PLANT SCIENCES (PLSCI)

PLSCI 1101 - Plant Science and Systems (4 Credits)
This course will explore the scientific principles and processes forming the foundation of plant-based systems that provide food, fiber, beverage, environmental enhancement, medicine and art. Students will learn the language of plants and growing systems including the complex interactions among climate, soil, and human manipulation to meet our needs and desires. This course will challenge the notions of sustainable, organic, GMOs and how plants solve environmental problems. We consider the science behind plant growth, health, performance and their interactions with the environment. Successful completion of this course will prepare students for more advanced courses in the Plant Sciences curriculum.
Enrollment Information: Priority given to: Agricultural Sciences, Plant Sciences and Landscape Architecture majors, plus Horticulture minors.
Distribution Requirements: (AFS-AG)
Exploratory Studies: (CU-CEL, CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:
- Explain, evaluate, and effectively interpret factual claims, theories and assumptions in the application of the plant sciences.
- Integrate quantitative and qualitative information to reach defensible conclusions on applied plant science topics.
- Communicate effectively through writing and speech about issues in the applied plant sciences.
- Demonstrate the capability to work both independently and in cooperation with others.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 1102 - Hands-On Horticulture for Gardeners (2 Credits)
The objective is to instill in students a lifelong appreciation for how gardening can enhance individual well-being through aesthetics, culinary experiences, and mastery of techniques. Emphasizes hands-on learning and practice of key gardening skills and techniques in the greenhouse and the field, such as landscape management, garden design, propagation, pruning, grafting, pest management, and flower arrangement.
Enrollment Information: Enrollment limited to: first-year students, sophomores and juniors.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Develop a life-long appreciation for how gardening can enhance individual well-being through aesthetics, culinary experiences, and mastery of techniques.
- Apply key gardening skills and techniques, such as landscape management, garden design, propagation, pruning, grafting, pest management, and flower arrangement.
- Explain the science behind various practices used in the production and management of fruits, vegetables, flowers, grass and landscape plants.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 1105 - FWS: Issues and Ideas in Plant Science (3 Credits)
This First-Year Writing Seminar is devoted to examining critical issues and ideas in the plant sciences by discussing texts on topics ranging from genetic modification of plants to sustainability to climate change and issues involving agricultural labor, among others. The scale of challenges in plant science provides a wide range of stimulating opportunities to think and write critically about the human condition and our impact on the world. Topics vary by semester.
Distribution Requirements: (WRT-AG)
Last Four Terms Offered: Spring 2024
Learning Outcomes:
- Execute college writing strategies such as preparation of outlines, drafts, revisions, and participation in the peer-review process.
- Analyze a variety of information in the plant sciences ranging from scientific literature, reviews, popular science articles, and books.
- Summarize key ideas in the plant sciences.
- Reference and cite scholarly sources appropriately.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 1110 - Pathways to Success in Agriculture and Plant Sciences (2 Credits)
Navigating the first year of college is a personal and professional challenge. This course provides opportunities for new students who major in Agricultural Sciences or Plant Sciences to acclimate, discover, and begin to thrive. You'll engage in self-discovery, make new connections, learn about fields of study and career options, develop a resume, and start an ePortfolio. Weekly workshops are combined with field visits, guests, and peer engagement.
Enrollment Information: Enrollment limited to: new students in the Agricultural Sciences and Plant Sciences majors.
Exploratory Studies: (CU-CEL)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:
- Confidently facilitate discussions with faculty, staff, peers, guest speakers, and alumni for support and resources, such as requesting letters of recommendation, seeking positions in labs, and identifying internships.
- Describe the vast career opportunities across the agricultural and plant sciences disciplines, including the work being done by various faculty on campus.
- Articulate individual goals and action steps for academic, extracurricular, and career planning.
- Define academic and professional skills for successful degree completion and job acquisition or graduate school admission.
- Plan a course schedule that includes major and college requirements, plus potential electives.
- Reflect on how course planning and career paths influence one another.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 1115 - The Nature of Plants (3 Credits)
An introductory course that examines plant diversity, function, and adaptation. Topics include an introduction to plant community structure, relationships between plants and other organisms, how plants cope in their environments, and plant-human interactions. This course is suitable for life sciences majors.
Distribution Requirements: (BIO-AG, BSC-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe the reproduction, growth, and development of plants.
- Describe how communities and ecosystems are structured.
- Identify the importance and describe the physiological mechanisms that organisms use to respond to their environments.
- Independently interpret and apply physiological plant ecology from the literature.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 1130 - Light and Life: The Relationship between Light and Life in the Natural World (3 Credits)
By most accounts, whether theological or scientific, light is fundamental for life. Throughout the living world, there are vital processes, such as photosynthesis and vision that are associated with light. Living organisms use the daily and seasonal changes in illumination to regulate their rhythms. However, too much of a good thing is not necessarily a good thing as too much light can result in photodamage. The extraordinary relationship between light and life provides an important unifying framework for understanding the luminescence of living organisms, the striking and flamboyant coloration of plants and animals as well as the inconspicuous nature of their camouflage in terms of physics, chemistry and biology. This course will enhance your understanding of the natural world through studying the relationships between light and life. This course is suitable for life sciences majors.
Distribution Requirements: (BIO-AG, BSC-AG, OPHLS-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Explain the relationship between light and the basic structures and fundamental processes of life over a range of levels of organization within the full scope of biology from molecules to ecosystems, integrated with the basic principles of inheritance and evolution.
- Apply quantitative reasoning and basic principles from the physical sciences to thinking about biology.
- Explain principles by which hypotheses can be evaluated scientifically using examples of observations and experiments that have shaped biological thought.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 1150 - CSI: Forensic Botany (3 Credits)
Plant-based evidence has been an important component in solving crimes for centuries. Modern techniques and facilities have made plant evidence more important and useful than ever, and there are some stunning examples of trials where plant evidence played a critical roles in the outcomes. We will blend criminal cases and plant science in this course. We will review important cases that have involved and even depended upon significant plant-based evidence. Along the way, students will learn, at the introductory level, the plant science needed to appreciate the importance of plant-based evidence in crime solving. An overriding but intrinsic theme will be how the scientific method is useful and integral to applying logic to a body of plant-based evidence in specific cases. This course is suitable for life sciences majors.
Distribution Requirements: (BIO-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Evaluate the nature of plant-based evidence.
- Review court rulings on the admissibility of scientific and other expert testimony.
- Observe how plant-based evidence has been used in criminal trials including durability of plant organs in human digestive system.
- Apply logical analysis of plant-based evidence to crime solving.
- Describe techniques used to identify and evaluate plant-based evidence including light microscopy, electron microscopy, spectroscopy, CTScan technology, DNA analysis, and natural history.
- Identify and be able to names sources for illegal plants and their derivatives, including poisons.
- Master an appropriate range of knowledge on plant structure including morphology, wood anatomy, distribution, and soil types.
- Be able to communicate a broad knowledge of plant diversity/ taxonomy.
- Explain plant reproductive biology, including life cycles, seasonality and correlated plant disseminules, including palynology (micromorphology, ultrastructure and taxonomic utility), fruits and seeds, leaves or leaf fragments, and including poisons.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 1225 - Photography through a Scientific Lens (3 Credits)
Last Four Terms Offered: Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

PLSCI 1275 - Exploring the Small Farm Dream (3 Credits)
Small farms play a vital role in local food systems, rural economies, and sustainable agriculture. This course provides an interdisciplinary exploration of the opportunities and challenges of operative a small farm, with a focus on economic viability, environmental sustainability, and community engagement. Through weekly meetings, readings, discussions, and field trips to local farms, students will gain a foundational understanding of small-scale agricultural enterprises. They will explore farm business models, land access, production methods, marketing strategies, and policy influences. Hands-on work sessions will allow students to engage with real-word farming scenarios. This course is designed for students from any discipline who are curious about farming, food systems, or entrepreneurship. Whether considering a career in agriculture, food policy, or rural development, students will gain a well-rounded perspective on what it takes to start and sustain a small farm.
Distribution Requirements: (AFS-AG)
Learning Outcomes:

- Identify key components of successful small farms.
- Assess economic, environmental, and social factors affecting farm viability.
- Analyze real-world agricultural practices implemented by local farmers.
- Develop strategies to improve sustainability and land stewardship of individual farms.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 1300 - Just Food: Exploring the Modern Food System (4 Credits)
Crosslisted with GDEV 1300
This course provides a comprehensive review of the modern food system from the green revolution to the industrialized model of today. It offers a critical perspective on existing paradigms and insights into alternative approaches for producing food security, environmental stewardship, and equity in an era of climate change. The course is taught by an interdisciplinary team of instructors who bring insights from both the biophysical and social sciences and will ask students to consider their food using a systems-thinking lens. This course is suitable for life sciences majors.
Distribution Requirements: (AFS-AG, BIO-AG, BSC-AG, CA-AG, SBA-AG)
Exploratory Studies: (CU-CEL, CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe key concepts across disciplines and perspectives related to the food system, including relationships between food, human society (including politics and culture), and the non-human environment.
- Describe some key historical and contemporary events, processes, and concepts that have shaped the current food system.
- Apply systems thinking to describe current key debates, concepts, trade-offs, and challenges in the food system from multiple perspectives.
- Communicate factual aspects of the impact of climate change on global food system.
- Evaluate assumptions and values about food systems that underpin one's own thinking and that of others, connect personal values and beliefs to diet and nutritional choices.
- Apply and synthesize scientific evidence in support of arguments that address food systems research questions.
- Analyze and critically evaluate food systems research results and policies for evidence-based assessments and ethical decision-making.
- Engage in respectful dialogue, collaborative teamwork, and problem-solving with those of differing viewpoints and backgrounds.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 1420 - Functional Plant Biology (3 Credits)
This course is an overview of basic plant structure and function. We will survey the basic cell types, tissues and organs that make up the plant body as related to the physiology (functions) of a plant. The goal is to provide a sound foundation in basic plant biology and preparation for higher-level coursework. The laboratory portion of this course is designed to review the material covered in lecture, as well as introduce students to the investigative nature of scientific research. Students will get experience in experimental design, scientific method, and analysis of data collected through experimentation. This course is suitable for life sciences majors.
Distribution Requirements: (BIO-AG, BSC-AG)
Last Four Terms Offered: Summer 2025, Spring 2025, Spring 2024, Spring 2023
Learning Outcomes:

- Describe the structure of a typical plant, from the cellular to organ level.
- Relate the structure of tissues and organs to the major life processes occurring in a plant: transport, photosynthesis, and development.
- Effectively design an experiment to test a valid hypothesis.
- Evaluate and assess information for factual validity.
- Evaluate basic information and incorporate it to solve problems and explain more complex concepts.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 1560 - Application of CHEM 1560 to Plant Sciences (2 Credits)
The purpose of this course is to facilitate making connections between biology and chemistry at the time you are learning the chemistry. In reality, chemistry is essential to biology. Life is, after all, a specialized set of chemical reactions, highly diverse and complex to be sure, but chemical reactions nonetheless. Developing an understanding and appreciation of this critical connection between chemistry and plant science is the primary goal of this course. At the same time, we should all recognize that chemistry is a challenging subject for most students. Because the application of chemistry to concepts and problems in biology first requires one to understand the chemistry, the course will also place a significant emphasis on making sure students understand the basic chemistry as well.
Corequisites: CHEM 1560.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2018
Learning Outcomes:

- Describe the biological context of the chemical phenomena in plant science.
- Give specific examples of plant process(es) to which the chemical concepts are applicable.
- Think critically about the material covered in CHEM 1560.
- Articulate the intimate connections between chemistry and plant science.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 1900 - Sustainable Agriculture: Food, Farming, and the Future (3 Credits)
Introduction to agronomy and agroecology and an exploration of environmental, economic, and social factors that influence agriculture. Students participate in interactive discussions about food systems and food security. Labs include field trips to a variety of field crop, vegetable, and dairy farms and experiential activities designed to enhance understanding of important themes in sustainable agriculture, including multifunctionality and resilience.
Distribution Requirements: (AFS-AG, OPHLS-AG)
Exploratory Studies: (AFAREA, LAAREA)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Understand 'real world' sustainable agriculture by interacting with local farmers.
- Explain what sustainable agriculture means and why it is important.
- Describe the dominant types of agriculture operations in the region.
- Compare different methods of crop and livestock production in terms of environmental, economic, and social factors.
- Think holistically about production and food systems.
- Critically evaluate information about agriculture from diverse sources (e.g., newspapers, Google, scientific journal articles).
- Create presentations and short films using videography equipment and software.
- Identify components of a well-supported, articulate argument.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2010 - Magical Mushrooms, Mischievous Molds (2 Credits)
Presentation of the fungi and how they shape our civilizations and the natural world in which we live. Fungi play important roles in pressing issues in agriculture, food security, climate, disease, and environment. This class emphasizes the significance of fungi as decayers of organic matter, as pathogens and symbionts of plants and animals, as food, and as sources of mind-altering chemicals.
Forbidden Overlaps: PLSCI 2010, PLSCI 2013
Distribution Requirements: (OPHLS-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe the properties of fungi and relate them to their abilities and their contributions to ecosystems.
- Discuss positive and negative effects of fungi on food and agriculture and evaluate their impacts on global food security.
- Explain how fungal toxins, allergens, and diseases affect human health.
- Apply evolutionary concepts and knowledge of fungal life cycles to devise ways to manage disease progress.
- Describe fungal foods, biochemicals, and materials and explain how they may contribute to environmental sustainability.
- Compare lichen and mycorrhizal symbioses and discuss their contributions to carbon cycling and climate.
- Communicate information about a wide range of fungi and their impacts to diverse audiences.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2013 - Mushrooms, Molds and More (3 Credits)
Presentation of the fungi and their roles in nature and in shaping past and present civilizations. Emphasizes the historical and practical significance of fungi as decayers of organic matter, as pathogens of plants and animals, as food, and as sources of mind-altering chemicals. Lectures and exams for this course are the same as those in PLSCI 2010. However, students in this course also participate in a weekly 55-minute discussion section where they grow mushrooms and other fungi in culture, learn about contemporary classification of fungi, see examples of major taxa growing on natural substrates, and determine whether suspect pathogens really can kill agricultural crops. Students also teach their peers about the fungus world with presentations of their own creation. This course is suitable for non-life sciences majors.
Forbidden Overlaps: PLSCI 2010, PLSCI 2013
Distribution Requirements: (BIO-AG, BSC-AG), (SCT-IL)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe the properties of fungi and relate them to their abilities and their contributions to ecosystems.
- Discuss positive and negative effects of fungi on food and agriculture and evaluate their impacts on global food security.
- Explain how fungal toxins, allergens, and diseases affect human health.
- Apply evolutionary concepts and knowledge of fungal life cycles to devise ways to manage disease progress.
- Describe fungal foods, biochemicals, and materials and explain how they may contribute to environmental sustainability.
- Compare lichen and mycorrhizal symbioses and discuss their contributions to carbon cycling and climate.
- Communicate information about a wide range of fungi and their impacts to diverse audiences.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2015 - Field Botany (0.5 Credits)
How does one understand nature if not by the power of careful observation? This course seeks to use natural history to inspire an interest in the natural world right here in the geologically fascinating Finger Lakes region. We will embark on an exploration of a variety of local habitats including old growth forests, secondary forests, swamps, old fields, hills, and gorges that the Finger Lakes region is known for. We will build foundational field methods skills including taking field notes, assessing species richness, observing ecological interactions, and collecting specimens for herbarium deposition. Finally, we will revisit our first field site in the last class to make observations about changing phenology and the potential of collecting timeseries data.
Learning Outcomes:

- Integrate natural history observations into broader eco-evolutionary or botanical concepts and theories.
- Describe the possible ecological and evolutionary significance of various species traits and their interactions within diverse ecosystems.
- Use visual depictions or words to show how natural history observations express human relationships with nature.
- Demonstrate specimen collection and herbarium repository skills.
- Explain how sample collection over time aids in quantifying plant phenology and how data can be used for climate change research.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2020 - Foods of the Future (3 Credits)
The class is intended to provide insight and exposure to the unique challenges associated with the changing dynamics and markets of fresh produce. It is targeted at students with an interest in plants and food in general to better understand how current and future changes affect the availability, diversity and access of foods including the influence on, and creation of new markets. The class will focus on real world issues addressing changes in production environments, aesthetics, markets, postharvest quality and consumer demands. Among the diverse challenges involved in addressing future needs include the changing consumer quality and aesthetic expectations, changing market dynamics, year-round consistency, nutrition, production, global markets and targeting of new controlled environment production approaches.
Distribution Requirements: (AFS-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2023, Spring 2021, Spring 2019
Learning Outcomes:

- Define the role of whole foods and plant based products in food systems and how they are unique in their production and market requirements.
- Identify the major participants involved with food distribution and their respective roles in satisfying the current and future market demands.
- Lend insight into the environmental, political and social factors surrounding the emergence of new crops and products historically, currently and in the future.
- Contrast the roles of urbanization and globalization on defining the trends in U.S. and global food systems and markets.
- Critically analyze scientific literature, research, social media, current affairs and market trends to: a) assess the potential for a given horticultural crop to gain traction as a food of the future and b) identify desirable traits to target for the development of future foods and food products.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2100 - Medical Ethnobotany (3 Credits)
Plants have always played a key role in the history of life on Earth and have served as medicinal agents in all societies since prehistoric times. Medical Ethnobotany is the study of medicinal plants used by a group of people. Medicinal plants are either critical constituents of many modern drugs or provide templates for synthetic analogous molecules. In this course we will introduce and be acquainted with past and current plant-based natural remedies used across the globe, exploring their efficacy and mode of actions. We will analyze and compare how plants are employed in the different continents to heal (or alleviate) a plethora of pathological conditions, and explore how they affect our bodies (which organic system is affected, i.e., gastro-intestinal, central nervous or respiratory system). The course is designed for students with an interest in the natural world and in traditional medicine. This course is suitable for life sciences majors.
Distribution Requirements: (BIO-AG, BSC-AG, OPHLS-AG)
Last Four Terms Offered: Summer 2025, Fall 2024, Summer 2024, Winter 2024
Learning Outcomes:

- Describe the role of plants in human health and in social contexts in the past and the present.
- Identify and define the most commonly used medicinal plants across the continents and their bioactive compounds.
- Discuss the processes involved in the isolation of active bio compounds from plants.
- Compare how medicinal plants are used in various cultures, which organ(s) they affect in the human body, how efficacy is measured, and explain in general terms their modes of action.
- Integrate concepts from ethnobotany, biochemistry, pharmacology, toxicology and conservation.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2110 - Field Crop Systems (4 Credits)
Principles of field-crop production of major crops used for food, feed, fiber and bioenergy. Includes introductory concepts of plant growth, development and maturation as they relate to crop performance and management, adaptation to soil, climatic and environmental conditions, tillage, mineral nutrition, pests, cropping sequences, management systems, and crop improvement. Grain, oilseed, biofuel and forage crops are emphasized. Laboratory includes field trips and demonstrations of the most important crop species, morphological and growth characteristics essential to environmental adaptation and response to management.
Distribution Requirements: (AFS-AG, BSC-AG, OPHLS-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Recognize and identify the production constraints, nutritional characteristics, and storage conditions of the world's major food, feed and forage crops.
- Identify the vegetative and flower morphologies of major cereal, legume, and forage crops.
- Describe the stages of root, shoot, and seed development in corn, soybean, and other crops.
- Apply the principles of crop science to explain the geographic distribution and response of crop species to differences in light, temperature, water status, and soil properties.
- Describe and demonstrate the impact of agroecosystems, cropping systems, and management factors such as plant establishment, crop variety, soil mineral nutrition, pests, and diseases on the productivity and quality of crops.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2200 - Introduction to Mapping and Spatial Analysis with GIS (3 Credits)
This class serves as an introduction to the principles of geographic information systems (GIS) and mapping to understand natural, social, and environmental issues at a range of scales. Students will develop competence and confidence at recognizing, interpreting, and applying spatially-informed thinking approaches via maps and mapping. Emphasis will be on accessing, processing, visualizing, and analyzing geospatial data for communication and decision making, including understanding the role of uncertainty in the use of digital spatial data and maps. Throughout the class, students will gain experience in structuring spatial problems, organizing and managing geospatial data, modeling and spatial analysis, and digital cartography. Students will use both desktop and online mapping software and applications.
Distribution Requirements: (DLG-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe how location-based information and spatial attributes affect environmental problems and issues at different geographic scales.
- Explain the structure and function of geographic information systems.
- Develop basic proficiency with coordinate systems, map projections, and data as necessary for data coordination and management.
- Differentiate among spatial data models appropriate for diverse applications and scales.
- Demonstrate basic proficiency to seek, identify, access, and prepare geospatial data sets from a range of online public sources.
- Model best practices of data organization and management skills.
- Select and apply methods of analyzing vector and raster data sets.
- Identify errors from and invalid approaches to conducting GIS-based analyses.
- Design and produce final map products informed by standard cartographic principles.
- Develop and present a collaborative group project.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2225 - Healthy Plants, Healthy People (3 Credits)
In this course, students will acquire a broad understanding of plant diseases, plant pathogens and plant disease management. Primary literature will be used to examine the diverse aspects of plant pathology, including disease dynamics at the cellular, organismal, and population level, and how diverse biotic and abiotic factors can influence these dynamics.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Spring 2024, Fall 2023, Spring 2023
Learning Outcomes:

