approaches to data analysis. Topics include properties of morphological and molecular characters, models of character evolution, tree estimation procedures, and tree-based testing of evolutionary hypothesis. Special approval needed from the instructor. Credit Hours: 3

PLB557 - Biostatistics (Same as ZOOL 557) Basic biostatistical procedures used by researchers in life sciences and related fields. Topics include descriptive statistics, probability and distributions, statistical models, likelihood methods, experimental design, analysis of variance, regression, correlation, and the use of statistical software. Credit Hours: 4

PLB558 - Advanced Biostatistics (Same as ZOOL 558) Advanced biostatistical procedures used by researchers in life sciences and related fields. Topics include multiple and logistic regression, randomization tests, jackknife and bootstrap. Mantel tests, BACI designs, MANOVA, repeated measures analysis, and the use of statistical software. Prerequisite: PLB 557 or equivalent, ZOOL 557. Credit Hours: 4

PLB570 - Graduate Readings in Plant Biology A course of individually assigned readings in botanical literature. Every semester. Special approval needed from the instructor. Graded S/U only. Credit Hours: 2-3

PLB571 - Genomics of Eukaryotes: Bioinformatics (Same as PSAS 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

PLB578 - Population Genetics (Same as ZOOL 578) Genetic structure of populations, factors causing changes and principles governing rate and direction of change. Three lectures per week. Prerequisite: BIOL 304 and BIOL 305. Credit Hours: 3

PLB580 - Departmental Seminar Student presentations and critiques of original research, including presentations by occasional invited speakers. Graded S/U only. Required of all graduate students in residence, when offered. Credit Hours: 1-6

PLB589A - Seminars in Plant Biology-Ecology (Same as ZOOL 576) Discussions of current and historical research and literature in various subject areas of plant biology. Graded S/U only. Credit Hours: 1

PLB589B - Seminars in Plant Biology-Molecular and Biochemical Physiology Discussions of current and historical research and literature in various subject areas of plant biology. Graded S/U only. Credit Hours: 1

PLB589C - Seminars in Plant Biology-Systematics and Biodiversity Discussions of current and historical research and literature in various subject areas of plant biology. Graded S/U only. Credit Hours: 1

PLB590 - Introduction to Research General introduction to research and graduate program policies. Guest presentations by department faculty. Fall only. Graded S/U only. Required of all graduate students during their first year in residence, when offered. Credit Hours: 1

PLB591A - Research-Anatomy Assignments involving research and individual problems. Master's students may use this for their research for their thesis. Summer only. Graded S/U. Special approval needed from the instructor and the department. Credit Hours: 2-9

PLB591B - Research-Bryology Assignments involving research and individual problems. Master's students may use this for their research for their thesis. Summer only. Graded S/U. Special approval needed from the instructor and the department. Credit Hours: 2-9

PLB591C - Research-Ecology Assignments involving research and individual problems. Master's students may use this for their research for their thesis. Summer only. Graded S/U. Special approval needed from the instructor and the department. Credit Hours: 2-9

PLB591D - Research-Morphology Assignments involving research and individual problems. Master's students may use this for their research for their thesis. Summer only. Graded S/U. Special approval needed from the instructor and the department. Credit Hours: 2-9

PLB591E - Research-Mycology Assignments involving research and individual problems. Master's students may use this for their research for their thesis. Summer only. Graded S/U. Special approval needed from the instructor and the department. Credit Hours: 2-9

PLB591F - Research-Paleobotany Assignments involving research and individual problems. Master's students may use this for their research for their thesis. Summer only. Graded S/U. Special approval needed from the instructor and the department. Credit Hours: 2-9

PLB591G - Research-Pathology Assignments involving research and individual problems. Master's students may use this for their research for their thesis. Summer only. Graded S/U. Special approval needed from the instructor and the department. Credit Hours: 2-9

PLB591H - Research-Photography Assignments involving research and individual problems. Master's students may use this for their research for their thesis. Summer only. Graded S/U. Special approval needed from the instructor and the department. Credit Hours: 2-9

PLB591I - Research-Phycology Assignments involving research and individual problems. Master's students may use this for their research for their thesis. Summer only. Graded S/U. Special approval needed from the instructor and the department. Credit Hours: 2-9

PLB591J - Research-Physiology Assignments involving research and individual problems. Master's students may use this for their research for their thesis. Summer only. Graded S/U. Special approval needed from the instructor and the department. Credit Hours: 2-9