- Describe plant disease etiology, plant pathogen biology, and approaches to plant disease management.
- Evaluate primary literature in diverse aspects of plant pathology.
- Explain disease dynamics at the cellular level, at the organismal level and at the population level.
- Describe how diverse biotic and abiotic factors can influence these dynamics.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2250 - Plant Genetics (4 Credits)
Surveys fundamental plant genetics with a focus on applications in agriculture and plant sciences. Reviews and extends concepts from introductory biology for students with an interest in plants and their contributions to food, fiber, biofuels, ornamentals and ecology. Also preparation for advanced coursework in genetics for students considering graduate studies in a related field. Unique topics include polyploidy and organellar inheritance, pollination, seed saving and basic plant breeding. Companion lab exercises follow a generation of pea breeding and includes plant pollination techniques, DNA extraction and sequencing, molecular markers.
Prerequisites: one majors-level biology course or equivalent.
Distribution Requirements: (BSC-AG, OPHLS-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Access and review the background information necessary for designing a plant breeding program or genetics study with proper citations from primary literature.
- Describe of the roles of DNA mutation, allele segregation, epigenetics and mechanisms that promote cross pollination in contributing to the diversity, ecology, genetic improvement, evolution and uses of plants.
- Interpret new genetic findings, applications, tests and theories reported in the popular media or later judge their impact on their lives within a framework of examples, concepts and principles.
- Follow protocols and apply concepts in class to pollination, DNA extraction and analysis, scoring and genetic evaluations of plant phenotypes.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2253 - Lectures in Plant Genetics (3 Credits)
Surveys fundamental plant genetics with a focus on applications in agriculture and plant sciences. Reviews and extends concepts from introductory biology for students with an interest in plants and their contributions to food, fiber, biofuels, ornamentals and ecology. Also preparation for advanced coursework in genetics for students considering graduate studies in a related field. Unique topics include polyploidy and organellar inheritance, pollination, seed saving and basic plant breeding.
Prerequisites: one majors-level biology course or equivalent.
Distribution Requirements: (BSC-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Access and review the background information necessary for designing a plant breeding program or genetics study with proper citations from primary literature.
- Describe of the roles of DNA mutation, allele segregation, epigenetics and mechanisms that promote cross pollination in contributing to the diversity, ecology, genetic improvement, evolution and uses of plants.
- Interpret new genetic findings, applications, tests and theories reported in the popular media or later judge their impact on their lives within a framework of examples, concepts and principles.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2300 - Global Plant Biodiversity and Vegetation (3 Credits)
Plants are distributed across the globe in distinctive vegetation types, and have a close association with local and global climate. This course discusses factors determining vegetation structure, plant diversity, biodiversity hotspots, plant adaptations, human-plant interactions and climate change with an emphasis on ecological concepts, plant-climate interactions and plant adaptation at a very basic level. Intended for both Plant Sciences majors and students without a strong background in plant sciences. An associated field trip to Patagonia that was previously offered with this course is now offered as a separate course with credits in the spring semester.
Distribution Requirements: (BSC-AG)
Exploratory Studies: (CU-ITL)

Last Four Terms Offered: Fall 2023, Fall 2021, Fall 2019, Fall 2017
Learning Outcomes:
- Evaluate any area of the globe and predict the general vegetation types that should occur based on an understanding of the relationship between climate and plant distribution, adaptation, and form.
- Evaluate individual plants for morphological adaptation syndromes to drought, salinity, predation, and excess water.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2301 - Field Lab in Global Plant Biodiversity and Vegetation (2 Credits)
An intensive three-week field course in Latin America over winter break (most years taken in Patagonia) studying local vegetation and flora and the relationship of vegetation to climate, geography and geology. In the field, students will receive lectures on the vegetation, learn to identify dominant plants, and undertake a directed set of vegetation transects that record species diversity and ecological parameters.
Prerequisites: PLSCI 2300.
Exploratory Studies: (CU-ITL, CU-UG)

Last Four Terms Offered: Winter 2025, Winter 2024, Winter 2023, Winter 2020
Learning Outcomes:
- Interpret the distribution of vegetation in relation to climate and soils.
- Observe carefully in the field, take precise and easily interpretable field notes, conduct collaborative scientific data collection and analysis.
- Identify plant species in the field.
- Exercise specific methods of data collection using ecological transects.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2302 - Vegetational Analysis of the Patagonian Region (1 Credit)
This is a reflective lecture course, following the winter session field course, PLSCI 2301. Students will write a reflection and give an oral presentation; assemble and analyze field data; and as a group, write a scientific report. In addition, the students will produce a report on the trip, detailing places visited and illustrating the trip with color images.
Prerequisites: PLSCI 2300 and PLSCI 2301.
Exploratory Studies: (CU-ITL, CU-UG)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2020
Learning Outcomes:

- Interpret the distribution of vegetation in relation to climate and soils.
- Observe carefully in the field, take precise and easily interpretable field notes, conduct collaborative scientific data collection and analysis.
- Identify plant species in the field.
- Exercise specific methods of data collection using ecological transects.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2400 - Green World, Blue Planet (3 Credits)
Focuses on helping individuals understand how scientific information relates to the issues they face as citizens, in management decision making, and in public policy. To what extent should genetic engineering of crop plants be permitted? Should we place limits on fossil fuel consumption as a means of limiting global warming and global climate change? Must human endeavors be restricted in certain areas to maintain diversity? The format of this course is interactive, with lectures and discussions about how we as a society deal with controversial issues. This course is suitable for life sciences majors.
Distribution Requirements: (BIO-AG, BSC-AG, OPHLS-AG, SCH-AG), (SCT-IL)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Summer 2025, Winter 2025, Fall 2024, Summer 2024
Learning Outcomes:

- Explain, evaluate, and effectively interpret basic concepts in cell and molecular biology.
- Explain, evaluate, and effectively interpret basic concepts in general ecology and biodiversity.
- Integrate qualitative information to reach defensible and creative conclusions about the impacts of climate change, genetic engineering, and biodiversity on the natural world and society.
- Communicate effectively through writing, speech, and visual information via written exams, writing assignments and class discussion concerning the above topics.
- Articulate the views of people with diverse perspectives on the above issues.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2410 - Introductory Plant Diversity and Evolution (4 Credits)
Introduction to plant diversity, ecology, structure, and evolutionary adaptation, with an emphasis on land plants. Laboratory and lectures are integrated to provide hands-on skills and concepts. First and second weeks of laboratory are field trips, starting with the first full week of classes. This course is suitable for life sciences majors.
Distribution Requirements: (BIO-AG, BSC-AG, OPHLS-AG), (SCT-IL)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Identify cells, tissues, and organ systems that comprise multicellular plants, and discuss how these emergent systems support plant functions.
- Distinguish among the major land plant lineages.
- Identify the three major plant life cycles and to conceptually connect how these life cycles are related to one another.
- Communicate the basic principles of Darwinian evolution by means of natural selection and the major principles of plant biology.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2430 - Ecology and Evolution of Plants (3 Credits)
In this course, we will explore the fundamental principles of ecology and evolutionary biology from a plant perspective. We will introduce you to plant ecology at scales ranging from individual organisms, to populations, communities, and ecosystems. At each level, we will explore interactions between plants and their environments, with a focus on societally-relevant issues and the ecological theories needed to understand them. This course also provides a comprehensive overview of microevolution (evolution at or below the species level) and macroevolution (evolution above the species level) with an emphasis on plants as exemplars for understanding evolutionary theory and the interpretation of data pertaining to evolutionary patterns and processes.
Prerequisites: PLSCI 1101, PLSCI 1420, and PLSCI 2410, or equivalent.
Distribution Requirements: (BSC-AG, OPHLS-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023
Learning Outcomes:

- Explain the various lines of evidence supporting the theory of evolution: evidence drawn from molecular biology, phylogenetics, population genetics, trait diversity, biogeography, and the fossil record.
- Explain the main areas of plant ecology (organismal, population, community, and ecosystem ecology) and provide examples of how plants interact with other organisms and their environment at each scale.
- Evaluate the effects of various global change drivers on evolutionary and ecological interactions and compare approaches for studying them.
- Link your observations of plants and plant communities to ecological and evolutionary processes. (Corollary: you will become a horrible hiking companion.)

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2470 - Plants and Cultures around the World (3 Credits)
This course explores the economic and agricultural importance of plants to people. Topics include the roles of plants as sources of food, shelter, fiber, and medicines, as well as the cultural and historical aspects of economic botany, and will instill an appreciation of our connection with plants. This course is suitable for non-life sciences majors.
Distribution Requirements: (BIO-AG, BSC-AG, OPHLS-AG)
Exploratory Studies: (LAAREA)

Last Four Terms Offered: Spring 2023, Fall 2021, Fall 2019, Fall 2017
Learning Outcomes:

- Articulate the connections between plants and people that are commonly encountered.
- Describe the fundamental concepts of the value of plants within different areas (agriculture, medicine, etc.)
- Identify the interactions among plants, people and the biosphere.
- Explain the role of people and plants in relationship to climate change.
- Apply the principles of economic botany to everyday situations.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2480 - Vascular Plant Systematics (4 Credits)
An introduction to the goals and methods of plant systematics, and a survey of the diversity of vascular plants, including ferns, conifers, flowering plants, and related groups. Lectures cover plant reproduction and evolution, patterns of plant diversity, biogeography, and the methods used to analyze and interpret these patterns. The laboratory presents a survey of the diversity of vascular plants with a focus on major plant families, emphasizing groups that are prominent in natural habitats and in cultivation.
Prerequisites: BIOEE 1780 or PLSCI 2410.
Distribution Requirements: (BSC-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe the goals of systematics and the methods used to analyze and interpret the history of plant diversification.
- Interpret and describe the vegetative and reproductive structures of plants using standard botanical terminology.
- Discuss the methods used to interpret major evolutionary changes in plant characteristics, with reference to the time, geographic location, and ecological setting in which these changes occurred.
- Discuss the nature of plant species, the principal mechanisms of plant speciation, and the methods used to describe, name, and classify species and higher-level groups.
- Describe the role of plant biodiversity and the study of systematics in conservation and sustainability initiatives.
- Work collaboratively to discuss the patterns and processes leading to our current biodiversity on earth.
- Distinguish 60 families of vascular plants.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2490 - Hollywood Biology: Science in Cinema (3 Credits)
Biological subjects presented in Hollywood films. Lecture topics include the scientific method, Darwinism, development, paleobiology, animal cloning, genome sequencing, forensic DNA, artificial intelligence, eugenics, and epidemiology as background to discussions of their presentation in selected films. Themes: genetics/genomics; evolution; development; epidemiology; physical anthropology; and genetic engineering. This course is suitable for non-life sciences majors.
Distribution Requirements: (BIO-AG, BSC-AG, OPHLS-AG)
Last Four Terms Offered: Spring 2025, Spring 2023, Spring 2022, Spring 2019
Learning Outcomes:

- Analyze and discuss a wide variety of biological concepts, methodologies, and theories--and their cultural and ethical implications--as confronted in cinema, the popular media, and modern society.
- Explain biological concepts to a lay audience via written and oral communication.
- Describe the scientific method as a human activity designed to test hypotheses about the natural world.
- Discuss the theory of biological evolution as a foundational concept to understanding all biological principles.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2500 - Fundamentals and Applications of Genetics (3 Credits)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2600 - Soil Science (4 Credits)
Designed for undergraduate and graduate students interested in a comprehensive introduction to Soil Science from both an environmental and management perspective as well as graduate students who wish to advanced their understanding of the biogeochemical (biologic, hydrologic and mineral interfaces and linkages underpinning and controlling the soil, plant and atmospheric continuum. This course examines the dynamic relationship of soils with the environment and will place particular focus on both the larger landscape as well as site specific implications of this relationship. The course is flipped with online lectures, in-class homework, projects and activities as well as a weekly laboratory and is presented in three components.
Enrollment Information: Enrollment limited to: sophomores, juniors, or seniors.
Distribution Requirements: (OPHLS-AG, PSC-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe and explain the distribution and variability of soils and their properties across the landscape.
- Display a knowledge of how these properties are created and how they affect landscape processes (both at a large and small scale).
- Demonstrate a preliminary ability to investigate soil characteristics.
- Exhibit an understanding of how we manage (or not) soils and their properties for multiple objectives.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2930 - It's Just Grass: Grassing the Urban Eden (2 Credits)
This course explores the elements of sustainable design, establishment and management of sports, golf and lawn turf. Focus on practical aspects through field tours, hand-on activities and real-world case studies.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2023, Spring 2021, Spring 2019
Learning Outcomes:
- Critically evaluate design specifications for turfgrass installations.
- Develop skills for effective client communication regarding sustainable design and management of turf.
- Develop hands-on plant identification and other practical turfgrass management skills.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2940 - Introduction to Agricultural Machinery (2 Credits)
Overview of agricultural machinery used in the production of field crops. Information is presented in a lecture and field laboratory format stressing hands-on equipment demonstrations and use, particularly of tractors. Tractor safety is emphasized during the initial three weeks of tractor instruction where the students practice learning to competently drive a tractor. Successful completion provides a broad understanding of agricultural machinery operation and design rationale.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:
- Explain the design rationale and general operation of standard agricultural machinery.
- Decide which types of equipment should be used for various farm tasks and applications.
- Articulate the current and developing trends in agricultural machinery technology.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 2990 - Introduction to Research Methods in Plant Science (1-3 Credits)
Intended for students who are new to undergraduate research. Students enrolled in PLSCI 2990 may be reading scientific literature, learning research techniques, or assisting with ongoing research. The faculty supervisor determines the work goals and the form of the final report.
Exploratory Studies: (CU-UG)

Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:
- Conduct research in plant science, including framing and formulation of scientific questions, developing testable hypotheses, design and execution of original experiments, and interpretation and explanation of scientific data in relation to the scientific literature.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3000 - Annual and Perennial Plants in the Landscape (1.5 Credits)
This course is an introduction to the identification, cultural requirements, and use of northern climate annual and perennial herbaceous plants in the landscape. Herbaceous plants are important parts of the landscape. They provide pollination resources and aid in habitat for fauna. In addition, they can add biodiversity and reduce stormwater runoff when used appropriately.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2022, Fall 2021, Fall 2020
Learning Outcomes:
- Recognize by sight the genus, species, and common name of approximately 100-plus herbaceous garden plants.
- Describe the site conditions under which to grow each of these plants.
- Comprehend aspects of design, establishment and management of annuals and perennials in the landscape.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3010 - Biology and Management of Plant Diseases (4 Credits)
Introduction to the biology of the pathogens that cause plant diseases, and the diagnosis and management of plant diseases. Topics include the biology of bacteria, fungi, oomycetes, viruses, and nematodes; disease cycles; plant disease epidemiology; and the principles and practices of plant disease management. Intended for students who want a practical knowledge of plant diseases and their control, as well as for students preparing for advanced courses in plant pathology and plant-microbe biology.
Prerequisites: one year of biology.
Distribution Requirements: (OPHLS-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:
- Examine the concept of disease in the context of natural and agriculturally relevant plant systems.
- Demonstrate a good working knowledge of the biology of key plant pathogen groups: viruses, bacteria, nematodes, fungi, stramenopiles, and plants.
- Recognize the basics of plant disease diagnostics and integrated approaches to plant disease management.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3025 - Hydroponic Food Crop Production and Management (4 Credits)
Covers principles and practices of commercial hydroponic vegetable and herb production in controlled environment agriculture (CEA). Topics include: growing environments (high tunnels, greenhouses, and warehouse/vertical farms), manipulation of and crop response to the aerial and root-zone environments including estimating energy use in diverse growing environments, nutrient solution preparation and management, aquaponics and organic hydroponics, crop maintenance, production scheduling, integrated pest management, business plan development, and markets. Laboratory session will reinforce lectures through hands-on practice of concepts. Students will be responsible for growing several crops including leafy greens, herbs, and vine crops (such as tomatoes and cucumbers).
Distribution Requirements: (AFS-AG, BSC-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Explain how hydroponic systems are designed to meet the physical, chemical, and biological needs of plant roots. Discuss the benefits and constraints of several different hydroponic systems.
- Articulate the ideal growing environment and plant response to temperature, light, and carbon dioxide for several of the most common hydroponic crops.
- Estimate the energy costs and crop yields in different growing environments.
- Demonstrate plant care and maintenance practices necessary to produce healthy hydroponic crops.
- Use a spreadsheet to develop fertilizer recipes for common hydroponic crops.
- Use a spreadsheet to estimate production costs and revenue of a hydroponic crop.
- Articulate how hydroponics relates to sustainable, organic, and local food production.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3030 - FoodCycle: Systems Thinking Toward Circular Economy for Organic Resources (3 Credits)
Crosslisted with GDEV 3030
In seeking to understand issues and opportunities at the nexus of agriculture, sanitation, water, health and the natural and built environments, students will gain skills in systems thinking, participatory design and innovation towards systems change. Through individual and collective work, students will conduct general and specific systems analysis and construct systems models to identify opportunities to reduce carbon pollution, improve system health. Students will seek to learn from cases and literature from diverse national and international contexts. The Cornell campus will be considered a living laboratory for an inquiry into how organic resources flow through our facilities, and how waste flows might be utilized to produce energy, fertilizer, food, building materials and/or other valued products. Students will engage with local entities (facilities, organizations, farms and other enterprises) to gain specific information that will inform our analysis. Students will engage in hands-on work to learn about ways in which organic resources can be up-cycled.
Distribution Requirements: (AFS-AG, SBA-AG)
Exploratory Studies: (CU-CEL)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe concepts and skills related to systems thinking, analysis and intervention, including ability to understand and design pathways to change in diverse contexts.
- Explain systems related to organic resource management, such as those involved in food, agriculture, sanitation, the built environment, and health-related surveillance.
- Analyze and conceptualize context-related similarities and differences that influence problems, opportunities and pathways to change.
- Design a waste-to-value chain (e.g., porta-potties/toilets ; loo-litter from corn cobs [similar in purpose and format to kitty litter]; making building materials from agricultural wastes).
- Create up-cycling activities, including design, invention, production and utilization.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3050 - Arboriculture: Applied Tree Care (1.5 Credits)
Gain hands-on experience with tree establishment, nutrition, plant health care, diagnosing tree disorders, pruning techniques, tree worker safety and urban forestry.
Prerequisites: Recommended prerequisite: LA 4910.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2022, Fall 2020, Fall 2018
Learning Outcomes:

- Demonstrate knowledge of plant morphology, anatomy, physiology, and growth and how those play roles in tree selection and care.
- Inspect trees for condition, make risk assessment, and recommend actions.
- Describe the nutritional requirements of plants, soil water relationships in plants, and soil management.
- Describe the techniques and materials used in proper tree climbing and management, including pruning, and support systems.
- Gain knowledge to pass the ISA-certified arborist examination.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3100 - Medicinal Botany and Drug Discovery (2 Credits)
Plants have been a source of medicinal agents for thousands of years and a remarkable number of modern drugs have been isolated or derived from plants. In this course, we will explore the mechanisms of action and effects of injurious plants (e.g., poisons, causing allergic reactions), of medicinal plants found to have remedial properties, and discuss which body system(s) they affect (e.g., digestive, urinary), and psychoactive plants affecting the central nervous system (e.g., hallucinogens, stimulants). We will get familiar with the chemistry, pharmacology and efficacy demonstrated in clinical trials of the most used plant-derived drugs, and the mechanisms of the diseases targeted with these treatments. Furthermore, we will discuss the biosynthesis and distribution of plant secondary metabolites, the use of techniques in the isolation and structure elucidation of natural products, and of biological assays used in the discovery of chemicals with pharmacological activity, and the steps involved in drug production and approval.
Prerequisites: a minimum of one semester of introductory biology (either BIOG 1140, BIOG 1440, or BIOMG 1350) or one semester of organic chemistry (either CHEM 1570, CHEM 3530, or CHEM 3570); or permission of instructor.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe the biosynthesis and distribution of plant secondary metabolites, the use of techniques in isolation and structure elucidation of natural products, and biological assays in the discovery of chemicals with pharmacological activity.
- Explain the chemistry, pharmacology, mode of action and efficacy demonstrated in clinical trials of the most used plant-derived drugs in the North American market, which organ(s) they affect in the human body, and the mechanisms of the diseases targeted with these treatments.
- Compare selected medicinal plants, their historical value, how their active components are extracted or/and manipulated to give specific drugs and the process involved in drug production and approval.
- Critically evaluate and present information from peer-reviewed scientific articles.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3150 - Weed Biology and Management (4 Credits)
This course examines components of the biology, ecology, and management of weeds in crop and non-crop ecosystems, particularly in the Northeastern United States. The first part of the course focuses on biological/ecological factors that govern seed dormancy, plant growth, population dynamics, competitiveness, reproduction, and survival. Close attention is given to accurate identification of plants and to characteristics that make weeds competitive, undesirable, or both. The second part of the course examines strategies to control weeds, including their benefits and drawbacks. Aspects of chemical control, including classification, mode of action, selectivity, symptomotology, and resistance, are presented. Herbicide-tolerant crop (i.e., GMO) issues and health and environmental concerns of herbicide use are addressed. The use of integrated approaches to weed management is emphasized.
Prerequisites: introductory course in biology or botany.
Distribution Requirements: (BSC-AG, OPHLS-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Identify the different life stages of at least 90 weed species commonly found in the Northeastern United States and southern Canada.
- Identify and describe the major biological factors and ecological principles that influence weed growth, population dynamics, invasiveness, and survival.
- Describe the various strategies currently being used to control and/or suppress weeds in different crop and non-crop systems.
- Identify the classification, mode of action, selectivity, and symptomatology of commonly used herbicides.
- Calculate and apply the appropriate amount of a given herbicide that is required to treat a specific area using a backpack sprayer.
- Describe the diversity and impact that weeds have in different ecosystems.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3190 - Mushrooms of Field and Forest (2 Credits)
Students learn to identify mushrooms and other macrofungi we collect on a series of six afternoon field trips to local forests. During evening labs, students practice identification skills, using keys and microscopes to observe and differentiate the diverse mushrooms we've collected. The course takes advantage of the peak Fall mushroom season in our region. Brief in-lab lectures introduce fungal diversity and the roles mushrooms play in Earth's ecosystems.
Enrollment Information: Enrollment preference given to: undergraduates.
Distribution Requirements: (OPHLS-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Recognize a fungus when you see one.
- Distinguish a handful of common mushrooms in the field.
- Observe and describe in vivid detail the characteristics of any mushroom.
- Select an appropriate field guide or key, then integrate your observations to identify unknown mushrooms.
- Develop a collection of macrofungi from the local environment.
- Discuss the roles of fungi in the ecosystem.
- Explain to others, convincingly, why fungi are cool.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3210 - Soil and Crop Management for Sustainability (3 Credits)
Students learn about agronomy and recent advances in sustainable soil and crop management, and gain a lot of practical farming knowledge. Integrated perspectives on the physical, biological, and chemical aspects of soil management in the broader context of agroecosystems are explored. Soil and crop management practices and resulting interactions between soil, water, organisms, and organic and chemical inputs form the basis for discussions on diverse cropping systems, soil health, water quality and quantity, bioenergy, greenhouse gases, and sustainability.
Prerequisites: PLSCI 1900 or PLSCI 2600.
Distribution Requirements: (AFS-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Spring 2022
Learning Outcomes:

- Articulate the grand challenge of sustaining future world populations.
- Synthesize and evaluate concepts of sustainable soil and crop management, relate and integrate them into your personal experience through assigned readings, homework, writing, in-class discussion, and group collaborative work.
- Recognize and describe basic soil physical, biological, and chemical processes through analysis, graphing (in Excel), and interpretation of data for laboratory and homework activities.
- Summarize factors affecting soil management and crop production, and describe common criteria used to evaluate the sustainability of cropping systems.
- Use technologies (including Adapt-N) and cite policies related to the management of soil and crops.
- Apply what you learn from reading, lectures, hands-on experience and the use of commonly used management tools to assess, plan, and modify sustainable soil management practices.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3350 - Sustainable Orchard Management (2-3 Credits)
The science of tree-fruit production with an emphasis on the agroecology and physiology of regionally important species. Topics include: site selection; orchard design; clonal rootstock and variety selection; nursery production and grafting, tree pruning and training; flowering and pollination; crop load management; water, nutrient, and soil management; fruit ripening, maturity, and storage; marketing and profitability; integrated pest management; orchard mechanization; and sustainable production practices. Students will synthesize and apply knowledge from a broad range of life sciences within the context of perennial crop agroecosystems. Orchard field trips and lab sessions will provide practical, hands-on experience. This course is designed for students interested in commercial tree-fruit production and/or pomology research, hobby fruit growers, and professional IPM consultants.
Prerequisites: two college-level biology courses. Recommended prerequisite: previous horticulture/plant science courses.
Distribution Requirements: (AFS-AG, OPHLS-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2024, Spring 2023, Spring 2021, Spring 2019
Learning Outcomes:

- Make critical decisions required for profitable orchard management.
- Find and evaluate essential information resources about tree-fruit orchards.
- Integrate key ecological, physiological, environmental, and economic issues in sustainable orchard systems.
- Select the optimal systems for orchard management.
- Successfully plant, prune, and train fruit trees.
- Harvest, store, and market fruit efficiently.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3400 - Far Beyond Ithaca (FBI): Plant Explorations (0.5 Credits)
Sections in this course prepare students for faculty-led winter-session travel courses offered through the School of Integrative Plant Science. Students spend seven class sessions in the fall focusing on a particular challenge in plant sciences, such as climate change and the spread of plant diseases, drought and viticulture, and the tension between biodiversity, species conservation and large-scale agriculture. Students then enroll in the complementary winter-session course and travel to a domestic or international locale where they engage with communities confronting and working to solve these challenges today.
Enrollment Information: Enrollment preference given to: Plant Sciences and Agricultural Sciences majors.
Course Fee: Course Fee, TBA. TBA.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024
Learning Outcomes:

- Describe the state of plant communities and/or agroecosystems in the targeted region.
- Determine how humans are interfacing with these systems to create challenges or to help mitigate problems.
- Explain how events in the targeted region can have impacts at home.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3401 - Far Beyond Ithaca (FBI): Plant Explorations in Winter (1-2 Credits)
In sections of this course, students travel with faculty to a domestic or international locale to experience first-hand the issues around a particular challenge in plant sciences, such as climate change and the spread of plant diseases, drought and viticulture, and the tension between biodiversity, species conservation and large-scale agriculture. Students engage with communities, collect and analyze data, and collaborate with peers in a final presentation at the end of the course.
Enrollment Information: Enrollment preference given to: Plant Sciences and Agricultural Sciences majors.
Course Fee: Course Fee, TBA. Fees for associated winter trip will vary by class section.
Last Four Terms Offered: Winter 2025
Learning Outcomes:

- Describe the state of plant communities and/or agroecosystems in the targeted region.
- Determine how humans are interfacing with these systems to create challenges or to help mitigate problems.
- Explain how events in the targeted region can have impacts at home.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3402 - Far Beyond Ithaca (FBI): International Plant Explorations in Spring (2 Credits)
In sections of this course, students learn about the issues around a particular challenge in plant sciences, such as climate change and the spread of plant diseases, drought and viticulture, and the tension between biodiversity, species conservation and large-scale agriculture, then travel with faculty to a domestic or international locale over Spring Break to experience those issues first-hand. Students engage with communities, collect and analyze data, and collaborate with peers in a final presentation at the end of the course.
Enrollment Information: Enrollment preference given to: Plant Sciences and Agricultural Sciences majors.
Course Fee: Course Fee, TBA. Fees for associated spring-break trip will vary by class section. Students must participate in the spring-break trip to earn a satisfactory grade in the course.
Last Four Terms Offered: Spring 2025, Spring 2024
Learning Outcomes:

- Describe the state of plant communities and/or agroecosystems in the targeted region.
- Determine how humans are interfacing with these systems to create challenges or to help mitigate problems.
- Explain how events in the targeted region can have impacts at home.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3420 - Plant Physiology, Lectures (3 Credits)
Integrated and interdisciplinary study of the processes that contribute to the growth, competition, and reproduction of plants. Topics include, but are not limited to, plant-water relations, membrane properties and processes, photosynthesis, plant respiration, mineral and organic nutrition, stress physiology, control of growth and development, and responses to the environment. Emphasis is on the relationship between structure and function from the molecular to the whole-plant level.
Prerequisites: BIOG 1140 or BIOG 1440, plus PLSCI 1420 and PLSCI 2410, or permission of instructor. Corequisite: PLSCI 3421.
Distribution Requirements: (BSC-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe, and give relevant examples of, how each process in a plant integrates with other relevant processes to determine the overall response of the plant to a particular set of conditions.
- Demonstrate how energy affects processes at all levels of biological organization from the molecule and cell to organisms and ecosystems.
- Predict how the basic rules of chemistry and physics constrain the physiological behavior of plants.
- Explain how cells/organisms perceive and respond to their environment, and the signal transduction, intercellular communication and information processing mechanisms involved.
- Explain how evolution underlies all aspects of biology and accounts for the unity and diversity of life.
- Discuss new findings and newly discovered mechanisms and signaling pathways that are shaping our understanding of plant development, and plant responses to the environment.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3421 - Plant Physiology, Laboratory (1 Credit)
Experiments exemplify concepts covered in PLSCI 3420 and offer experience in a variety of biological and biochemical techniques, from the cellular to whole plant level, with emphasis on experimental design.
Corequisites: PLSCI 3420.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Explain, evaluate, and effectively interpret concepts relating to plant physiology.
- Learn and perform basic laboratory techniques to test hypotheses and make critical observations.
- Demonstrate the ability to think critically, and analyze data as it relates to basic concepts in plant physiology.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3430 - Molecular Biology and Genetic Engineering of Plants (2 Credits)
Introduction to current studies involving recombinant DNA technology and its application to the improvement of plants. Emphasizes genetic transformation methodology, gene expression systems, and strategies for increasing productivity.
Prerequisites: two courses in genetics, molecular biology or biochemistry.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Explain the basic principles that underlie developmental processes in plants.
- Explain the basic concepts and methods of molecular biology and genetics as they relate to the following questions.
- How to transfer genes to plants.
- How to design vectors for transforming plants.
- How to analyze plant gene function.
- How to express foreign genes in new plant hosts.
- How to perform transient gene expression.
- How to regenerate whole plants from single cells.
- How to produce stable transgenic lines with single transgene integrations.
- How to protect plants against viruses and pests.
- How to improve quality traits in crop plants.
- How to safeguard the environment and insure food safety.
- How to evaluate claims relating to the GMO debate.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3431 - Laboratory in Molecular Biology and Genetic Engineering of Plants (2 Credits)
Companion to Molecular Biology and Genetic Engineering of Plants course with laboratory activities that focus on the practice of plant biotechnology. Students construct transgenes using recombinant DNA methods, transfer genes to plants by a variety of approaches including tissue culture-based methods, assess the integration of transgenes in the host genome and analyze their expression by use of reporter gene assays and by preparing and analyzing nucleic acids. Students will also gain basic skills in bioinformatics.
Prerequisites: Prerequisite or corequisite: two courses in genetics, molecular biology or biochemistry, such as PLSCI 3430.
Enrollment Information: Enrollment preference given to: juniors and seniors.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe the fundamental concepts underlying modern plant molecular biology.
- Use experimental methods typically used in plant molecular biological studies.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3440 - Evolutionary Plant Biology (3 Credits)
This course provides a comprehensive overview of evolution with an emphasis on plants as excellent exemplars for understanding evolutionary theory and the interpretation of data pertaining to evolution. The topics will include population generics, developmental biology (including comparative embryology and anatomy), theories about speciation (including allopatric, sympatric, and peripatric models), the empirical study of speciation (examples include autopolyploidy, and allopolyploidy), macroevolution (including species selection, kin selection, and multilevel selection theory), the evolution of multicellularity, physical constraints on evolution, evolutionary ecology, and major evolutionary transitions as recorded in the fossil record.
Prerequisites: Recommended prerequisite: PLSCI 2250 or BIOMG 2800.
Enrollment Information: Enrollment limited to: sophomores, juniors and seniors.
Distribution Requirements: (BSC-AG, OPHLS-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Critically evaluate information pertaining to evolution.
- Describe the various lines of evidence supporting the theory of evolution, including evidence drawn from molecular and population genetics, comparative studies of embryology, morphology, and anatomy, biogeography, and the fossil record.
- Demonstrate how changes at the DNA sequence level constitute the core of evolution.
- Articulate the importance of plants to evolution and understanding of evolutionary theory.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3450 - Basic Plant Anatomy (3 Credits)
Descriptive course with equal emphasis on development and mature structure. Lecture, laboratory, and reading are integrated in a study guide. The laboratory offers the opportunity to develop the practical skills required to make anatomical diagnoses and to write anatomical descriptions.
Prerequisites: introductory course in biology or botany.
Distribution Requirements: (BSC-AG)
Last Four Terms Offered: Fall 2024, Fall 2022, Fall 2018, Fall 2015
Learning Outcomes:

- Describe the variety of anatomical data and concepts to identify the organization of plant histology and morphology.
- Perform practical diagnosis on anatomical unknowns.
- Use the necessary tools to identify plant anatomical forms, function and evolutionary diversity based on comparative studies of several taxa among vascular plants.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3550 - Postharvest Biology of Horticultural Crops (3 Credits)
Study of the biological processes controlling physical and chemical changes in harvested yet living horticultural crops or their parts. Discusses the theoretical principles and fundamental processes underlying these changes. Also covers strategies and practical handling requirements/conditions for storage, transportation, and quality monitoring of harvested horticultural crops.
Distribution Requirements: (AFS-AG, BSC-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2024
Learning Outcomes:

- Describe what changes are occurring in vegetables and fruits after harvest in terms of nutritional (and in some cases medicinal) values, and how those changes happen.
- Explain general guidance and underlying basic principles on how to handle and store horticultural products (fruits, vegetables, and ornamentals).

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3575 - Principles of Vegetable Production (3 Credits)
Commercial vegetable production from variety selection to postharvest. Topics include crop physiology and culture, soil and pest management, stand establishment, marketing, and history of production. Term project required. Field trips to large-scale conventional, small, diversified, and organic farms are planned early in the semester.
Prerequisites: PLSCI 1101, PLSCI 2600, or equivalent.
Distribution Requirements: (AFS-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2022, Fall 2020, Fall 2018
Learning Outcomes:

- Describe the scale of the vegetable industry from the local to international markets and the challenges facing producers.
- Appraise how successful vegetable production is related to soil health, cultural practices, pest management and marketing and develop a farm plan that considers all aspects of production and marketing for one vegetable crop.
- Demonstrate the ability to diagnose common vegetable problems and offer solutions.
- Develop the ability to grow a wide variety of vegetables either commercially or as a gardener.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3630 - Soil Genesis, Classification, and Survey (4 Credits)
Discusses factors and processes of soil formation on which soil survey is based. Practices principles of field identification, classification, survey, and interpretation in a field setting. Provides an overview of soil databases, their content, development, and use for site evaluation and land classification.
Prerequisites: PLSCI 2600.
Distribution Requirements: (PSC-AG)
Last Four Terms Offered: Spring 2025, Fall 2022, Fall 2020, Fall 2018
Learning Outcomes:

- Demonstrate knowledge of and apply needed tools and skills to better understand the nature of soil and soil management needs.
- Demonstrate skills and identify tools to monitor and assess soil properties.
- Produce good written academic and research projects to effectively demonstrate knowledge and the ability to communicate such knowledge.
- Articulate the distribution and diversity of soils.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3650 - Environmental Chemistry: Soil, Air, and Water (3 Credits)
This course provides an overview of the chemistry of the biosphere and biogeochemical processes that control the concentrations, fluxes, and bioavailability of essential elements and contaminants in soil, air, and water. Describes the history of environmental contamination by xenobiotics and heavy metals, with emphasis on behavior and properties of pollutants that pose the greatest risk to human and ecological health. The course content includes student-led discussion of relevant current events.
Prerequisites: CHEM 1560 or CHEM 2070-CHEM 2080.
Distribution Requirements: (PSC-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2021
Learning Outcomes:

- Explain the basic chemical nature and composition of soils, water, and the atmosphere.
- Describe how elements and organic chemicals, both natural and anthropogenic, are mobilized, cycled, and modified or degraded in the soil, water and air of the biosphere.
- Articulate the degree to which human activity changes our environment as a result of contamination, impacting ecosystems, and the health of plants and animals.
- Link theoretical concepts to environmental problems.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3800 - Principles and Practices in Certified Organic Agriculture (3 Credits)
Organic farming is an increasingly important part of US agriculture and the food system. Students learn about the history of organic agriculture, the USDA National Organic Program, management practices used in organic crop and livestock production, and the scientific research on organic agriculture. Laboratory sessions complement lecture discussions with field trips to a variety of organic farms. Students read journal articles about organic agriculture, work through certification issues, and grow organic vegetable seedlings on campus.
Distribution Requirements: (AFS-AG)
Last Four Terms Offered: Spring 2024, Spring 2022, Spring 2020, Spring 2019
Learning Outcomes:
- Summarize the history of organic agriculture.
- Explain the certification process and the National Organic Program standards.
- Develop appropriate management solutions to production problems.
- Discuss the scientific evidence for and against organic agriculture.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 3880 - Genetic Engineering of Food Crops: Myths, Truths and Detection (1 Credit)
Genetically modified (GM) crops have been a hot topic with controversy. One of the major concerns is on the GM crops' safety when served as our food or food ingredients. The objective of this one-credit course is to discuss the principles and nature of crop genetic engineering vs. conventional plant breeding, and to show case studies of genetically engineered food crops with emphases on how they are generated, how the nutritional values are improved, and how to detect or examine if one's food may be genetically engineered or may contain GM crop-derived ingredients. This is a middle-level course that emphasizes the science-based principles and practices. An understanding of the basic biological processes involved in GM crops-related food will help students to rationally deal with GMO food and related issues.
Prerequisites: college-level introductory biology.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Articulate the nature of genetic engineering of crops vs. conventional plant breeding.
- Evaluate and assess the nutritional and economical values of various improved crops by genetic engineering.
- Identify and use various techniques to monitor/determine if their food is GM crops or contains ingredients derived from GM crops.
- Develop science-based critical thinking of the GMO issues in general and engineered food crops in particular.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4000 - Concepts and Techniques in Computational Biology (4 Credits)
This course is geared towards graduate students and advanced biology undergraduates seeking a better understanding of computational biology. Lectures will be a combination of presentations, paper discussions and hands-on sessions. Labs and paper discussions will have a significant component of plant science, but students from non-plant fields are also encouraged to register. Students will learn to work in a Unix environment, code using Python/R, and deploy tools for genome assembly, RNA-seq data analysis, local and global sequence alignment, protein domain searching using Hidden Markov Models, phylogenetic reconstruction, metabolomic analysis, and machine learning. Lectures will cover the algorithmic concepts underlying popular tools. The students will also learn practical aspects of implementing these tools in their own research using facilities available at Cornell.
Prerequisites: biology courses: BIOMG 2800 or PLSCI 2250, BIOMG 3320 or BIOMG 3350, or equivalent. Computational courses: CS 1110, CS 1133 or equivalent. Statistics courses: BTRY 3010, STSCI 2150, or equivalent.
Distribution Requirements: (DLG-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Implement popular bioinformatics tools using Unix, Python and R.
- Explain the theory behind different bioinformatics tools.
- Identify the applicability, strengths and weaknesses of different bioinformatics algorithms.
- Integrate popular bioinformatics tools into their own research.
- Critique plant science research papers utilizing bioinformatics tools, and identify the caveats of the performed analyses.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4020 - Plant Propagation (3 Credits)
Plant propagation, the multiplication of plants, is both a science and an art. This class will introduce the principles, practices and techniques of sexual and asexual propagation of horticultural plants. Emphasis is placed on learning the techniques that are involved with the many aspects of plant propagation as well as the science behind the methods. The art of plant propagation will be learned through hands-on experiences with seed propagation, cutting propagation, grafting & budding systems, layering, specialized plant structures (bulbs, corms, etc.), and tissue culture for micropropagation. In addition, propagation media, greenhouse environmental control and management, and plant care, as they relate to propagation, will be emphasized. The science behind the methods that are learned will be explained in order to develop a better understanding of plant propagation and how to make it successful. This knowledge base and the practical, hands-on experiences will give students the ability to better solve problems that arise during the propagation and growth of plants.
Prerequisites: PLSCI 2410.
Distribution Requirements: (AFS-AG, BSC-AG, OPHLS-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2021, Fall 2019
Learning Outcomes:

- Demonstrate proficiency in the propagation of plants through seeds, cuttings, grafting, layering, and micropropagation.
- Recognize how the different environmental conditions, types of plants, and growth stages of plants affect the success of plant propagation.
- Think critically about plant propagation and the different techniques and applications that are used for its success.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4030 - Genetic Improvement of Crop Plants (3 Credits)
Genetic enhancement of crop value to humans began with domestication and continues with farmers' variety development and scientifically trained plant breeders' applications of Mendelian, quantitative, and molecular genetics. This course examines crop genetic improvement methods by discussing the history and current practice of plant breeding, tools available to breeders, decision-making about breeding objectives and methods, and the roles of plant breeding in addressing global challenges including climate change, sustainability, equity, food security, and malnutrition.
Prerequisites: BIOMG 2800 or PLSCI 2250 or other standard genetics course, plus a course in crops or horticulture.
Distribution Requirements: (AFS-AG, BSC-AG, OPHLS-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Value the contribution of Indigenous groups in domestication of modern crops and their cultural significance.
- Explain the genetics that control plant characteristics and how genes can be manipulated to improve plant traits.
- Describe the reproductive mechanisms in crop and horticultural plants.
- Explain the range of phenotypic traits that are important targets for genetic improvement of plants, and the social and environmental contexts of their trait values
- Describe the range of phenotypic and genomic selection techniques and approaches used by plant breeders.
- Explain the different approaches used to breed self- and cross-pollinated crops and the development of hybrids.
- Describe recurrent selection techniques.
- Describe the roles of tissue culture and genetic transformation in plant improvement.
- Explore the contributions of plant breeding to agriculture and food systems.
- Summarize concisely in writing the objectives, main results, and conclusions described in primary research papers in plant breeding and genetics.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4040 - Crop Diversity and Genetic Resources (2 Credits)
Crop genetic diversity is critical for the sustainability, productivity, and resilience of agriculture and food systems. Crop diversity can be measured from the cellular to the landscape scale. Crop diversity relates not only to genetics, ecology, and agricultural management, but also policy, economics, ethics, and culture. This class explores these complex interactions and discusses tools used to evaluate, manage, and conserve crop diversity.
Prerequisites: either one plant breeding course or one crop production-related course.
Learning Outcomes:

- Describe the importance of crop diversity in agriculture and food systems in the US and globally.
- Differentiate between approaches to crop conservation.
- Describe the function and operation of gene banks and their role in breeding programs and agricultural research.
- Identify implications of crop conservation for ethical conduct of research.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4070 - Nutritional Quality Improvement of Food Crops (2 Credits)
The nutrients in human diets are ultimately derived from plants. However, the edible portions of the world's most extensively grown staple food crops are poor sources for numerous micronutrients and health-promoting compounds that are essential for sustaining and enhancing life. The improvement of crop nutritional quality through breeding, termed biofortification, is a sustainable strategy being used to address micronutrient deficiences worldwide. This course covers recent progress on crop nutritional quality trait improvement. The lectures will focus on vitamins, minerals, prebiotics, phytonutrients, essential amino acids, and fatty acids in the context of better human nutrition and health.
Prerequisites: one majors-level biology course or permission of instructors.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Articulate why there is a compelling need for improving the nutritional quality of food crops.
- Explain the approaches and mechanisms used for nutritional quality improvement.
- Describe the status of development and commercialization of nutrient-dense crops.
- Demonstrate improvement in the ability to write and speak to scientific audiences.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4080 - Methods of Plant Breeding Laboratory (2 Credits)
Field trips to plant breeding programs involve discussion of breeding methods used, overall goals, selection and screening techniques, and variety and germplasm release. Additional labs include selection techniques for various traits, intellectual property issues, genetically modified crops, and international agriculture. For a term project, each student designs a comprehensive breeding program on a chosen crop.
Prerequisites: Prerequisite or corequisite: PLSCI 4030 or equivalent.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Design a breeding program to improve both quantitative and qualitative traits in plants.
- Describe the impact that plant breeding has on community and global health and well-being.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4090 - Perennial Crop Breeding Seminar (1 Credit)
Perennial crops are critical components of sustainable farming systems, and have many environmental benefits including increased biodiversity, water quality, soil conservation, carbon sequestration, productivity, and resilience. Due to the biology of these species, plant breeders seeking to develop perennial crop cultivars face a unique set of challenges and opportunities. This course examines a wide range of perennial crop breeding programs and discusses tools available to breeders, decision-making in perennial crop breeding programs, and opportunities for plant breeding to enhance sustainability and perenniality in cropping systems.
Prerequisites: PLSCI 4030 or equivalent.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2023
Learning Outcomes:

- Describe the significance of perennial crops in agriculture and food systems in the US and globally.
- Examine traits that are important targets for genetic improvement of perennial crops and the genetics that control perenniality.
- Analyze the unique challenges faced perennial crop breeding and the range of breeding methods used for these plants.
- Describe the importance of perennial crop improvement in addressing environmental challenges and their role in carbon sequestration and climate change mitigation.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4100 - Plant Responses to Environmental Stresses and Global Climate Change (3 Credits)
Abiotic stresses including drought, temperature extremes, flooding, salinity, and toxic metals limit crop productivity, particularly in developing countries where people are resource-poor and have limited options. Anticipated global climate changes are expected to exacerbate the impact of stresses even further. Therefore, knowledge of stress response mechanisms is urgently needed for developing novel molecular breeding and genomics approaches for generating plants and management systems that will improve performance in hostile environmental conditions. This course explores the molecular, physiological, developmental and morphological characteristics that plants use to adapt to environmental stresses. Emphases are placed on stresses associated with global climate change including drought, flooding, extreme temperatures, salt, and environmental pollution. The course will also discuss strategies for improving stress tolerance in crops.
Prerequisites: PLSCI 3420 or equivalent, plus PLSCI 3430 or equivalent.
Distribution Requirements: (BSC-AG)
Last Four Terms Offered: Fall 2023, Fall 2021, Fall 2019, Fall 2017
Learning Outcomes:

- Have an in-depth understanding of the impact of various abiotic stresses on plant metabolism, growth, development, and yield.
- Describe adaptation/resistance mechanisms of plants to different abiotic factors.
- Compare common and unique effects of various abiotic stress and crosstalk between pathways that lead to plants adaptation/resistance.
- Understand approaches and scientific basis behind approaches for improving plant stress tolerance.
- Improve ability to analyze and critique the primary scientific literature, scientific writing, and communication skills.
- Explain, evaluate, and interpret original experimental data of the response of plants to environmental conditions, and design and interpret results of one's own experiments.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4125 - Cover Crops in Agroecosystems (3 Credits)
Cover crops are not harvested, but rather they are planted to protect soil and provide other benefits. Use of cover crops has increased dramatically as more people understand their value. In this course, students will 1) explore the management, environmental, economic, and social considerations of cover crops across a diversity of agricultural production systems; 2) grow cover crops, measure benefits and trade-offs, and apply knowledge to make management and policy recommendations; and 3) interact with and learn from faculty and students across multiple states through virtual synchronous meetings.
Prerequisites: PLSCI 1101.
Last Four Terms Offered: Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Define cover crop types and describe characteristics of cover crop species and functional groups and their agroecosystem services.
- Manage and make decisions about cover crops across a diversity of climates, soils, and cropping systems.
- Measure the short- and long-term economic impacts of cover crop management decisions.
- Quantify the environmental benefits of cover crops using digital tools and describe how those benefits are influenced by management decisions across environments.
- Apply cover crop system knowledge to design policy and social initiatives to help overcome barriers to cover crop adoption.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4140 - Global Cropping Systems and Sustainable Development (3 Credits)
Crosslisted with GDEV 4140
With accelerating demands for food, feed, and fiber along with increasing recognition of the importance of agricultural systems to ecosystem services and rural livelihoods, the requirements of agricultural systems are simultaneously intensifying and diversifying. This course introduces foundational concepts that explain the distribution, productivity, and ecological impacts of the world's major cropping systems from an interdisciplinary perspective, including soils, climate and water, markets, policies, and institutions. Through systems thinking and process-based agronomy, an emphasis is placed on assessing solutions for resolving core challenges to the sustainable development goals in the context of global change. Students gain insights into sustainable intensification technologies as well as the social process that support innovation. Evidence synthesis through a geographically-anchored case study and active participation in class discussions are required.
Prerequisites: at least one of the following courses or their equivalents: PLSCI 1900, PLSCI 2110, PLSCI 2600, PLSCI 3210 or PLSCI 3150.
Enrollment Information: Enrollment limited to: UG students.
Distribution Requirements: (AFS-AG, D-AG, SCH-AG)
Exploratory Studies: (CU-ITL, CU-SBY); (LAAREA)

Last Four Terms Offered: Spring 2025, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe the biophysical and socioeconomic factors that interact to define and differentiate global cropping systems.
- Articulate major drivers of change and how they are influencing, and will likely continue to influence, the structure and function of global cropping systems.
- Diagnose core challenges to improving food security, profitability, and ecosystem service outcomes as they differ across major cropping systems from an integrative sustainable development perspective.
- Translate principles to practice by critically reviewing sustainability challenges in selected cropping systems and developing insights into intervention priority setting that will drive more effective agricultural development programming.
- Collaborate and communicate with a peer group to frame problems and potential solutions in a common logical model that is supported by evidence and systems thinking.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4170 - Quantitative Genetics for Analysis and Improvement of Complex Traits (4 Credits)
This course will provide students with a solid foundation in quantitative genetics theory, as applied to the field of plant and animal breeding, introduce students to modern-day modeling approaches, simulation tools and applications of genomic selection. While the methodologies of plant and animal breeding are distinct in many ways, the core principles are the same, and this course will cover topics in a way that is inclusive of animal breeding applications.
Prerequisites: STSCI 2150 or BTRY 3010, plus familiarity with matrix algebra.
Distribution Requirements: (BSC-AG, DLG-AG)
Last Four Terms Offered: Spring 2025, Spring 2023, Spring 2022
Learning Outcomes:

- Interpret quantitative genetics research with substantial mathematical and statistical components.
- Analyze complex breeding datasets using advanced modeling methods.
- Estimate gain from selection and impact on genetic variance of breeding decisions.
- Design optimal breeding approaches.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4175 - Production and Management of Greenhouse Crops (4 Credits)
Covers basics of establishing a greenhouse operation, growing crops in optimized environments, and serving niche or mass market. Discusses technology basics including structures and equipment, systems for heating and cooling, lighting, irrigating and fertilizing, material handling, environmental stewardship, integrated pest management, and production management. Also covers world centers of greenhouse crop production; culture of cut, pot, bedding, vegetable, and fruit crops in greenhouses, emphasizing predictive harvesting through environmental, physical, and chemical management of growth and development. Each student grows one or more crops.
Prerequisites: PLSCI 1101 and junior standing.
Distribution Requirements: (AFS-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2024, Spring 2023, Spring 2021, Spring 2019
Learning Outcomes:
- Identify the major kinds of structures that are used for growing plants under protected cultivation and how a protected cultivation structure influences the plant-growing environment.
- Describe the major environmental factors that affect plant growth and control floral induction, initiation, and development and how they are manipulated to achieve desired results.
- Describe the equipment necessary to modify the greenhouse environment and demonstrate how they function.
- Calculate standard heat loss from greenhouse structures and determine the size of heating infrastructure needed.
- Calculate winter and summer ventilation requirements and equipment to meet cooling demand.
- Using available resources, develop crop production costs.
- Utilize outside resources to devise appropriate methods of growing an unknown crop.
- Describe the major greenhouse production and management systems and how they interact to profitably and responsibly produce floral crops.
- Responsibly produce (grow) a variety of flowering and edible crops within a commercially acceptable time period, recording major events and observations.
- Conduct an experiment, collect data and analyze the results, then interpret and communicate those results to an audience.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4200 - Geographic Information Systems (GIS): Concepts and Application (3 Credits)
This course introduces the fundamental principles and concepts necessary to carry out meaningful and appropriate geospatial applications using geographic information science (GIS), with a particular emphasis on characterizing, assessing, and understanding agronomic and environmental systems. The course covers key issues in GIS such as geographic coordinate systems, map projections, spatial analysis, use of remotely sensed data, visualization of spatial data, spatial statistics, and spatial modeling. Laboratory exercises include database query, database acquisition, spatial analysis and visualization to address issues in hydrology, ecology, agriculture, and sustainability. Students will gain proficiency with the leading open-source GIS platform, QGIS, and familiarity with commercial GIS software such as ArcGIS Pro.
Prerequisites: PLSCI 2200.
Distribution Requirements: (DLG-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Explain the basic principles and functions of GIS (including coordinate systems, projections and datums, spatial data models and their appropriate application environment.
- Generate effective maps for visualization and communication with end users for decision-making.
- Acquire geospatial datasets from various sources.
- Perform geospatial data analysis in QGIS.
- Apply geostatistical methods for pattern analysis and spatial interpolation.
- Perform land cover classification using built-in machine learning algorithms in QGIS and analyze temporal changes.
- Design, perform, and present a collaborative group project using geospatial skills acquired in the course.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4220 - Comparative Plant Development: Evo-Devo (2 Credits)
A comparative analysis of the developmental-genetic mechanisms contributing to the evolution of plant morphological structure and diversity.
Prerequisites: PLSCI 2410, plus BIOMG 2800 or PLSCI 2250.
Last Four Terms Offered: Fall 2023, Fall 2021, Fall 2019, Fall 2018
Learning Outcomes:
- Explain, evaluate, and effectively interpret claims, hypotheses, and theories in the evolution of plant development and more broadly in the sciences.
- Communicate effectively utilizing speech, and visual information.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4230 - Equitable Crop Improvement: From Theory to Practice (3 Credits)
This course explores how global crop improvement processes and outcomes can address social inequalities from design to implementation and impact. It covers a broad range of topics, offering perspective on how systematic social inequalities shape whose priorities are served by crop improvement programs locally, and globally. Drawing from theory and methodology across diverse disciplines, this course encourages students to critically analyze mainstream crop improvement paradigms with an equity lens, and design more inclusive alternatives.
Distribution Requirements: (AFS-AG, D-AG, ETH-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2023
Learning Outcomes:

- Describe key issues and concepts related to equity and social inclusion in global crop improvement.
- Identify systematic oppression at multiple levels, and how these limit the representation and voice of historically marginalized groups in crop improvement theory and practice.
- Describe how interdisciplinary (bridging social and biophysical sciences) crop improvement research is conceptualized and practiced.
- Explain how social science theories, methods and data enable equitable crop improvement processes and outcomes.
- Describe how equitable crop improvement principles and strategies are applied across a product development pipeline, from varietal design to selection and release through critical analysis and case studies.
- Demonstrate knowledge and awareness of the cultural practices, values and beliefs of diverse groups of individuals.
- Assess one's own cultural perspective and the potential for associated biases, and how these may shape scientific practice in crop improvement research.
- Respectfully communicate and collaborate across difference with individuals from different identities, disciplines and backgrounds.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4290 - Remote Sensing and Modeling for Ecosystems (3 Credits)
This course introduces advanced concepts of remote sensing and numerical modeling, with hands-on experience in data acquisition, processing, and interpretation. This course aims to explore key questions facing the agronomic and natural eco-systems using remote sensing techniques and ecological modeling at various scales. It provides hands-on experience in remote sensing techniques and using datasets/tools and model simulations to address research questions.
Prerequisites: knowledge of the basics of remote sensing, calculus, physics, and programming skills, and some background in agro-ecosystems.
Distribution Requirements: (DLG-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe the basic principles in remote sensing.
- Describe the spectral signatures of land surface properties and appropriate application.
- Acquire satellite dataset from NASA, ESA, and Google Earth Engine.
- Process remote sensing data using ENVI, and R (or Python).
- Run mechanistic model simulations in the CLM framework.
- Apply remote sensing observations and model simulations to interpret agro-ecological phenomena.
- Conduct an independent applications-based project.
- Develop and present an oral and collaborative group project.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4300 - Mycology (4 Credits)
Fungi are one of the major lineages of eukaryotes and the sister group of animals. We will consider evolutionary relationships among different groups of fungi, their ecology and significance to humans. We will explore fungal lifestyles, their reproduction, and the ways that fungi use to communicate with each other and with their symbiotic partners. In addition to true fungi, we will study several distantly related groups of organisms that share with fungi absorptive nutrition, filamentous somatic structures, and spore-based reproduction. We will reconstruct fungal phylogenies using molecular evolution methods. We will also isolate fungi from the environment and identify them using morphological and molecular approaches.
Prerequisites: two semesters of general biology.
Distribution Requirements: (BSC-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Familiarity with methods of phylogeny reconstruction for taxonomic identification of organisms.
- Ability to characterize major groups of fungi and their life histories.
- Familiarity with different fungal nutrition modes: saprotrophy, biotrophy, hemibiotrophy, and necrotrophy.
- Appreciation of the links between fungal lifestyle and reproductive biology, i.e. loss of sex in mutualists vs. importance of recombination in parasites.
- Understanding principles that regulate fungal mating versus vegetative compatibility.
- Appreciation for the roles of fungi as: decomposers, mutualists of plants (endophytes, mycorrhizae, lichens) and animals (gut microbiota), pathogens of plants and animals, model systems for biology, sources of food, antibiotics, organic acids, allergens, toxins and carcinogens.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4400 - Phylogenetic Systematics (3 Credits)
Basic and advanced theory and methods of phylogenetic analysis. Introduces students to cladistic analysis using parsimony and gain experience with computer-aided analysis of taxonomic data, including both morphological and molecular data sources. Topics include applications of phylogenetic methods to biogeography and evolutionary studies.
Prerequisites: one majors-level biology course.
Distribution Requirements: (BSC-AG)
Last Four Terms Offered: Spring 2025, Spring 2023, Spring 2021, Spring 2019
Learning Outcomes:

- Obtain, organize, and analyze molecular (DNA, RNA and protein) and morphological data, and combine the two data sources to produce phylogenetic trees that will reveal the history of various plant groups.
- Use computational approaches to generate, plot, and compare phylogenetic trees in R and the Terminal command line.
- Discuss and interpret phylogenetic trees to describe patterns of plant evolution, diversity, and adaptation/ecological interaction.
- Formulate original questions about the evolutionary history and evolution of plants and plant traits, translate these into empirically testable hypotheses, and then perform the analyses to see if the hypothesis is supported.
- Collect and analyze data obtained from original research, using methods that are reproducible.
- Translate and apply genetic and phylogenetic data to advance the field and solve real-world problems.
- Discuss the effects of understanding phylogenetics on environmental sustainability and human health (e.g., evolution of plant, animal and human disease).
- Demonstrate an awareness of the ethical principles and global consequences associated with past, present, and future advances in evolutionary studies.
- Succinctly and clearly communicate information about the breadth of issues in phylogenetics to diverse audiences in oral and written formats.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4420 - Mineral Nutrition: From Plants to Humans (3 Credits)
Plants provide almost all essential minerals for humans and therefore plants are critical components of the human diet. Plant biologists address challenges of meeting the nutritional needs of the increasing world's population by studying plants' ability to uptake, translocate and accumulate mineral nutrients in edible tissues. By integrating basic plant biology with molecular breeding and genomics approaches, fundamental discoveries are utilized to have the greatest impact on solving biofortification of plant-based foods. This team-taught course explores the mechanisms of acquisition of mineral nutrients from the soil, translocation and accumulation in plant tissues, strategies to prevent mineral element deficiencies while avoiding their overload, and toxicity of noxious metals. Selected lectures focus on the relation between the nutrient status of plants and human nutrition and health.
Prerequisites: PLSCI 3420 and PLSCI 3430 or permission of instructor.
Distribution Requirements: (AFS-AG)
Last Four Terms Offered: Spring 2025, Spring 2023, Spring 2021, Spring 2019
Learning Outcomes:

- Explain the impact of mineral deficiencies on plant growth and yield and the impact of poor mineral nutrition on human health.
- Describe transport pathways and their regulatory components that control the uptake of minerals from the soil solution, their radial transport, root-to-shoot partitioning, and grain filling.
- Explain the rationale behind designing nutrient solution for different plant species.
- Explain the approaches and scientific basis behind them for crop biofortification.
- Analyze original scientific literature, design, and communicate scientific presentation.
- Explain, evaluate, and interpret original experimental data, reflect on the design and the interpretation of results of one's own experiments.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4440 - Integrated Pest Management (4 Credits)
Crosslisted with ENTOM 4440
Lectures integrate the principles of pest control, ecology, and economics in the management of pests across multiple systems. Labs consist of exercises to reinforce concepts presented in lecture and demonstrate pest monitoring techniques and the application of computer technology to management problems.
Prerequisites: introductory biology or permission of instructor.
Distribution Requirements: (AFS-AG, BSC-AG, OPHLS-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Students will be able to articulate the often-overlooked economic and ecological underpinnings of pest outbreaks.
- Students will be able to identify and evaluate ethical issues involved with pest management.
- Students will be able to use multiple integrated techniques to assess pest populations and determine if treatment is warranted.
- Students will be able to evaluate pest management alternatives and develop integrated pest management plans.
- Students will be able to participate actively in discussion and debate with peers about integrated pest management.
- Students will be able to work together to facilitate discussion and understanding of contentious issues.
- Students will be able to search scientific literature to learn more about integrated pest management from primary sources.
- Students will be able to conduct research with team members to report on the management of a specific pest of their choice.
- Students will be able to summarize and codify data from a literature review about the hypothesis-driven approach to scientific research.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4450 - Urban Plants and Public Health (3 Credits)
This class examines how urban plants affect public health (e.g., air pollution reduction, temperature regulation, etc.). We will also explore the causes and health consequences of variation in urban plant composition, environmental justice perspectives, the effects of policies and management approaches, and the impacts of climate change.
Prerequisites: college-level statistics course and experience reading peer-reviewed journal articles.
Enrollment Information: Enrollment limited to: undergraduate seniors. Others must obtain permission from the instructor.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024
Learning Outcomes:

- Describe the public health relevance of urban trees.
- Independently identify and interpret peer-reviewed journal articles and extract quantitative data from them.
- Analyze the public health consequences of plant-human interactions in a case study.
- Create written and verbal summaries of research findings from the case study.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4480 - Plant Evolution and the Fossil Record (3 Credits)
Last Four Terms Offered: Spring 2020, Spring 2018, Spring 2016, Spring 2015
Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4500 - Fruit Crop Physiology (3 Credits)
We will be studying the physiology of perennial fruit crop production with an emphasis on the biochemical and genetic mechanisms by which fruit crops function and interact with the environment. The class focuses on temperate fruit trees, grapevines, and small-fruits that are commercially grown in the Northeastern U.S., but other species will be highlighted on occasion. Topics include: flower development, pollination and fertilization, cold hardiness, fruit set and growth, plant growth regulators, carbon acquisition and partitioning, soil-root interactions, mineral nutrition, and water transport. Additionally, we will highlight critical challenges to fruit crop production, such as climate change and soil degradation. Course readings will largely come from journal articles. Students will lead and participate in discussions, write a review article, and learn how to evaluate scientific methods.
Prerequisites: college-level plant physiology course, such as PLSCI 1420 or PLSCI 3420. Recommended: PLSCI 3350, PLSCI 3575, PLSCI 4520, PLSCI 4140, or NTRES 3250.
Distribution Requirements: (AFS-AG, BSC-AG)
Last Four Terms Offered: Spring 2025, Spring 2022, Spring 2020, Spring 2018
Learning Outcomes:
- Apply physiological processes to temperate fruit crop plants and planting systems.
- Evaluate scientific methods and experimental designs used to study fruit crops.
- Synthesize complex phenomena and present information in a concise written format.
- Facilitate discussions based upon course readings.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4520 - Berry Crops: Culture and Management (3 Credits)
Study of the evolution, breeding history, and physiology of strawberries, raspberries, blackberries, blueberries, and other minor small fruit crops and of cultural practices that influence productivity, fruit quality, and pest damage. Also considers marketing and economics and discusses alternate production practices for both commercial and home gardeners. Frequent field trips enhance classroom activities.
Distribution Requirements: (AFS-AG, BSC-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2022, Fall 2020, Fall 2018
Learning Outcomes:
- Communicate the impact that berries have on local and national economies, human well-being and diet, and the role they play in American and world agriculture.
- Integrate information to produce high-quality berry crops at various scales in the most efficient and economical manner possible, with minimal impact on environmental quality.
- Explain the science behind various practices used in the production of berry crops.
- Produce a business plan for a berry farm.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4530 - Light and Video Microscopy for Biologists (3 Credits)
Students learn the relationship between reality and the image using philosophy, mathematics, and physical theory. Next they apply these tools theoretically and in practice to understand and become experts at image formation and analysis using brightfield, darkfield, phasecontract, fluorescence, polarization, interference, differential interference, and modulation contrast microscopes. They build upon our knowledge and experience to understand how analog image processors and digital image processors can influence, enhance, and analyze the images gathered by the microscope. Last they learn about many other kinds of microscopes, including confocal, near field, x-ray, acoustic, nuclear magnetic resonance, infrared, centrifuge, atomic force, and scanning tunneling microscopes.
Prerequisites: Recommended prerequisite: college-level biology course.
Last Four Terms Offered: Fall 2024, Fall 2020, Fall 2018, Fall 2014
Learning Outcomes:
- Describe the relationship between an object and its image.
- Describe how light interacts with matter to yield information about the structure, composition and local environment of biological and other specimens.
- Describe how optical systems work. This will permit us to interpret the images obtained at high resolution and magnification.
- Gain practical experience with many types of light microscopy, and learn the procedures and the tricks necessary to become an excellent microscopist.
- Integrate philosophical and historical thinking, mathematical skills, as well as physical, chemical and biological insight to become an accomplished, scientifically accurate and accomplished microscopist with an artistic eye.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4540 - Plant Cell Biology (4 Credits)
Uses evidence from microscopy, physiology, biochemistry, and molecular biology to try to unravel the mystery of the living cell. Studies the dynamics of protoplasm, membranes, and the various organelles. The mechanisms of cell growth and division, the relationship of the cytoskeleton to cell shape and motility, the interaction of the cell with its environment, and the processes that give rise to multicellular differentiated plants are investigated.
Prerequisites: one year of college-level introductory biology.
Distribution Requirements: (BSC-AG)
Last Four Terms Offered: Fall 2023, Fall 2021, Fall 2017, Fall 2015
Learning Outcomes:
- Explain why the cell is the basic unit of life.
- Describe the natural laws that underlie the physicochemical behavior of cells.
- Explain cell behavior in physicochemical terms.
- Describe the diversity, morphology, function, chemistry, development, turnover, and evolution of organelles.
- Describe the physiological processes of cells, including mitosis, secretion, nutrient uptake, water movement, photosynthesis, respiration, growth, and adaptation to the environment. Evaluate the processes physicochemically.
- Examine cells with many types of microscopy and measure physicochemical properties of cells.
- Demonstrate proficiency in laboratory techniques used to study cells.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4551 - Principles of Nutrition and Nutrient Management in Crops and Landscape Plants (3 Credits)
Students learn the principles of mineral nutrient function in crop and landscape plants, are able to diagnose deficiencies by symptoms and tissue tests, and can devise organic and conventional nutrient management schemes that maximize productivity and mineral nutrient quality.
Prerequisites: PLSCI 2600 and PLSCI 3420.
Distribution Requirements: (AFS-AG, BSC-AG)
Last Four Terms Offered: Spring 2024, Spring 2022, Spring 2020, Spring 2018
Learning Outcomes:

- Characterize the behavior of mineral nutrients in the soil and how they affect plant growth and development.
- Identify nutrient deficiencies and excesses in plants through visual symptoms.
- Diagnose the nutrient status of plants using various tools and identify corrective measures.
- Describe basic principles and methods of nutrient management for crops and landscape plants.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4620 - Plant Biochemistry (3 Credits)
Focuses on biochemistry of plant specific processes, with the aim to obtain an integrative overview of plant biochemistry. Examples include processes such as cell wall biochemistry, pigment biosynthesis and degradation, secondary metabolism, senescence, defense mechanisms, amino acid biosynthesis, and small molecule transport. Genomics-based experimental tools such as proteomics and metabolomics are discussed.
Prerequisites: PLSCI 3420, plus BIOMG 3300 or BIOMG 3310.
Distribution Requirements: (BSC-AG, PSC-AG)
Last Four Terms Offered: Fall 2024, Spring 2023, Spring 2022, Spring 2020
Learning Outcomes:

- Describe a range of plant biochemical pathways and associated regulatory mechanisms (e.g., allosteric regulation, post-translational modifications, feedback regulation).
- Articulate how those processes are different from, or share some features with, analogous systems in non-plant taxonomic groups, such as bacteria, yeast and mammals.
- Demonstrate insights into (sub)cellular compartmentalization of plant biochemical processes.
- Explain how multiple plant biochemical pathways intersect and influence each other.
- Discuss current literature in the field of plant biochemistry, including new analytical techniques, bioinformatics approaches and analytical paradigms in 'model' and 'non-model' experimental systems.
- Describe the importance of plant biochemistry in the areas of human health, agricultural biotechnology and new and emerging applications such as bioenergy and fine chemicals.
- Communicate key aspects of grant proposals to address central questions in both basic and applied plant biochemistry.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4660 - Soil Ecology (3-4 Credits)
Soil ecology is the study of soil organisms and their interactions with each other and with their environment. The outcomes of these interactions drive many soil processes, particularly the decomposition of organic matter and the cycling of important plant nutrient elements. Topics that will be covered in this course include the structure and function of the soil sub-system, soil as a habitat for microorganisms, the biology, ecology and diversity of soil organisms, physiological, biochemical and molecular methods for measuring microbial abundance, activity and diversity in soil, and the role of soil microbes in organic matter decomposition and nutrient cycling. Readings include the textbook - Gentry et al. (2021) - and current research articles that will introduce students to ecological concepts and recent research methods in soil ecology. The optional laboratory section will focus on the effects of soil management on soil microbial communities using traditional and molecular methods for assessing the abundance, activity and diversity of soil organisms.
Prerequisites: one year of biology or ecology. PLSCI 2600 is recommended.
Distribution Requirements: (AFS-AG, BSC-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Access and apply concepts in ecology, microbiology, biology, and biochemistry as they relate to the study of soil sub-systems.
- Demonstrate knowledge of how the soil biota and their activities contribute to global biogeochemistry, plant productivity and environmental quality.
- Manage the world's soils to enhance ecosystem services provided by the soil biota.
- Evaluate peer-reviewed research articles and research methods. Identify key concepts and articulate them in a formal research report.
- Lab-only outcome: Identify research questions, apply appropriate methods, gather and analyze data and prepare research reports.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4720 - Nutrient and Carbon Cycling and Management in Ecosystems (3 Credits)
Building on knowledge of basic physico-chemical and microbial nutrient and carbon transformations in soil, we will examine the pathways of carbon and nutrients in ecosystems from the rhizosphere to the landscape level. An important aspect will be the understanding of environmental impacts by agriculture, forestry and agroforestry and the development of sustainable landus systems. We will explore various tracer methods for the study of carbon and nutrient cycling including stable and radio-isotopes as well as rare elements and biomarkers. You will expand you knowledge in discussion groups and through presentations and work in-depth on a project which involves both field and laboratory experimentation. The results of the project will be presented in a poster conference.
Prerequisites: PLSCI 2600.
Distribution Requirements: (AFS-AG, PSC-AG)
Last Four Terms Offered: Fall 2024, Fall 2022, Fall 2020, Spring 2019
Learning Outcomes:

- Design a research project and articulate the justification for research questions.
- Develop mechanistic hypotheses, choose appropriate methods for a certain problem, and interpret complex data.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4730 - Ecology of Agricultural Systems (4.5 Credits)
Analysis of the ecological processes operating in agricultural systems, with an emphasis on understanding relationships between agroecosystem structure and function and interactions among organisms. Examines agroecological theory and research through readings and discussions. The first part of this course emphasizes understanding biogeochemical processes, population and community ecology with emphasis on plant-herbivore and plant-microbial interactions, and evolutionary processes in agroecosystems. The latter part focuses on the application of ecological knowledge to the design and management of multifunctional agroecosystems and comparative analysis of frameworks used to assess sustainability. Field trips to local farms and case studies from both the tropics and the temperate zone are used to illustrate important concepts.
Prerequisites: BIOEE 1610 or PLSCI 2430.
Distribution Requirements: (AFS-AG, OPHLS-AG, SCH-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2023, Fall 2022, Fall 2021, Fall 2020
Learning Outcomes:

- Apply ecological concepts to agricultural systems.
- Explain concepts of agroecology including population, community, evolutionary and ecosystem principles, and processes as well as interactions across social and ecological systems.
- Describe history of agricultural intensification and the diverse approaches to meeting the challenge of achieving sustainability.
- Apply critical thinking skills to evaluate controversies and ongoing political debates over technological pathways and environmental policies targeting food production systems.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4825 - Museum and Park Interpretation (3 Credits)
This class is for students who are interested in receiving an overview of interpretive planning. Interpretation is a mission-based communication process that forges emotional and intellectual connections between the interests of the audience and meanings inherent in the resource. This theory-driven process can be applied to a wide variety of opportunities to communicate to the public. Professionals who apply this communication process develop interpretive materials for museums, science centers, historic sites, zoos, aquaria, botanic gardens, national and state parks and other cultural attractions. In this course, students will collaborate with staff at Cornell Botanic Gardens to create interpretive media including but not limited to signage, exhibits, written material, or self-guided tours.
Prerequisites: one of the following: COMM 1101, COMM 2850, EDUC 2410 or PLSCI 3940.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe and demonstrate what interpretation is and how it is used as a tool for communicating science and other subjects of focus in a cultural institution.
- Articulate the theory and practice of the interpretive approach to effective communication.
- Explain how the interpretive approach is applied in a museum, zoo, botanic garden or other cultural institution.
- Identify professions in the interpretive or related fields.
- Describe the various methods of interpretive evaluation and practice at least one evaluation technique.
- Apply the interpretive planning process to create a product in a museum, zoo, botanic garden or other cultural institution.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4900 - Reflection on Experiential Learning (0.5 Credits)
This course is designed to guide Plant Sciences and Agricultural Sciences majors in developing career goals around an out-of-classroom experience, in reflecting on that experience, and in recording that experience. To that end, students will draw up a set of learning outcomes for a plant or agriculture-related internship, research opportunity or extension experience, which must be approved by the course advisor before the experience begins. The student must then develop a critical reflection on that experience.
Enrollment Information: Enrollment limited to: Plant Sciences and Agricultural Sciences majors.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:

- Establish the goals/learning outcomes for the internship, research or extension experience before beginning the work.
- Evaluate the completed internship, research or extension experience as a complement to required and elective courses.
- Reflect on how the experience has provided new insights into the plant sciences and how it contributes to career goals.
- Articulate the internship or research experience for a lay audience.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4925 - Plant Sciences Senior Portfolio (1 Credit)
The purpose of this course is to demonstrate that Plant Sciences students will have met all learning outcomes in the major prior to graduation by documenting relevant in-class and co-curricular activities. Preparatory work will include observing and learning from a diversity of presentations in preparation for taking PLSCI 4950. The basis for evaluation will be an ePortfolio that the student develops. It will contain the following elements: a personal profile, career goals and exploration, leadership experiences, a current resume, examples of how the learning outcomes for the major have been met, and summaries of 14 plant-related seminars that the student has attended while at Cornell. The evaluation and assignment of a grade will be made by the student's advisor using a common rubric across the major. Ideally, students will enroll in this course in the second-to-last semester so any deficiencies can be addressed prior to graduation.
Enrollment Information: Enrollment limited to: Plant Sciences majors.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:

- Acquire a broad grasp of current research across the Plant Science disciplines.
- Communicate how knowledge gained in seminars integrates with concepts acquired in previous coursework.
- Demonstrate interdisciplinary competency and mastery of the Plant Sciences's learning outcomes by documenting one's scholarship, training, and experience in an ePortfolio.
- Observe different scientific presentations and discern which factors contribute to an effective presentation.
- Build a stronger relationship with one's faculty advisor.
- Further develop a professional trajectory, including a resume and deeper career exploration.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4940 - Special Topics in Plant Sciences (1-4 Credits)
The School of Integrative Plant Science teaches trial courses under this number. Offerings may vary by semester and will be advertised before the semester begins. Courses offered under the number will be approved by the Plant Sciences curriculum committee, and the same course is not offered more than twice under this number.
Last Four Terms Offered: Spring 2025, Spring 2020, Fall 2019, Spring 2019
Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4950 - Senior Seminar in Plant Sciences (3 Credits)
Students in the Plant Sciences major are required to complete a research experience, extramural internship or extension experience. It is critical for students to be able to explain their work to both scientific audiences and the general public. This course will walk students through the steps needed to produce a quality presentation for each audience, and students will practice giving these presentations. The presentations will be based on research or extension experiences the students have had as part of their Plant Sciences degree program. The course will culminate in an end-of-semester symposium in which students present their experience in a 10-minute talk.
Prerequisites: PLSCI 4900.
Enrollment Information: Enrollment limited to: Plant Sciences majors. All others by permission of instructor.
Distribution Requirements: (ORL-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Employ different strategies and approaches in presenting scientific content to professional and lay audiences.
- Describe one's personal research, internship, or extension experience as a coherent story.
- Demonstrate the steps necessary to prepare an engaging PowerPoint presentation.
- Engage an audience as part of an undergraduate symposium.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4960 - Undergraduate Internship in Plant Sciences (1-3 Credits)
In this experiential learning opportunity, students participate in an agricultural- or plant science-related work and learning experience equivalent to a minimum of six weeks of full-time effort.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:

- Specific learning goals for the experience are arranged between students, their faculty advisor, and the internship host.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4970 - Individual Study in Plant Sciences (1-4 Credits)
An opportunity for undergraduate individual study of a special topic in plant sciences under the direction of a faculty member.
Exploratory Studies: (CU-UG)

Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4975 - Undergraduate Peer Mentoring and Leadership Development in SIPS (1-2 Credits)
Being a club officer or a peer mentor is an opportunity to learn about leadership and collaboration, as well as communication and the challenges of balancing diverse responsibilities. Preparation in this arena can serve a student for life, from learning how to engage in the workplace to being involved in community organizations and learning responsibilities ranging from conflict management to serving as a fiscal steward. Opportunities for leadership development and growth will vary; in general, they include learning how to: foster inclusiveness and a healthy, positive social atmosphere among members and peers; respond to student concerns; communicate and collaborate effectively with staff, faculty advisors, and other faculty, staff, administrators and students; reflect on and articulate experiences with other mentors or club officers throughout the semester; and maintain the reputation, continuity and history of a Cornell organization.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:

- Communicate and collaborate effectively with staff, advisors, faculty, staff, administrators, and students.
- Foster inclusiveness and a healthy, positive social atmosphere among members and peers.
- Recognize the signs of students in distress and respond appropriately.
- Communicate the breadth and depth of campus resources that assist students.
- Model excellent study habits, as well as how to engage with others in collaborative settings that foster learning.
- Collaborate with other mentors or club officers to increase peer-to-peer and peer-to-university professional interactions.
- Model and articulate how mistakes and failure are a natural part of the learning process, as well as an opportunity for growth.
- Model attributes of positive mentoring, including compassion, responsiveness, integrity, and confidentiality.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4980 - Undergraduate Teaching Experience in Plant Sciences (1-4 Credits)
Designed to give qualified undergraduate students teaching experience through actual involvement in planning and teaching plant sciences courses under the supervision of SIPS faculty members. May include leading discussion sections; preparing, assisting in, or teaching laboratories; and tutoring.
Prerequisites: previous enrollment in course to be taught or equivalent.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

PLSCI 4990 - Independent Undergraduate Research in Plant Science (1-4 Credits)
Affords opportunities for students to carry out independent research under appropriate supervision. Each student is expected to review pertinent literature, prepare a project outline, conduct the research, and prepare a report.
Prerequisites: GPA of at least 3.0.
Exploratory Studies: (CU-UG)

Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:

- Identify a question or topic requiring original research through critical examination of existing literature.
- Formulate the question into one or more testable hypotheses or central arguments and develop methods suitable to evaluate these hypotheses or arguments.
- Obtain information relevant to the hypotheses or arguments through effective use of contemporary methods and research techniques.
- Critically analyze the evidence obtained to refute or support the hypotheses or arguments.
- Integrate the findings of this research to the findings of others and to larger issues in the discipline.
- Communicate effectively through writing the thesis and oral or poster presentations.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5000 - Annual and Perennial Plants in the Landscape (1.5 Credits)
This course is an introduction to the identification, cultural requirements, and use of northern climate annual and perennial herbaceous plants in the landscape. Herbaceous plants are important parts of the landscape. They provide pollination resources and aid in habitat for fauna. In addition, they can add biodiversity and reduce stormwater runoff when used appropriately.
Last Four Terms Offered: Fall 2024, Fall 2022, Fall 2021
Learning Outcomes:

- Recognize by sight the genus, species, and common name of approximately 100-plus herbaceous garden plants.
- Describe the site conditions under which to grow each of these plants.
- Comprehend aspects of design, establishment and management of annuals and perennials in the landscape.
- Create a chart comparing seasonal interest, ecological functions, and site conditions of all plants.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5010 - Biology and Management of Plant Diseases (4 Credits)
Biology and Management of Plant Diseases is an introduction to the world of diseases of plants and the biology of the pathogens that cause them. Students will gain an understanding of the concepts of plant pathology and apply them both philosophically and practically to achieve an understanding of how one would identify and address disease problems. Additional emphasis will be placed on how plant diseases and their management affect our lives and shape our culture.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe the concept of disease in both natural and agriculturally relevant plant systems and be able to apply concepts learned to address stakeholder queries on plant disease and injury in a practical setting.
- Articulate the basic biology of key plant pathogen groups: viruses, bacteria, nematodes, fungi, stramenopiles, and plants. Students will be able to explain topics on advanced pathogen biology to undergraduates and stakeholder audiences.
- Apply the essential tools of plant disease diagnostics and integrated management approaches to solve plant production problems for stakeholders.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5020 - Systems Epidemiology for Plant Pathology (3 Credits)
Systems Epidemiology for Plant Pathology offers an expansion of plant pathology concepts into quantitative epidemiology and population biology. The course is taught as two inter-related seven-week modules. The epidemiology module explores the concepts of disease and crop loss and social, economic, and ecological consequences. Students will gain underpinning theory and hands-on experience with measuring disease, crop loss modeling, spatial and temporal attributes of epidemics. The population biology module focuses on biological processes that affect plant pathogen populations and communities in natural and agronomic settings, and how these processes affect disease development and control. These concepts include, but are not limited to, pathogen and virulence diversity, host-pathogen interaction at the population level, selection pressure, super-races, pathogen sexual vs. clonal reproduction, invasive species, quorum-sensing, etc. Although this course is organized into two modules, the over-arching theme of a systems approach will intertwine through all material.
Prerequisites: PLSCI 3010 or equivalent.
Distribution Requirements: (OPHLS-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe epidemiological concepts and apply selected statistical approaches to test assumptions and model data.
- Conclude why and how pathogen populations change and the basis for pathogen virulence evolution.
- Explain how pathogen population structure affects plant disease development and epidemic progress.
- Apply epidemiological and population biology concepts into systems-level thinking for hypotheses development and decisions for disease management.
- Apply population biology, population genetics, and epidemiological concepts in the design of research experiments and data analysis.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5025 - Hydroponic Food Crop Production and Management (4 Credits)
Covers principles and practices of commercial hydroponic vegetable and herb production in controlled environment agriculture (CEA). Topics include: growing environments (high tunnels, greenhouses, and warehouse/vertical farms), manipulation of and crop response to the aerial and root-zone environments including estimating energy use in diverse growing environments, nutrient solution preparation and management, aquaponics and organic hydroponics, crop maintenance, production scheduling, integrated pest management, business plan development, and markets. Laboratory session will reinforce lectures through hands-on practice of concepts. Students will be responsible for growing several crops including leafy greens, herbs, and vine crops (such as tomatoes and cucumbers).
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Explain how hydroponic systems are designed to meet the physical, chemical, and biological needs of plant roots. Discuss the benefits and constraints of several different hydroponic systems.
- Articulate the ideal growing environment and plant response to temperature, light, and carbon dioxide for several of the most common hydroponic crops.
- Estimate the energy costs and crop yields in different growing environments.
- Demonstrate plant care and maintenance practices necessary to produce healthy hydroponic crops.
- Use a spreadsheet to develop fertilizer recipes for common hydroponic crops.
- Use a spreadsheet to estimate production costs and revenue of a hydroponic crop.
- Articulate how hydroponics relates to sustainable, organic, and local food production.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5045 - Chemistry and Pharmacology of Cannabis (1 Credit)
Cannabis sativa is a psychoactive plant used for medical or recreational purposes. Its primary psychoactive component, THC, is one of the >400 known compounds, including at least 65 cannabinoids. CBD, the other major compound, is currently studied for its potential in a variety of medical disorders (e.g., treatment of anxiety, seizure, loss of appetite, chronic pain, etc.). In this course, we will learn past and current uses of cannabis in different cultures. We will become familiar with the chemistry, pharmacology, toxicology, mode of action and safety of cannabis. Furthermore, we will review the biosynthesis and distribution of plant secondary metabolites, the techniques used in their isolation and structure elucidation, the value of biological assays, and the steps involved in drug production and approval.
Prerequisites: college-level biology or chemistry course. PLSCI 5190 is recommended.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe the role of cannabis in various parts of the world, in human health and in social contexts in the past and the present.
- Analyze and validate globally the relevance of preservation of biological diversity, native culture, knowledge, and languages in human societies.
- Describe the biosynthesis and distribution of plant secondary metabolites in cannabis and other plant species, the use of techniques in isolation and structure elucidation of natural products, and biological assays used in the discovery of chemicals with pharmacological activity
- Explain the chemistry, pharmacology, toxicology, mode of action and efficacy demonstrated in scientific trials of cannabis, which organ(s) it affects in the human body and the mechanisms of the diseases targeted with these treatments.
- Integrate concept from botany, biochemistry, bioprospecting, indigenous knowledge, pharmacology, toxicology, and conservation.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5050 - Cultivating Community through Self-discovery and Skill Development (2 Credits)
This course is designed primarily for students in the first semester of their MPS program in Integrative Plant Science. The intent is to guide these students in their path of career discovery by exploring their strengths, preferences and perspectives on their work in the world. Strategies will be introduced and practiced that will help students become a better team-member and leader. A component of the course will be assistance with the development of a capstone project.
Enrollment Information: Enrollment limited to: SIPS MPS students; others by permission of instructor.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Recognize important elements of self-identity, how identity differs among individuals and informs the way we engage with the world.
- Identify personal strengths and leadership attributes and apply these to define an individual leadership style.
- Utilize strategies to construct effective groups and resolve conflict.
- Define personal and career goals based on individual motivations.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5110 - Field Crop Systems (4 Credits)
Principles of field-crop production of food, feed, fiber and bioenergy. Includes introductory concepts of plant growth, development and maturation as they relate to crop performance and management, adaptation to soil, climatic and environmental conditions, tillage, mineral nutrition, pests, cropping sequences, management systems, and crop improvement. Grain, oilseed, biofuel and forage crops are emphasized. Lab report and term paper on field crop systems required. Designed for professional students or advanced undergraduates.
Distribution Requirements: (OPHLS-AG)
Exploratory Studies: (CU-CEL)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Recognize and identify the production constraints, nutritional characteristics, and storage conditions of the world's major food, feed, and forage crops.
- Identify the vegetative and flower morphologies of major cereal, legume, and forage crops.
- Describe the stages of root, shoot, and seed development in corn, soybean, and other crops.
- Apply the principles of crop science to explain the geographic distribution and response of crop species to differences in light, temperature, water status, and soil properties.
- Describe and demonstrate the impact of agroecosystems, cropping systems and management factors such as plant establishment, crop variety, soil mineral nutrition, pests, and diseases on the productivity and quality of crops.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5140 - Global Cropping Systems and Sustainable Development (3 Credits)
With accelerating demands for food, feed, and fiber along with increasing recognition of the importance of agricultural systems to ecosystem services and rural livelihoods, the requirements of agricultural systems are simultaneously intensifying and diversifying. This course introduces foundational concepts that explain the distribution, productivity, and ecological impacts of the world's major cropping systems from an interdisciplinary perspective, including soils, climate and water, markets, policies, and institutions. Through systems thinking and process-based agronomy, an emphasis is placed on assessing solutions for resolving core challenges to the sustainable development goals in the context of global change. Students gain insights into sustainable intensification technologies as well as the social process that support innovation. Evidence synthesis through a geographically-anchored case study and active participation in class discussions are required.
Exploratory Studies: (CU-ITL, CU-SBY)