PLB591K - Research-Systematics Assignments involving research and individual problems. Master's students may use this for their research for their thesis. Summer only. Graded S/U. Special approval needed from the instructor and the department. Credit Hours: 2-9

PLB599 - Thesis Course to be taken in the preparation of the Master's thesis. Every semester. Special approval needed from the instructor. Graded S/U only. Credit Hours: 2-9

PLB600 - Dissertation Course to be taken in the research for and in writing of the doctoral dissertation. Every semester. Graded S/U only. Special approval needed from the instructor. Credit Hours: 1-12

PLB601 - 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

PLB699 - Postdoctoral Research Must be a Postdoctoral Fellow. Concurrent enrollment in any other course is not permitted. Credit Hours: 1

Plant Biology Faculty

Anterola, Aldwin M., Associate Professor, Ph.D., Washington State University, 2001; 2005. Metabolic pathways, medicinal compounds, nutraceuticals, biosynthesis of natural products.

Da Cunha Leme Filho, Jose F., Assistant Professor, Ph.D., Virginia Polytechnic Institute and State University, 2020. Controlled environment agriculture, vertical farm, cannabis biology, plant physiology, secondary metabolites, plant biostimulants.

Gage, Karla L., Associate Professor, Ph.D., Southern Illinois University Carbondale, 2013; 2015. Weed science, weed ecology, agroecology, integrated pest management, herbicide resistance, invasive species.

Garwood, Nancy, Adjunct Professor, Ph.D., University of Chicago, 1979; 2005. Tropical botany, including community ecology, seed germination, seedling morphology, and systematics.

Geisler, J.B. Matthew, Associate Professor, Ph.D., The Ohio State University, 1999; 2006. Gene expression and protein interaction patterns, mathematical gene modeling, arabidopsis, yeast and drosophila interactomes.

Geisler-Lee, Jane, Adjunct Assistant Professor, Ph.D., The Ohio State University, 2002; 2007. Systems biology, cell wall, suberin, onoclea sensibilis, genomics, transcriptomics, metabolic pathways, sporogenesis, rhizome development.

Jayakody, Lahiru N., Assistant Professor, Ph.D., Kagoshima University, 2014; 2019. Biotechnology, molecular biology, metabolic engineering, synthetic microbiology, systems biology.

Neubig, Kurt M., Associate Professor, Ph.D., University of Florida, 2012; 2015. Plant systematics, phylogenetics, floristics, DNA barcoding and pollination biology.

Petri, Laís., Assistant Professor, Ph.D., University of Michigan, 2023; 2025. Plant community ecology, invasion biology.

Sipes, Sedonia D., Associate Professor, Ph.D., Utah State University, 2001; 2001. Plant-insect interactions, evolutionary ecology, chemical ecology, and systematics.

Weber, Jennifer., Assistant Professor, Ph.D., University of CA, Irvine, 2012; 2020. Evolutionary ecology, including breeding system evolution, pollination biology, population genetics and climate change biology.

Wood, Andrew J., Professor, Ph.D., Purdue University, 1994; 1996. Biotechnology, biochemistry, desiccation, drought, genetics, horticulture, plant physiology, stress.

Emeriti Faculty

Bozzola, John J., Professor, Emeritus, Ph.D., Southern Illinois University Carbondale, 1975; 1983.

Crandall-Stotler, Barbara, Professor, Emerita, Ph.D., University of Cincinnati, 1968; 1970.

Gibson, David J., Distinguished Professor, Emeritus, Ph.D., University of Wales, 1985; 1992.

Matten, Lawrence C., Professor, Emeritus, Ph.D., Cornell University, 1965; 1965.

Mohlenbrock, Robert H., Distinguished Professor, Emeritus, Ph.D., Washington University, 1957; 1957.

Nickrent, Daniel L., Distinguished Research Professor, Emeritus, Ph.D., Miami University (Ohio), 1984; 1990. Distinguished research.

Renzaglia, Karen, Distinguished Research Professor, Emerita, Ph.D., Southern Illinois University Carbondale, 1981; 2005. Distinguished research.

Richardson, John A., Associate Professor, Emeritus, M.F.A., Ohio University, 1969; 1969.

Robertson, Philip A., Professor, Emeritus, Ph.D., Colorado State University, 1968; 1970.

Tindall, Donald R., Professor, Emeritus, Ph.D., University of Louisville, 1966; 1966.

Vitt, Dale H., Distinguished Research Professor, Emeritus, Ph.D., University of Michigan, 1970; 2000.

Yopp, John H., Professor, Emeritus, Ph.D., University of Louisville, 1969; 1970.

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