Last Four Terms Offered: Spring 2025, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe the biophysical and socioeconomic factors that interact to define and differentiate global cropping systems.
- Articulate major drivers of change and how they are influencing, and will likely continue to influence, the structure and function of global cropping systems.
- Diagnose core challenges to improving food security, profitability, and ecosystem service outcomes as they differ across major cropping systems from an integrative sustainable development perspective.
- Translate principles to practice by critically reviewing sustainability challenges in selected cropping systems and developing insights into intervention priority setting that will drive more effective agricultural development programming.
- Collaborate and communicate with a peer group to frame problems and potential solutions in a common logical model that is supported by evidence and systems thinking.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5150 - Weed Biology and Management (4 Credits)
This course examines components of the biology, ecology, and management of weeds in crop and non-crop ecosystems, particularly in the Northeastern United States. The first part of the course focuses on biological/ecological factors that govern seed dormancy, plant growth, population dynamics, competitiveness, reproduction, and survival. Close attention is given to accurate identification of plants and to characteristics that make weeds competitive, undesirable, or both. The second part of the course examines strategies to control weeds, including their benefits and drawbacks. Aspects of chemical control, including classification, mode of action, selectivity, symptomotology, and resistance, are presented. Herbicide-tolerant crop (i.e., GMO) issues and health and environmental concerns of herbicide use are addressed. The use of integrated approaches to weed management is emphasized.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Identify the different life stages of at least 90 weed species commonly found in the Northeastern United States and southern Canada.
- Identify and describe the major biological factors and ecological principles that influence weed growth, population dynamics, invasiveness, and survival.
- Describe the various strategies currently being used to control and/or suppress weeds in different crop and non-crop systems.
- Identify the classification, mode of action, selectivity, and symptomatology of commonly used herbicides.
- Calculate and apply the appropriate amount of a given herbicide that is required to treat a specific area using a backpack sprayer.
- Describe the diversity and impact that weeds have in different ecosystems.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5175 - Production and Management of Greenhouse Crops (4 Credits)
Covers basics of establishing a greenhouse operation, growing crops in optimized environments, and serving niche or mass market. Discusses technology basics including structures and equipment, systems for heating and cooling, lighting, irrigating and fertilizing, material handling, environmental stewardship, integrated pest management, and production management. Also covers world centers of greenhouse crop production; culture of cut, pot, bedding, vegetable, and fruit crops in greenhouses, emphasizing predictive harvesting through environmental, physical, and chemical management of growth and development. Each student grows one or more crops.
Last Four Terms Offered: Spring 2024, Spring 2023
Learning Outcomes:

- Explain the importance of the major environmental factors that affect plant growth, especially in semi-controlled environments (greenhouses).
- Describe how and why a protected cultivation structure can influence the plant-growing environment.
- Describe environmental manipulations needed to control floral induction, initiation, and development in a variety of plants, and how to apply them to produce commercially acceptable crops.
- Successfully produce a variety of flowering crops within a commercially acceptable time period.
- Develop production costs for a crop or crop sequence.
- Use outside resources to develop and evaluate methods of growing an unknown crop.
- Be conversant in the major greenhouse production and management systems and how they interact to profitably and responsibly produce floral crops.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5200 - Geographic Information Systems (GIS): Concepts and Application (3 Credits)
This course introduces the fundamental principles and concepts necessary to carry out meaningful and appropriate geospatial applications using geographic information science (GIS), with a particular emphasis on characterizing, assessing, and understanding agronomic and environmental systems. The course covers key issues in GIS such as geographic coordinate systems, map projections, spatial analysis, use of remotely sensed data, visualization of spatial data, spatial statistics, and spatial modeling. Laboratory exercises include database query, database acquisition, spatial analysis and visualization to address issues in hydrology, ecology, agriculture, and sustainability. Students will gain proficiency with the leading open-source GIS platform, QGIS, and familiarity with commercial GIS software such as ArcGIS Pro.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Explain the basic principles and functions of GIS (including coordinate systems, projections and datums, spatial data models and their appropriate application environment.
- Generate effective maps for visualization and communication with end users for decision-making.
- Acquire geospatial datasets from various sources.
- Perform geospatial data analysis in QGIS.
- Apply geostatistical methods for pattern analysis and spatial interpolation.
- Perform land cover classification using built-in machine learning algorithms in QGIS and analyze temporal changes.
- Design, perform, and present a collaborative group project using geospatial skills acquired in the course.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5210 - Soil and Crop Management for Sustainability (3 Credits)
Students learn about agronomy and recent advances in sustainable soil and crop management, and gain a lot of practical farming knowledge. Integrated perspectives on the physical, biological, and chemical aspects of soil management in the broader context of agroecosystems are explored. Soil and crop management practices and resulting interactions between soil, water, organisms, and organic and chemical inputs form the basis for discussions on diverse cropping systems, soil health, water quality and quantity, bioenergy, greenhouse gases, and sustainability.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Spring 2022
Learning Outcomes:

- Articulate the grand challenge of sustaining future world populations.
- Synthesize and evaluate concepts of sustainable soil and crop management, relate and integrate them into your personal experience through assigned readings, homework, writing, in-class discussion and group collaborative work.
- Recognize and describe basic soil physical, biological, and chemical processes through analysis, graphing (in Excel), and interpretation of data for laboratory and homework activities.
- Summarize factors affecting soil management and crop production, and describe common criteria used to evaluate the sustainability of cropping systems.
- Use technologies (including Adapt-N) and cite policies related to the management of soil and crops.
- Apply what you learn from reading, lectures, hands-on experience, and the use of commonly used management tools to assess, plan, and modify sustainable soil management practices.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5290 - Remote Sensing and Modeling for Ecosystems (3 Credits)
This course introduces advanced concepts of remote sensing and numerical modeling, with hands-on experience in data acquisition, processing, and interpretation. This course aims to explore key questions facing the agronomic and natural eco-systems using remote sensing techniques and ecological modeling at various scales. It provides hands-on experience in remote sensing techniques and using datasets/tools and model simulations to address research questions.
Prerequisites: knowledge of the basics of remote sensing, calculus, physics, and programming skills, and some background in agro-ecosystems.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe the basic principles in remote sensing.
- Describe the spectral signatures of land surface properties and appropriate application.
- Acquire satellite dataset from NASA, ESA, and Google Earth Engine.
- Process remote sensing data using ENVI, and R (or Python).
- Run mechanistic model simulations in the CLM framework.
- Apply remote sensing observations and model simulations to interpret agro-ecological phenomena.
- Conduct an independent applications-based project.
- Develop and present an oral and collaborative group project.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5350 - Sustainable Orchard Management (3 Credits)
The science of tree-fruit production with an emphasis on the agroecology and physiology of regionally important species. Topics include: site selection; orchard design; clonal rootstock and variety selection; nursery production and grafting, tree pruning and training; flowering and pollination; crop load management; water, nutrient, and soil management; fruit ripening, maturity, and storage; marketing and profitability; integrated pest management; orchard mechanization; and sustainable production practices. Students will synthesize and apply knowledge from a broad range of life sciences within the context of perennial crop agroecosystems. Orchard field trips and lab sessions will provide practical, hands-on experience. This course is designed for students interested in commercial tree-fruit production and/or pomology research, hobby fruit growers, and professional IPM consultants.
Last Four Terms Offered: Spring 2024, Spring 2023
Learning Outcomes:

- Make critical decisions required for profitable orchard management.
- Find and evaluate essential information resources about tree-fruit orchards.
- Integrate key ecological, physiological, environmental, and economic issues in sustainable orchard systems.
- Select the optimal systems for orchard management.
- Successfully plant, prune, and train fruit trees.
- Harvest, store, and market fruit efficiently.
- Synthesize course material into IPM and Commodity Report fact sheets that address sustainable orchard management.
- Produce a 15-20 page term paper based on a review and interpretation of current literature.
- Apply knowledge of fruit physiology to mentor undergraduate colleagues by reviewing and providing a critical assessment of undergraduate term paper drafts.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5420 - Plant Physiology, Lectures (3 Credits)
Integrated and interdisciplinary study of the processes that contribute to the growth, competition, and reproduction of plants. Topics include, but are not limited to, plant-water relations, membrane properties and processes, photosynthesis, plant respiration, mineral and organic nutrition, stress physiology, control of growth and development, and responses to the environment. Emphasis is on the relationship between structure and function from the molecular to the whole-plant level.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe, and give relevant examples of, how each process in a plant integrates with other relevant processes to determine the overall response of the plant to a particular set of conditions.
- Demonstrate how energy affects processes at all levels of biological organization from the molecule and cell to organisms and ecosystems.
- Describe how cells/organisms perceive and respond to their environment, and the signal transduction, intercellular communication and information processing mechanisms involved.
- Explain how evolution underlies all aspects of biology and accounts for the unity and diversity of life.
- Discuss new findings, including newly discovered mechanisms and signaling pathways, that are shaping our understanding of plant development, and plant responses to the environment.
- Outline research projects to investigate basic aspects of plant growth and development using physiological and molecular approaches. Evaluate existing knowledge in the topic of research, propose experimental approaches to address the research questions and discuss how to interpret and evaluate data.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5430 - Molecular Biology and Genetic Engineering of Plants (2 Credits)
Introduction to current studies involving recombinant DNA technology and its application to the improvement of plants. Emphasizes genetic transformation methodology, gene expression systems, and strategies for increasing productivity.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Explain the basic principles that underlie developmental processes in plants.
- Explain the basic concepts and methods of molecular biology and genetics as they relate to the following questions.
- How to transfer genes to plants.
- How to design vectors for transforming plants.
- How to analyze plant gene function.
- How to express foreign genes in new plant hosts.
- How to perform transient gene expression.
- How to regenerate whole plants from single cells.
- How to produce stable transgenic lines with single transgene integrations.
- How to protect plants against viruses and pests.
- How to improve quality traits in crop plants.
- How to safeguard the environment and insure food safety.
- How to evaluate claims relating to the GMO debate.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5431 - Laboratory in Molecular Biology and Genetic Engineering of Plants (2 Credits)
Companion to Molecular Biology and Genetic Engineering of Plants course with with laboratory activities that focus on the practice of plant biotechnology. Students construct transgenes using recombinant DNA methods, transfer genes to plants by a variety of approaches including tissue culture-based methods, assess the integration of transgenes in the host genome and analyze their expression by use of reporter gene assays and by preparing and analyzing nucleic acids. Students will also gain basic skills in bioinformatics.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe the fundamental concepts underlying modern plant molecular biology.
- Use experimental methods typically used in plant molecular biological studies.

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PLSCI 5440 - Integrated Pest Management (4 Credits)
Crosslisted with ENTOM 5440
Lectures integrate the principles of pest control, ecology, and economics in the management of pests across multiple systems. Labs consist of exercises to reinforce concepts presented in lecture and demonstrate pest monitoring techniques and the application of computer technology to management problems.
Prerequisites: introductory biology or permission of instructor.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Students will be able to articulate the often-overlooked economic and ecological underpinnings of pest outbreaks.
- Students will be able to identify and evaluate ethical issues involved with pest management.
- Students will be able to use multiple integrated techniques to assess pest populations and determine if treatment is warranted.
- Students will be able to evaluate pest management alternatives and develop integrated pest management plans.
- Students will be able to participate actively in discussion and debate with peers about integrated pest management.
- Students will be able to work together to facilitate discussion and understanding of contentious issues.
- Students will be able to search scientific literature to learn more about integrated pest management from primary sources.
- Students will be able to conduct research with team members to report on the management of a specific pest of their choice.
- Students will be able to summarize and codify data from a literature review about the hypothesis-driven approach to scientific research.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5450 - Basic Plant Anatomy (3 Credits)
Descriptive course with equal emphasis on development and mature structure. Lecture, laboratory, and reading are integrated in a study guide. The laboratory offers the opportunity to develop the practical skills required to make anatomical diagnoses and to write anatomical descriptions.
Last Four Terms Offered: Fall 2024, Fall 2022
Learning Outcomes:

- Describe the variety of anatomical data and concepts to identify the organization of plant histology and morphology.
- Perform practical diagnosis on anatomical unknowns.
- Use the necessary tools to identify plant anatomical forms, function and evolutionary diversity based on comparative studies of several taxa among vascular plants.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5500 - Master Composter Training and Extension Internship (2 Credits)
Students will study the managed decomposition of organic matter. Through discussion and hands on activities, we will explore the basics of the composting process, nutrient cycling and recycling as well as methods used to teach these concepts to a wide variety of audiences. The main aim of this subject is for students to understand the underlying biology and chemistry of the composting process and the resulting environmental, health and economic benefits of recycling organic residuals in real world situations. Emphasis will be placed on the applied aspects of composting, empowering students to become leaders in the community on compost education. Students will also be expected to apply the lessons learned through volunteer work each week and participate in community events where composing education will occur.
Enrollment Information: Enrollment limited to: juniors, seniors, and graduate students.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023
Learning Outcomes:

- Describe the basic and applied aspects of the decomposition of organic matter.
- Explain scientific principles of composting processes, community systems, and communication.
- Devise approaches to improve efforts to divert waste leading to sustainable communities.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5575 - Principles of Vegetable Production (3 Credits)
Commercial vegetable production from variety selection to postharvest. Topics include crop physiology and culture, soil and pest management, stand establishment, marketing, and history of production. Term project required. Field trips to large-scale conventional, small, diversified, and organic farms are planned early in the semester.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2022
Learning Outcomes:

- Describe the scale of the vegetable industry from the local to international markets and the challenges facing producers.
- Appraise how successful vegetable production is related to soil health, cultural practices, pest management and marketing and develop a farm plan that considers all aspects of production and marketing for one vegetable crop.
- Demonstrate the ability to diagnose common vegetable problems and offer solutions.
- Develop the ability to grow a wide variety of vegetables either commercially or as a gardener.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5600 - Soil Science (4 Credits)
Designed for undergraduate and graduate students interested in a comprehensive introduction to Soil Science from both an environmental and management perspective as well as graduate students who wish to advanced their understanding of the biogeochemical (biologic, hydrologic and mineral interfaces and linkages underpinning and controlling the soil, plant and atmospheric continuum. This course examines the dynamic relationship of soils with the environment and will place particular focus on both the larger landscape as well as site specific implications of this relationship. The course is flipped with online lectures, in-class homework, projects and activities as well as a weekly laboratory and is presented in three components.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022
Learning Outcomes:

- Describe and explain the distribution and variability of soils and their properties across the landscape.
- Display a knowledge of how these properties are created and how they affect landscape processes (both at a large and small scale).
- Demonstrate a preliminary ability to investigate soil characteristics.
- Exhibit an understanding of how we manage (or not) soils and their properties for multiple objectives.
- Communicate insight into the environment's drivers of the pedosphere that underpin all earth systems and their area of study.
- Produce an initial concept/content design for post baccalaureate programs as applicable.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5660 - Soil Ecology (3-4 Credits)
Soil ecology is the study of soil organisms and their interactions with each other and with their environment. The outcomes of these interactions drive many soil processes, particularly the decomposition of organic matter and the cycling of important plant nutrient elements. Topics that will be covered in this course include the structure and function of the soil sub-system, soil as a habitat for microorganisms, the biology, ecology and diversity of soil organisms, physiological, biochemical and molecular methods for measuring microbial abundance, activity and diversity in soil, and the role of soil microbes in organic matter decomposition and nutrient cycling. Readings include the textbook - Gentry et al. (2021) - and current research articles that will introduce students to ecological concepts and recent research methods in soil ecology. The optional laboratory section will focus on the effects of soil management on soil microbial communities using traditional and molecular methods for assessing the abundance, activity and diversity of soil organisms.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Access and apply concepts in ecology, microbiology, biology and biochemistry as they relate to the study of soil sub-systems.
- Demonstrate knowledge of how the soil biota and their activities contribute to global biogeochemistry, plant productivity and environmental quality.
- Manage the world's soils to enhance ecosystem services provided by the soil biota.
- Evaluate peer-reviewed research articles and research methods. Identify key concepts and articulate them in a formal research report.
- Evaluate and analyze peer-reviewed research articles and research methods. Identify key concepts and articulate them in a formal research report.
- Assist with in-class exercises to gain practice in co-teaching methods and demonstrate mastery of key concepts in soil ecology.
- Lab-only outcome: Identify research questions, apply appropriate methods, gather and analyze data and prepare research reports.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5700 - Symbioses: Evolution and Ecology (3 Credits)
Symbiosis, the living together of unlike organisms, encompasses a spectrum of interactions ranging from mutually beneficial to reciprocally detrimental. We will examine a selection of ecologically important symbioses, including interactions of bacteria and fungi with plants, protists, invertebrates, and vertebrates, focusing on their ecological, physiological and molecular mechanisms. We will consider the evolutionary origins, and explore conditions required for the establishment and maintenance of these associations. We will discuss the role of symbioses in the assembly of ecological communities and agriculture. Lastly, we will examine the impact of global change on symbioses.
Last Four Terms Offered: Spring 2025, Spring 2024
Learning Outcomes:

- Identify, explain, and categorize the ecological, physiological and molecular mechanisms of symbiotic interactions.
- Discuss these mechanisms and interpret associated data analyses in the light of evolutionary theory.
- Apply, categorize and integrate basic conceptual and analytical tools to describe ecological and evolutionary origins and stability of symbioses.
- Articulate the utility of symbiotic systems in sustainable agriculture.
- Evaluate consequences of global change for the functioning of symbiotic systems.
- Describe how the body of knowledge evolves in the face of new evidence.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5800 - Principles and Practices in Certified Organic Agriculture (3 Credits)
Organic agriculture is an increasingly important part of the food system. Students learn about the history of organic agriculture, the USDA National Organic Program, management practices used in organic crop and livestock production, and the scientific research on organic agriculture. Laboratory sessions complement lecture discussions with field trips to a variety of organic farms. Students read journal articles about organic agriculture, work through certification issues, and grow organic vegetable seedlings on campus.
Last Four Terms Offered: Spring 2024, Spring 2022
Learning Outcomes:

- Summarize the history of organic agriculture.
- Explain the certification process and the National Organic Program standards.
- Develop appropriate management solutions to production problems.
- Discuss the scientific evidence for and against organic agriculture.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5825 - Museum and Park Interpretation (3 Credits)
This class is for students who are interested in receiving an overview of interpretive planning. Interpretation is a mission-based communication process that forges emotional and intellectual connections between the interests of the audience and meanings inherent in the resource. This theory-driven process can be applied to a wide variety of opportunities to communicate to the public. Professionals who apply this communication process develop interpretive materials for museums, science centers, historic sites, zoos, aquaria, botanic gardens, national and state parks and other cultural attractions. In this course, students will collaborate with staff at Cornell Botanic Gardens to create interpretive media including but not limited to signage, exhibits, written material, or self-guided tours.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe and demonstrate what interpretation is and how it is used as a tool for communicating science and other subjects of focus in a cultural institution.
- Articulate the theory and practice of the interpretive approach to effective communication.
- Explain how the interpretive approach is applied in a museum, zoo, botanic garden, or other cultural institution.
- Identify professions in the interpretive or related fields.
- Describe the various methods of interpretive evaluation and practice at least one evaluation technique.
- Apply the interpretive planning process to create a product in a museum, zoo, botanic garden, or other cultural institution.
- Articulate how foundational research in the discipline informs the best practices of interpretive planning and development.
- Demonstrate the effectiveness of applying interpretive best practices and their foundational research when communicating to a general audience (or audience at a museum, park, or other cultural institution).

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 5850 - Public Garden Management (3 Credits)
Explores the history of public gardens, types of contemporary public gardens, and the operation of public gardens including botanical gardens and arboreta. Includes separate units on administration and business management of gardens, collections curatorship, collections design, educational programs, research, and management of landscapes and natural areas.
Course Fee: Course Fee, $100. For two-and-a-half-day trip to botanical gardens and arboreta.
Exploratory Studies: (CU-CEL)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe all aspects of establishing, managing, and expanding public gardens, including botanical gardens, arboreta, historic landscapes, and conservatories.
- Address challenges that arise at public gardens, and thereby to improve their decision-making abilities.
- Articulate ways in which public gardens are addressing social and environmental issues, in their communities and on regional and global bases.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6000 - Concepts and Techniques in Computational Biology (4 Credits)
This course is geared towards graduate students and advanced biology undergraduates seeking a better understanding of computational biology. Lectures will be a combination of presentations, paper discussions and hands-on sessions. Labs and paper discussions will have a significant component of plant science, but students from non-plant fields are also encouraged to register. Students will learn to work in a Unix environment, code using Python/R, and deploy tools for genome assembly, RNA-seq data analysis, local and global sequence alignment, protein domain searching using Hidden Markov Models, phylogenetic reconstruction, metabolomic analysis, and machine learning. Lectures will cover the algorithmic concepts underlying popular tools. The students will also learn practical aspects of implementing these tools in their own research using facilities available at Cornell.
Enrollment Information: Enrollment limited to: graduate students.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Implement popular bioinformatics tools using Unix, Python, and R.
- Explain the theory behind different bioinformatics tools.
- Identify the applicability, strengths, and weaknesses of different bioinformatics algorithms.
- Integrate popular bioinformatics tools into their own research.
- Critique plant science research papers utilizing bioinformatics tools, and identify the caveats of the performed analyses.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6010 - Molecular Biology of Plant-Microbe Interactions (3 Credits)
The co-evolutionary molecular battle between microbial pathogens and plants has game-like properties whose rules are emerging from recent genomic, biochemical, and cell biological advances. This course explores the molecular pieces and collective behaviors of pathogen virulence and plant immune systems, similarities between interaction mechanisms in plant and animal pathosystems, and the application of this knowledge to sustainable agriculture. The course emphasizes the development of professional skills, such as the management of scientific literature, creative design and critical evaluation of research, and communication of complex scientific concepts to diverse audiences.
Prerequisites: Prerequisite for undergraduate students: introductory genetics (BIOMG 2800, BIOMG 2801 or PLSCI 2250) or biochemistry (BIOMG 3300 or BIOMG 3310, and BIOMG 3320 or equivalent) and PLSCI 3010. Prerequisite for graduate students: must have taken a general plant pathology course and an introductory genetics, biochemistry or molecular biology course to enroll.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Search the primary literature on molecular plant-microbe interactions for information and manage literature libraries.
- Evaluate research papers from the current and historical literature on molecular plant-microbe interactions.
- Interpret and synthesize quantitative and qualitative data from the primary literature on molecular plant-microbe interactions into written proposals and oral presentations.
- Explain the different players involved in pathogen virulence and plant defense, the different categories of molecular interaction in plant immunity, how signals are transmitted, strategies used for discovery, similarities between interaction mechanisms in plant and animal pathosystems, and application of this knowledge to agriculture.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6017 - Cropping Systems Ecology (1 Credit)
Crop ecology is the integrative study of biological, physical, social, and technological factors that govern the emergent properties arising from cropping systems at different spatial and temporal scales. It implicitly recognizes that achieving the goals for multi-functional (i.e. 'sustainable') agriculture cannot be achieved without understanding the functional interdependencies among these factors. This course serves as a graduate-level synthesis of 1) how crop and crop communities are influenced by the physical and chemical growth environment, 2) how the growth environment is modified by agronomy and, in turn, 3) how production processes are shaped by both managed and unmanaged factors. Readings and class discussions of key concepts compose the first half of the course, with the hands-on application of systems analysis tools emphasized in the second half.
Enrollment Information: Enrollment limited to: graduate students.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2022
Learning Outcomes:
- Identify environmental drivers of crop performance and characterize how they vary in time and space.
- Apply foundational crop growth and development concepts at the individual plant and community level to understand productivity outcomes.
- Quantify how agronomic management affects the biophysical environment and shapes productivity outcomes.
- Use predictive models of the soil-plant-atmosphere continuum to characterize emergent properties of cropping systems under different scenarios of change.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6020 - Plant Propagation (3 Credits)
Plant propagation, the multiplication of plants, is both a science and an art. This class will introduce the principles, practices and techniques of sexual and asexual propagation of horticultural plants. Emphasis is placed on learning the techniques that are involved with the many aspects of plant propagation as well as the science behind the methods. The art of plant propagation will be learned through hands-on experiences with seed propagation, cutting propagation, grafting & budding systems, layering, specialized plant structures (bulbs, corms, etc.), and tissue culture for micropropagation. In addition, propagation media, greenhouse environmental control and management, and plant care, as they relate to propagation, will be emphasized. The science behind the methods that are learned will be explained in order to develop a better understanding of plant propagation and how to make it successful. This knowledge base and the practical, hands-on experiences will give students the ability to better solve problems that arise during the propagation and growth of plants.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2021
Learning Outcomes:
- Demonstrate proficiency in the propagation of plants through seeds, cuttings, grafting, layering, and micropropagation.
- Recognize how the different environmental conditions, types of plants, and growth stages of plants affect the success of plant propagation.
- Think critically about plant propagation and the different techniques and applications that are used for its success.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6030 - Genetic Improvement of Crop Plants (3 Credits)
Genetic enhancement of crop value to humans began with domestication and continues with farmers' variety development and scientifically trained plant breeders' applications of Mendelian, quantitative, and molecular genetics. This course examines crop genetic improvement methods by discussing the history and current practice of plant breeding, tools available to breeders, decision-making about breeding objectives and methods, and the roles of plant breeding in addressing global challenges including climate change, sustainability, equity, food security, and malnutrition.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:
- Value the contribution of Indigenous groups in domestication of modern crops and their cultural significance.
- Explain the genetics that control plant characteristics and how genes can be manipulated to improve plant traits.
- Describe the reproductive mechanisms in crop and horticultural plants.
- Explain the range of phenotypic traits that are important targets for genetic improvement of plants, and the social and environmental contexts of their trait values
- Describe the range of phenotypic and genomic selection techniques and approaches used by plant breeders.
- Explain the different approaches used to breed self- and cross-pollinated crops and the development of hybrids.
- Describe recurrent selection techniques.
- Describe the roles of tissue culture and genetic transformation in plant improvement.
- Explore the contributions of plant breeding to agriculture and food systems.
- Summarize concisely in writing the objectives, main results, and conclusions described in primary research papers in plant breeding and genetics.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6040 - Crop Diversity and Genetic Resources (2 Credits)
Crop genetic diversity is critical for the sustainability, productivity, and resilience of agriculture and food systems. Crop diversity can be measured from the cellular to the landscape scale. Crop diversity relates not only to genetics, ecology, and agricultural management, but also policy, economics, ethics, and culture. This class explores these complex interactions and discusses tools used to evaluate, manage, and conserve crop diversity.
Prerequisites: either one plant breeding course or one crop production-related course.
Learning Outcomes:

- Describe the importance of crop diversity in agriculture and food systems in the US and globally.
- Differentiate between approaches to crop conservation.
- Describe the function and operation of gene banks and their role in breeding programs and agricultural research.
- Identify implications of crop conservation for ethical conduct of research.
- Plan and implement a plant phenotypic data collection protocol.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6070 - Nutritional Quality Improvement of Food Crops (2 Credits)
The nutrients in human diets are ultimately derived from plants. However, the edible portions of the world's most extensively grown staple food crops are poor sources for numerous micronutrients and health-promoting compounds that are essential for sustaining and enhancing life. The improvement of crop nutritional quality through breeding, termed biofortification, is a sustainable strategy being used to address micronutrient deficiences worldwide. This course covers recent progress on crop nutritional quality trait improvement. The lectures will focus on vitamins, minerals, prebiotics, phytonutrients, essential amino acids, and fatty acids in the context of better human nutrition and health.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Articulate why there is a compelling need for improving the nutritional quality of food crops.
- Explain the approaches and mechanisms used for nutritional quality improvement.
- Describe the status of development and commercialization of nutrient-dense crops.
- Demonstrate improvement in the ability to write and speak to scientific audiences.
- Deliver advanced materials to the class, deconstruct a topic, and provide a deep interpretation of data.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6080 - Methods of Plant Breeding Laboratory (2 Credits)
Field trips to plant breeding programs involve discussion of breeding methods used, overall goals, selection and screening techniques, and variety and germplasm release. Additional labs include selection techniques for various traits, intellectual property issues, genetically modified crops, and international agriculture. For a term project, each student designs a comprehensive breeding program on a chosen crop.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Design a breeding program to improve both quantitative and qualitative traits in plants.
- Describe the impact that plant breeding has on community and global health and well-being.
- Convey to professional and lay audiences, orally and in writing, information about the organization and scope of a plant breeding program.
- Articulate a vision for the future trends that will transform plant breeding in the coming decade.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6090 - Perennial Crop Breeding Seminar (1 Credit)
Perennial crops are critical components of sustainable farming systems, and have many environmental benefits including increased biodiversity, water quality, soil conservation, carbon sequestration, productivity, and resilience. Due to the biology of these species, plant breeders seeking to develop perennial crop cultivars face a unique set of challenges and opportunities. This course examines a wide range of perennial crop breeding programs and discusses tools available to breeders, decision-making in perennial crop breeding programs, and opportunities for plant breeding to enhance sustainability and perenniality in cropping systems.
Prerequisites: PLSCI 6030 or equivalent.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2023
Learning Outcomes:

- Describe the significance of perennial crops in agriculture and food systems in the US and globally.
- Examine traits that are important targets for genetic improvement of perennial crops and the genetics that control perenniality.
- Analyze the unique challenges faced perennial crop breeding and the range of breeding methods used for these plants.
- Describe the importance of perennial crop improvement in addressing environmental challenges and their role in carbon sequestration and climate change mitigation.
- Synthesize and interpret scientific literature on perennial crop breeding.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6095 - Practicum in Plant Breeding (1-3 Credits)
In-depth, practical exposure to applied crop breeding. Students participate in the department's maize, small grains, potato, pepper, squash, forage, tomato, and onion breeding programs to gain hands-on experience in the planning and implementation of crossing, planting, harvesting, selecting, and evaluating disease and quality traits.
Prerequisites: PLSCI 4030.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6100 - Plant Responses to Environmental Stresses and Global Climate Change (3 Credits)
Abiotic stresses including drought, temperature extremes, flooding, salinity, and toxic metals limit crop productivity, particularly in developing countries where people are resource-poor and have limited options. Anticipated global climate changes are expected to exacerbate the impact of stresses even further. Therefore, knowledge of stress response mechanisms is urgently needed for developing novel molecular breeding and genomics approaches for generating plants and management systems that will improve performance in hostile environmental conditions. This course explores the molecular, physiological, developmental and morphological characteristics that plants use to adapt to environmental stresses. Emphases are placed on stresses associated with global climate change including drought, flooding, extreme temperatures, salt, and environmental pollution. The course will also discuss strategies for improving stress tolerance in crops. Graduate students will have assignments for in-depth learning of each topic. Examination questions will differ for graduate students to evaluate assigned material. Graduate students will write a paper for one of the topics and present it in class.
Prerequisites: coursework in advanced plant sciences, molecular biology and biochemistry required or permission of instructor.
Last Four Terms Offered: Fall 2023, Fall 2021, Fall 2019, Fall 2017
Learning Outcomes:

- Have an in-depth understanding of the impact of various abiotic stresses on plant metabolism, growth, development, and yield.
- Describe adaptation/resistance mechanisms of plants to different abiotic factors.
- Compare common and unique effects of various abiotic stress and crosstalk between pathways that lead to plants adaptation/resistance.
- Understand approaches and scientific basis behind approaches for improving plant stress tolerance.
- Improve ability to analyze and critique the primary scientific literature, scientific writing, and communication skills.
- Explain, evaluate, and interpret original experimental data of the response of plants to environmental conditions, and design and interpret results of one's own experiments.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6125 - Cover Crops in Agroecosystems (3 Credits)
Cover crops are not harvested, but rather they are planted to protect soil and provide other benefits. Use of cover crops has increased dramatically as more people understand their value. In this course, students will 1) explore the management, environmental, economic, and social considerations of cover crops across a diversity of agricultural production systems; 2) grow cover crops, measure benefits and trade-offs, and apply knowledge to make management and policy recommendations; and 3) interact with and learn from faculty and students across multiple states through virtual synchronous meetings.
Last Four Terms Offered: Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Define cover crop types and describe characteristics of cover crop species and functional groups and their agroecosystem services.
- Manage and make decisions about cover crops across a diversity of climates, soils, and cropping systems.
- Measure the short- and long-term economic impacts of cover crop management decisions.
- Quantify the environmental benefits of cover crops using digital tools and describe how those benefits are influenced by management decisions across environments.
- Apply cover crop system knowledge to design policy and social initiatives to help overcome barriers to cover crop adoption.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6140 - Weed Ecology and Management (3 Credits)
Examines plant ecological principles governing weed population dynamics and weed-crop competitive interactions in crop and non-crop ecosystems. Development of sustainable weed management strategies.
Prerequisites: PLSCI 3150 or equivalent.
Last Four Terms Offered: Spring 2025, Spring 2023, Spring 2021, Spring 2019
Learning Outcomes:

- Identify range of sustainable weed management strategies in crop and non-crop systems.
- Critically evaluate published, peer-reviewed literature in the disciplines of weedy and invasive plant biology, ecology, and management.
- Develop a grant proposal specific to the student's discipline.
- Pitch grant proposal to classmates using a verbal and visual presentation.
- Critically evaluate classmates' grant proposals and provide constructive criticism.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6170 - Advanced Analytical Methods for Plant Systems (2 Credits)
Principles and practical applications of selected laboratory methods in the plant and environmental sciences. Emphasizes enhancement of laboratory technique and problem-solving skills. Discusses suitability of various procedures for measuring important plant and soil components. Analytical techniques are chosen from elemental analysis by combustion or flow analysis, gas chromatography, HPLC, electrophoresis, electrochemical assays, enzyme assays, bioassays, and mass spectrometry.
Prerequisites: one year of general chemistry, one semester of organic chemistry and plant physiology.
Last Four Terms Offered: Spring 2023, Spring 2020, Spring 2019, Spring 2017
Learning Outcomes:

- Grasp the operating principles of major analytical techniques for measuring metabolites in plant research, such as, HPLC, GC, LC/MS, GC/MS and enzyme-linked assays.
- Gain hands-on experience in representative analytical methods.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6180 - People, Plants and Participation (3 Credits)
This course explores the theory and practice of participatory research approaches in agriculture, with an emphasis on plant science research. We will cover the theoretical and historical roots of participatory research in agriculture and learn from case studies and projects where participatory research approaches have been used. With a focus on active and applied learning, the course will include field visits to local communities throughout the semester. Students will engage in critical analysis of projects they identify using their course learning, as well as practicing conceptualizing a participatory research project in collaboration with community partners.
Exploratory Studies: (CU-CEL)

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6220 - Comparative Plant Development: Evo-Devo (2 Credits)
A comparative analysis of the developmental-genetic mechanisms contributing to the evolution of plant morphological structure and diversity.
Last Four Terms Offered: Fall 2023, Fall 2021
Learning Outcomes:

- Explain, evaluate, and effectively interpret claims, hypotheses, and theories in the evolution of plant development and more broadly in the sciences.
- Communicate effectively utilizing speech, and visual information.
- Critically review original proposed projects on the evolution of plant development and assess their merit, their experimental rationale and feasibility, and their impact on the field of plant evo-devo.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6230 - Equitable Crop Improvement: From Theory to Practice (3 Credits)
This course explores how global crop improvement processes and outcomes can address social inequalities from design to implementation and impact. It covers a broad range of topics, offering perspective on how systematic social inequalities shape whose priorities are served by crop improvement programs locally, and globally. Drawing from theory and methodology across diverse disciplines, this course encourages students to critically analyze mainstream crop improvement paradigms with an equity lens, and design more inclusive alternatives.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2023
Learning Outcomes:

- Describe key issues and concepts related to equity and social inclusion in global crop improvement.
- Identify systematic oppression at multiple levels, and how these limit the representation and voice of historically marginalized groups in crop improvement theory and practice.
- Describe how interdisciplinary (bridging social and biophysical sciences) crop improvement research is conceptualized and practiced.
- Explain how social science theories, methods, and data enable equitable crop improvement processes and outcomes.
- Describe how equitable crop improvement principles and strategies are applied across a product development pipeline, from varietal design to selection and release through critical analysis and case studies.
- Demonstrate knowledge and awareness of the cultural practices, values, and beliefs of diverse groups of individuals.
- Assess one's own cultural perspective and the potential for associated biases, and how these may shape scientific practice in crop improvement research.
- Respectfully communicate and collaborate across difference with individuals from different identities, disciplines and backgrounds.
- Interpret qualitative and quantitative social science data to inform crop improvement decisions in design, selection, and dissemination.
- Critically analyze crop improvement research programs to formulate recommendations for more equitable research processes and outcomes.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6250 - Data-Model Fusion in Research (3 Credits)
This hands-on class trains graduate students on integrating data with models via data-model fusion to address scientific questions in research. Students will learn about modeling and the nature of data by integrating their own data with relevant models. Students will identify appropriate data to constrain their own models using various techniques, e.g., data assimilation and machine learning, in data-model fusion.
Last Four Terms Offered: Fall 2024
Learning Outcomes:

- Integrate data with models.
- Improve model predictions with data from multiple sources.
- Synthesize data into diverse models for predicting biological and ecological responses.
- Apply skills of data-model fusion to solve various issues in agricultural and life sciences.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6300 - Mycology (4 Credits)
Fungi are one of the major lineages of eukaryotes and the sister group of animals. We will consider evolutionary relationships among different groups of fungi, their ecology and significance to humans. We will explore fungal lifestyles, their reproduction, and the ways that fungi use to communicate with each other and with their symbiotic partners. In addition to true fungi, we will study several distantly related groups of organisms that share with fungi absorptive nutrition, filamentous somatic structures, and spore-based reproduction. We will reconstruct fungal phylogenies using molecular evolution methods. We will also isolate fungi from the environment and identify them using morphological and molecular approaches.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Familiarity with methods of phylogeny reconstruction for taxonomic identification of organisms. .
- Ability to characterize major groups of fungi and their life histories.
- Familiarity with different fungal nutrition modes: saprotrophy, biotrophy, hemibiotrophy, and necrotrophy.
- Appreciation of the links between fungal lifestyle and reproductive biology, i.e. loss of sex in mutualists vs. importance of recombination in parasites.
- Understanding principles that regulate fungal mating versus vegetative compatibility.
- Appreciation for the roles of fungi as: decomposers, mutualists of plants (endophytes, mycorrhizae, lichens) and animals (gut microbiota), pathogens of plants and animals, model systems for biology, sources of food, antibiotics, organic acids, allergens, toxins and carcinogens.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6380 - Filamentous Fungal Genetics and Genomics (4 Credits)
Fungi play a vital role in our ecosystem and are responsible for devastating crop infestations that threaten global food supplies and diseases that result in the death of hundreds of thousands of individuals each year. This course explores fungal biology through the lens of molecular genetics and genomics, including epigenetics, genome defense mechanisms, metabolism, and signaling pathways. We will cover the use of genetic tools in fungi ranging from classical genetics to CRISPR to high-throughput sequencing. This course will also teach skills necessary to analyze genetic and genomic data using Python and publicly available sequencing analysis software. No prior coding experience is necessary. The course will emphasize the development of professional skills, such as critically reading and reviewing scientific literature, experimental design, scientific communication, and data analysis.
Prerequisites: Prerequisite for undergraduates: BIOMG 2800 or PLSCI 2250.
Last Four Terms Offered: Spring 2025, Fall 2023, Spring 2022
Learning Outcomes:

- Articulate the beneficial and harmful biological roles fungi play in the ecosystem.
- Explain the genetic and genomic principles governing fungi.
- Evaluate research papers from the current and historical literature on fungal genetics and genomics.
- Use Python and publicly available sequencing analysis programs to analyze transcriptomic data.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6410 - Laboratory in Plant Biology (2 Credits)
Includes selected experiments on gene expression, biolistic transformation, confocal microscopy, laser capture microdissection, microarray analysis, genetic mapping and mutant analysis, transposon tagging, proteomics, and metabolite analysis.
Prerequisites: Prerequisite for undergraduates: BIOMG 2800or PLSCI 2250, plus BIOMG 3300 or BIOMG 3310 orBIOMG 3350.
Last Four Terms Offered: Fall 2024, Fall 2022, Fall 2021, Fall 2020
Learning Outcomes:

- Demonstrate a set of methods for performing experiments with plant material in the laboratory and be able to follow and use experimental protocols.
- Describe what information can be gained by a particular type of experimentation or data analysis as well as the limitations of the methods.
- Formulate testable hypotheses and select available experimental techniques or analytical methods in order to draw defensible and creative conclusions.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6420 - Mineral Nutrition: From Plants to Humans (3 Credits)
Plants provide almost all essential minerals for humans and therefore plants are critical components of the human diet. Plant biologists address challenges of meeting the nutritional needs of the increasing world's population by studying plants' ability to uptake, translocate and accumulate mineral nutrients in edible tissues. By integrating basic plant biology with molecular breeding and genomics approaches, fundamental discoveries are utilized to have the greatest impact on solving biofortification of plant-based foods. This team-taught course explores the mechanisms of acquisition of mineral nutrients from the soil, translocation and accumulation in plant tissues, strategies to prevent mineral element deficiencies while avoiding their overload, and toxicity of noxious metals. Selected lectures focus on the relation between the nutrient status of plants and human nutrition and health. Graduate students will have assignments for in-depth learning of each topic. Examination questions will differ for graduate students to evaluate assigned material. Graduate students will write a paper for one of the topics and present it in class.
Prerequisites: course work in advanced plant sciences, molecular biology and biochemistry or permission of instructor.
Last Four Terms Offered: Spring 2025, Spring 2023, Spring 2021, Spring 2019
Learning Outcomes:

- Explain the impact of mineral deficiencies on plant growth and yield and the impact of poor mineral nutrition on human health.
- Describe transport pathways and their regulatory components that control the uptake of minerals from the soil solution, their radial transport, root-to-shoot partitioning, and grain filling.
- Explain the rationale behind designing nutrient solution for different plant species.
- Explain the approaches and scientific basis behind them for crop biofortification.
- Analyze original scientific literature, design, and communicate scientific presentation.
- Explain, evaluate, and interpret original experimental data, reflect on the design and the interpretation of results of one's own experiments.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6450 - Urban Plants and Public Health (3 Credits)
This class examines how urban plants affect public health (e.g., air pollution reduction, temperature regulation, etc.). We will also explore the causes and health consequences of variation in urban plant composition, environmental justice perspectives, the effects of policies and management approaches, and the impacts of climate change.
Last Four Terms Offered: Fall 2024
Learning Outcomes:

- Describe the public health relevance of urban trees.
- Independently identify and interpret peer-reviewed journal articles and extract quantitative data from them.
- Analyze the public health consequences of plant-human interactions in a case study.
- Create written and verbal summaries of research findings from the case study.
- Synthesize case studies into a submission-ready manuscript.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6490 - Current Topics in Fungal Biology (1 Credit)
In-depth analysis and discussion of current scientific literature focused on the genetics, genomics, cell and molecular biology, and evolution of fungi.
Prerequisites: BIOMG 2800 or PLSCI 2250 required for undergraduates; equivalent background in molecular biology and genetics coursework required for graduate students.
Last Four Terms Offered: Fall 2024, Spring 2024, Fall 2022, Fall 2021
Learning Outcomes:

- Synthesize and present scientific arguments and evaluate them in the context of published literature.
- Integrate quantitative and qualitative data to reach defensible conclusions and compare them to conclusions presented in the scientific literature.
- Evaluate and effectively interpret factual claims, theories, and assumptions in the current fungal biology scientific literature.
- Communicate data, claims, and theories effectively with peers.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6500 - Fruit Crop Physiology (3 Credits)
We will be studying the physiology of perennial fruit crop production with an emphasis on the biochemical and genetic mechanisms by which fruit crops function and interact with the environment. The class focuses on temperate fruit trees, grapevines, and small-fruits that are commercially grown in the Northeastern U.S., but other species will be highlighted on occasion. Topics include: flower development, pollination and fertilization, cold hardiness, fruit set and growth, plant growth regulators, carbon acquisition and partitioning, soil-root interactions, mineral nutrition, and water transport. Additionally, we will highlight critical challenges to fruit crop production, such as climate change and soil degradation. Course readings will largely come from journal articles. Students will lead and participate in discussions, write a review article, and learn how to evaluate scientific journal articles.
Last Four Terms Offered: Spring 2025, Spring 2022
Learning Outcomes:

- Apply physiological processes to temperate fruit crop plants and planting systems.
- Evaluate scientific methods and experimental designs used to study fruit crops.
- Synthesize complex phenomena and present information in a concise written format.
- Facilitate discussions based upon course readings.
- Lead discussion sessions based on the guest lectures and submitted student questions.
- Interpret course material through problem sets that challenge students to consider content that is not directly addressed during lectures.
- Teach others, including undergraduate colleagues, about key concepts in fruit physiology based upon your coursework and/or research experience.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6520 - Berry Crops: Culture and Management (3 Credits)
Study of the evolution, breeding history, and physiology of strawberries, raspberries, blackberries, blueberries, and other minor small fruit crops and of cultural practices that influence productivity, fruit quality, and pest damage. Also considers marketing and economics and discusses alternate production practices for both commercial and home gardeners. Frequent field trips enhance classroom activities.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2022
Learning Outcomes:

- Communicate the impact that berries have on local and national economies, human well-being and diet, and the role they play in American and world agriculture.
- Integrate information to produce high-quality berry crops at various scales in the most efficient and economical manner possible, with minimal impact on environmental quality.
- Explain the science behind various practices used in the production of berry crops.
- Produce a business plan for a berry farm.
- Exhibit leadership and team-building skills in the conduct of a multi-faceted study and report.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6540 - Plant Cell Biology (4 Credits)
Uses evidence from microscopy, physiology, biochemistry, and molecular biology to try to unravel the mystery of the living cell. Studies the dynamics of protoplasm, membranes, and the various organelles. The mechanisms of cell growth and division, the relationship of the cytoskeleton to cell shape and motility, the interaction of the cell with its environment, and the processes that give rise to multicellular differentiated plants are investigated.
Last Four Terms Offered: Fall 2023, Fall 2021
Learning Outcomes:

- Explain why the cell is the basic unit of life.
- Describe the natural laws that underlie the physicochemical behavior of cells.
- Explain cell behavior in physicochemical terms.
- Describe the diversity, morphology, function, chemistry, development, turnover, and evolution of organelles.
- Describe the physiological processes of cells, including mitosis, secretion, nutrient uptake, water movement, photosynthesis, respiration, growth, and adaptation to the environment. Evaluate the processes physicochemically.
- Examine cells with many types of microscopy and measure physicochemical properties of cells.
- Demonstrate proficiency in laboratory techniques used to study cells.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6550 - Postharvest Biology of Horticultural Crops (3 Credits)
Study of the biological processes controlling physical and chemical changes in harvested yet living horticultural crops or their parts. Discusses the theoretical principles and fundamental processes underlying these changes. Also covers strategies and practical handling requirements/conditions for storage, transportation, and quality monitoring of harvested horticultural crops.
Last Four Terms Offered: Spring 2025, Spring 2024
Learning Outcomes:

- Describe what changes are occurring in vegetables and fruits after harvest in terms of nutritional (and in some cases medicinal) values, and how those changes happen.
- Explain general guidance and underlying basic principles on how to handle and store horticultural products (fruits, vegetables, and ornamentals).

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6551 - Principles of Nutrition and Nutrient Management in Crops and Landscape Plants (3 Credits)
Students learn the principles of mineral nutrient function in crop and landscape plants, are able to diagnose deficiencies by symptoms and tissue tests, and can devise organic and conventional nutrient management schemes that maximize productivity and mineral nutrient quality.
Last Four Terms Offered: Spring 2024, Spring 2022
Learning Outcomes:

- Characterize the behavior of mineral nutrients in the soil and how they affect plant growth and development.
- Identify nutrient deficiencies and excesses in plants through visual symptoms.
- Diagnose the nutrient status of plants using various tools and identify corrective measures.
- Describe basic principles and methods of nutrient management for crops and landscape plants.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6560 - Topics in Plant Evolution (1 Credit)
Series of selected topics to provide a background in plant evolution, paleobotanical literature, and evolutionary theory. Among the topics discussed are: the origin of a terrestrial flora, the evolution of the seed plants, and the origin and adaptive radiation of the angiosperms.
Prerequisites: college-level coursework in evolution.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:

- Integrate and evaluate opposing points of view.
- Describe the role of fossil evidence in understanding plant evolution, biogeography, paleoecology, and hypothesis testing.
- Explain some basic principles of plant evolutionary biology.
- Describe the history of plant life on earth.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6610 - Diagnostic Lab Experience (1-2 Credits)
For graduate students and advanced undergraduates with a special interest in diagnosing plant diseases. Students work in the Diagnostic Laboratory (section of Plant Pathology and Plant-Microbe Biology) under supervision of the diagnostician.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6620 - Plant Biochemistry (3 Credits)
Focuses on biochemistry of plant specific processes, with the aim to obtain an integrative overview of plant biochemistry. Examples include processes such as cell wall biochemistry, pigment biosynthesis and degradation, secondary metabolism, senescence, defense mechanisms, amino acid biosynthesis, and small molecule transport. Genomics-based experimental tools such as proteomics and metabolomics are discussed.
Last Four Terms Offered: Fall 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe a range of plant biochemical pathways and associated regulatory mechanisms (e.g., allosteric regulation, post-translational modifications, feedback regulation).
- Articulate how those processes are different from, or share some features with, analogous systems in non-plant taxonomic groups, such as bacteria, yeast and mammals.
- Demonstrate insights into (sub)cellular compartmentalization of plant biochemical processes.
- Explain how multiple plant biochemical pathways intersect and influence each other.
- Discuss current literature in the field of plant biochemistry, including new analytical techniques, bioinformatics approaches and analytical paradigms in 'model' and 'non-model' experimental systems.
- Describe the importance of plant biochemistry in the areas of human health, agricultural biotechnology and new and emerging applications such as bioenergy and fine chemicals.
- Communicate key aspects of grant proposals to address central questions in both basic and applied plant biochemistry.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6630 - Pedology (3 Credits)
Covers weathering, reactions, and processes of soil genesis; principles of soil classification and the rationale and use of soil taxonomy; development and significance of major groups of soils of the world.
Prerequisites: PLSCI 3630 or permission of instructor.
Last Four Terms Offered: Spring 2025, Spring 2023, Spring 2021, Spring 2019
Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6660 - Applied Plant-Microbe Interactions (3 Credits)
Microbial interactions with plant roots strongly affect plant productivity. Mutualisms, such as root nodule bacteria and mycorrhizae; deleterious interactions, such as pathogenesis and herbivory; and the importance of microbial activity in the rhizosphere are among the topics discussed. Course activities are aimed at helping students improve their professional practice within the content area.
Prerequisites: PLSCI 4660 or solid understanding of ecological principles applied to soil systems.
Last Four Terms Offered: Fall 2023, Fall 2021, Fall 2019, Fall 2017
Learning Outcomes:

- Evaluate experimental research methods, refine research questions, and write critical research reports.
- Discuss the implications of soil management practices for improving the interrelationships between plant roots and soil microbial communities and, ultimately, crop productivity and environmental and economic integrity.
- Critically review current literature, present, discuss and debate research findings and devise approaches to improve the functioning of soil microbial populations to enhance plant growth.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6710 - Soil Chemistry (3 Credits)
This course provides an understanding of soil chemical properties and processes. A detailed examination of the structure and surface chemistry of mineral and organic colloidal particles important to the function of soils is provided. The course also emphasizes reactions that occur at the solid-solution interface (e.g., ion exchange, chemical and physical adsorption), mineral-solution equilibria, soil acidity, and redox reactions in soils. Thermodynamic and kinetic principles are used to model and conceptualize soil chemical processes. The objective is to explain the fundamental role of these soil chemical properties and processes to terrestrial systems, both agricultural and natural ecosystems.
Prerequisites: two semesters of college-level general/introductory chemistry.
Last Four Terms Offered: Fall 2023, Fall 2021, Fall 2019, Fall 2017
Learning Outcomes:

- Describe the surface properties of mineral and organic components of soils and the reactivity of these components towards a variety of ions and molecular classes.
- Apply thermodynamic and kinetic principles to environmental phenomena.
- Integrate theories and models to develop a conceptual framework of the chemical behavior of soils.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6720 - Nutrient and Carbon Cycling and Management in Ecosystems (3 Credits)
Building on knowledge of basic physico-chemical and microbial nutrient and carbon transformations in soil, we will examine the pathways of carbon and nutrients in ecosystems from the rhizosphere to the landscape level. An important aspect will be the understanding of environmental impacts by agriculture, forestry and agroforestry and the development of sustainable landus systems. We will explore various tracer methods for the study of carbon and nutrient cycling including stable and radio-isotopes as well as rare elements and biomarkers. You will expand you knowledge in discussion groups and through presentations and work in-depth on a project which involves both field and laboratory experimentation. The results of the project will be presented in a poster conference.
Prerequisites: PLSCI 2600 and BIOEE 4780. Advanced knowledge of biological and chemical processes is beneficial.
Last Four Terms Offered: Fall 2024, Fall 2022, Fall 2020, Fall 2018
Learning Outcomes:

- Design a research project and articulate the justification for research questions.
- Develop mechanistic hypotheses, choose appropriate methods for a certain problem, and interpret complex data.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6730 - Ecology of Agricultural Systems (4.5 Credits)
Analysis of the ecological processes operating in agricultural systems, with an emphasis on understanding relationships between agroecosystem structure and function and interactions among organisms. Examines agroecological theory and research through readings and discussions. The first part of this course emphasizes understanding biogeochemical processes, population and community ecology with emphasis on plant-herbivore and plant-microbial interactions, and evolutionary processes in agroecosystems. The latter part focuses on the application of ecological knowledge to the design and management of multifunctional agroecosystems and comparative analysis of frameworks used to assess sustainability. Field trips to local farms and case studies from both the tropics and the temperate zone are used to illustrate important concepts.
Prerequisites: Familiarity with basic ecological science and some knowledge of agricultural production systems.
Last Four Terms Offered: Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Apply ecological concepts to agricultural systems.
- Explain concepts of agroecology including population, community, evolutionary and ecosystem principles and processes as well as interactions across social and ecological systems.
- Describe history of agricultural intensification and the diverse approaches to meeting the challenge of achieving sustainability.
- Apply critical thinking skills to evaluate controversies and ongoing political debates over technological pathways and environmental policies targeting food production systems.
- Systematically analyze research papers, provide constructive feedback and lead round table discussions based on specific journal articles.
- Develop and practice teaching skills that engage students in active learning processes.
- Identify inconsistencies, develop hypotheses, and synthesize primary literature.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6820 - Graduate Student Research Updates (1 Credit)
Weekly graduate student seminar series. Guests with an interest in plant pathology research are welcome to attend. Classes meet simultaneously in Geneva and Ithaca and are linked by teleconference.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6831 - Concepts and Techniques in Plant Biology (3 Credits)
This course is the first of a two-semester sequence (with PLSCI 6841) which together provide a broad overview of concepts related to the study of plant molecular biology. It is intended to bring first-year graduate students in plant molecular biology to a common background in genetics, biochemistry and phylogenetics.
Enrollment Information: Open to: upper-level students in plant biology and plant sciences.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Identify and describe key research areas related to plant molecular biology.
- Explain, give relevant examples of, and make predictions using fundamental concepts of biochemistry, genetics and phylogeny.
- Integrate these same concepts into their understanding and interpretation of experimental techniques and interpretation of results.
- Articulate how experimental techniques constrain interpretation of experimental data.
- Evaluate current literature.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6841 - Plant Form and Function: Anatomy, Cell Biology, and Development (3 Credits)
This course is broken into three sections focusing on plant anatomy, cell biology, and development. In each section, we will discuss our current understanding of the key concepts, talk about some of the remaining open questions, and describe the techniques used in research to address these questions. Topics covered will include: cell versus organismic theory, meristems, organs, anatomical evolution, the cytoskeleton, cell wall, cell growth, cell division, advanced microscopy, subcellular trafficking, cell differentiation, pattern formation, intercellular signaling, and plant hormones.
Prerequisites: BIOMG 2800 or PLSCI 2250 or PLSCI 6831.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Explain the fundamental concepts in plant anatomy, plant cell biology, and plant development, and recognize how these principles underlie and impact research in other areas of plant biology.
- Evaluate experiments and the conclusions drawn from them in the scientific literature on plant anatomy, cell biology, and development.
- Design experiments using the techniques presented in the course and describe their advantages as well as limitations.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6880 - Genetic Engineering of Food Crops: Myths, Truths and Detection (1 Credit)
Genetically modified (GM) crops have been a hot topic with controversy. One of the major concerns is on the GM crops' safety when served as our food or food ingredients. The objective of this one-credit course is to discuss the principles and nature of crop genetic engineering vs. conventional plant breeding, and to show case studies of genetically engineered food crops with emphases on how they are generated, how the nutritional values are improved, and how to detect or examine if one's food may be genetically engineered or may contain GM crop-derived ingredients. This is a middle-level course that emphasizes the science-based principles and practices. An understanding of the basic biological processes involved in GM crops-related food will help students to rationally deal with GMO food and related issues.
Prerequisites: college-level introductory biology.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Articulate the nature of genetic engineering of crops vs. conventional plant breeding.
- Evaluate and assess the nutritional and economical values of various improved crops by genetic engineering.
- Identify and use various techniques to monitor/determine if their food is GM crops or contains ingredients derived from GM crops.
- Develop science-based critical thinking of the GMO issues in general and engineered food crops in particular.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 6940 - Special Topics in Plant Sciences (1-4 Credits)
The School of Integrative Plant Science offers graduate-level trial courses under this number. Offerings vary by semester and are advertised by the school before the semester starts. Courses offered under the number will be approved by the Plant Sciences Curriculum Committees, and the same course is not offered more than twice under this number.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

PLSCI 7000 - School of Integrative Plant Science Seminars (1 Credit)
Weekly seminars on selected topics in plant biology, plant breeding and genetics, plant pathology and plant-microbe biology, horticulture, and soil and crop science, as presented by faculty, graduate students and guest speakers. Students will have opportunities to be exposed to advances in plant science disciplines, learn how scientific data are collected, analyzed and presented, network with speakers, and engage in dialog about research, extension and teaching topics.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:

- Describe advances on a breadth of topics in the fields of plant biology, plant breeding and genetics, horticulture, and soil and crop science.
- Articulate new insights on investigative and analytical methods used by presenters.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 7160 - Perspectives in Plant Breeding Strategies (4 Credits)
Emphasizes critical discussion and evaluation of selected benchmark papers and current literature. Reviews and discusses conventional and molecular selection techniques and breeding objectives, methods, and strategies for both self- and cross-pollinated crops. Requires extensive outside reading. Grades are based on four papers demonstrating creative thinking and analysis of plant breeding concepts.
Prerequisites: PLSCI 4030.
Last Four Terms Offered: Spring 2025, Spring 2023, Spring 2021, Spring 2019
Learning Outcomes:

- Convey to professional and lay audiences, orally and in writing, advanced concepts relating to strategies for crop improvement.
- Explain the fundamental concepts that underlie a well designed breeding program to improve both quantitative and qualitative traits in plant.
- Articulate a vision for the future trends that will transform plant breeding in the coming decade.
- Describe the central role that crop improvement plays in global food security, health and well-being.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 7170 - Quantitative Genetics for Analysis and Improvement of Complex Traits (4 Credits)
This course will provide students with a solid foundation in quantitative genetics theory, as applied to the field of plant and animal breeding, introduce students to modern-day modeling approaches, simulation tools and applications of genomic selection. While the methodologies of plant and animal breeding are distinct in many ways, the core principles are the same, and this course will cover topics in a way that is inclusive of animal breeding applications.
Prerequisites: PLSCI 6030 and BTRY 6010 or equivalent.
Last Four Terms Offered: Spring 2025, Spring 2023, Spring 2022, Spring 2021
Learning Outcomes:

- Interpret quantitative genetics research with substantial mathematical and statistical components.
- Analyze complex breeding datasets using advanced modeling methods.
- Estimate gain from selection and impact on genetic variance of breeding decisions.
- Design optimal breeding approaches.
- Apply quantitative genetics theory to solve novel or emerging breeding problems.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 7201 - Advanced Statistics and Experimental Design (2 Credits)
This course will provide a comprehensive introduction to experimental designs that are commonly used in plant science and provide participants with the practical coding skills necessary to analyze data from such designs. This basic knowledge will be extended to accommodate high-dimensional data generated by modern 'omics techniques. This course will provide a foundational introduction of experimental designs and statistical analyses to guide independent research and avoid mistakes that are often made by new scientists. While this course will cover a wide range of topics, it is by no means an exhaustive coverage of experimental design and statistics. Students are strongly encouraged to complement the foundational knowledge learned in this course with classes on advanced statistical methods and/or experimental design.
Prerequisites: undergraduate-level course in statistics.
Enrollment Information: Enrollment limited to: graduate students. Undergraduates must obtain permission of instructor.
Last Four Terms Offered: Fall 2024, Fall 2022, Fall 2021, Fall 2020
Learning Outcomes:

- Interpret experimental designs that are commonly used in plant science and plant breeding.
- Apply and interpret linear models to account for systematic effects in commonly used experimental designs.
- Extend classical experimental designs and statistical frameworks to challenges and limitations associated with high-dimensional 'omics data.
- Apply these concepts to meet independent research objectives.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 7410 - Problems in Plant Biology (1 Credit)
Introduction to the research literature in plant biology through weekly problem sets and discussions.
Enrollment Information: Enrollment limited to: first- and second-year graduate students in the field of plant biology.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Evaluate and interpret experimental data as presented in the plant science literature in the context of the existing paradigms, theories, and assumptions in plant biology.
- Communicate effectively in verbal and written formats.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 7420 - Genotypes to Phenotypes: The Evolution of Genetic Modeling in Plant Breeding (1.5 Credits)
The goal of this journal-club course is to review historic and current literature related to the application of quantitative genetics in modern biology and its application in plant breeding. The format of the course will be a discussion of two landmark papers per session, each presented by a student and guided by study questions. The topics to be discussed include: advances in genomic technologies and their impact on the study of simple and complex traits, quantitative trait locus (QTL) mapping, linkage disequilibrium and Genome Wide Association Studies (GWAS), impacts of population structure and genetic architecture on genetic modeling decisions and breeding strategies, long term versus short term genetic gain and extracting signal from noisy data.
Last Four Terms Offered: Spring 2024, Fall 2021, Fall 2019
Learning Outcomes:

- Interpret quantitative genetics research with substantial mathematical and statistical components.
- Effectively present research findings from landmark papers in quantitative genetics theory.
- Describe the impacts of quantitative genetics theory in shaping modern plant breeding and genetics research.
- Demonstrate critical thinking of how to apply quantitative genetics theory to solving novel or emerging breeding problems.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 7440 - Graduate Research in Plant Biology (1 Credit)
After the first year, students present one seminar per year on their thesis research and then meet with their thesis committee members for evaluation. First-year students only attend the seminar series; they do not present. Second-year students give a 25-minute seminar, while students in their third and higher years present a 50-minute seminar.
Enrollment Information: Requirement for and limited to: all graduate students in the field of Plant Biology.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:

- Describe their personal research as a coherent story.
- Engage an audience as part of a graduate symposium.
- Employ different strategies and approaches in presenting scientific content to academic audiences.

Schedule of Classes (https://classes.cornell.edu/)

PLSCI 7450 - Current Papers in Plant Biology (1 Credit)
Students in this class read and discuss recently published papers in plant molecular biology. A faculty member from the Plant Biology Section in the School of Integrative Plant Science will assign the reading material and facilitate student discussions. To enable in-depth review and discussion, the literature reading in each semester will have a common theme, which will generally be based on the research interests and expertise of the faculty mentor.
Enrollment Information: Enrollment limited to: graduate students. Permission of instructor required for undergraduates.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

PLSCI 7980 - Graduate Teaching Experience in Plant Sciences (1-4 Credits)
Designed to give graduate students teaching experience through involvement in planning and teaching courses under the supervision of SIPS faculty members. May include leading discussion sections; preparing, assisting in, or teaching lectures and laboratories; and tutoring.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:

- Explain course content effectively to others.
- Appreciate the diversity of student learning styles and associated needs.
- Develop their own teaching philosophy.
- Critically self-reflect in order to enhance their skills and/or performance.
- Engage students in the learning process.
- Develop effective classroom materials (i.e., PowerPoint presentations, lab experiences, review sheets).
- Demonstrate respect for all students and their inclusive communities.

Schedule of Classes (https://classes.cornell.edu/)