BOTANY AND PLANT PATHOLOGY

Undergraduate Studies

Botany and plant pathology are concerned with the study of plants at all levels of biological organization, from molecular and cellular processes to the global ecosystem. This breadth of field reflects the wide range of issues and problems that confront plant biologists. In addition to addressing fundamental questions in plant biology, plant scientists in the 21st century will be called upon to provide information useful for producing food, fiber, and medicine for an increasing population, and for increasing our understanding of the diversity of plant and ecological systems and their interactions with humans. Students studying botany and plant pathology at OSU receive the basic science background necessary for such contributions, and may choose to focus in a particular area within plant science.

The undergraduate program in the Department of Botany and Plant Pathology is designed for students who wish to receive a BS in Botany degree and for students pursuing degrees in other fields that require a knowledge of plant biology. For example, students who have an undergraduate major in biology or environmental sciences may wish to emphasize botany courses in their upper-division course work.

Completion of the undergraduate curriculum in botany can qualify students for graduate work in various areas of plant biology and plant pathology, and for positions in state and federal agencies, and industries concerned with plants and their products.

Prospective botany majors should obtain a strong background in the biological and physical sciences at the high school level. Specifically recommended are a minimum of three years of high school mathematics, including algebra, geometry, and some exposure to trigonometry, one year of chemistry, one year of biology, one year of physics, and courses designed to develop computer and writing skills. Students without an adequate background in mathematics and science may make up these deficiencies early in their college careers.

Graduate Studies

The Department of Botany and Plant Pathology offers graduate programs in the following areas of concentration: ecology, genetics, genomics and computational biology, molecular and cellular biology, mycology, plant pathology, plant physiology, and systematics.

Students with majors in any one area may incorporate into their programs minors in other areas within the department or in other departments and colleges. Integrated minors, and interdisciplinary programs in plant physiology, molecular and cellular biology, genetics, and environmental sciences are also available.

The MS and PhD degrees offered by the Department of Botany and Plant Pathology require, in addition to course work, research resulting in presentation and defense of a thesis. A nonthesis MS degree also is available. PhD candidates must pass a written and oral preliminary examination upon completion of their course work. In addition, PhD students are required to be a teaching assistant for two quarters.

Inquiries concerning graduate studies can be forwarded to the chairperson of the department's Graduate Studies Committee (Andrew.Jones@oregonstate.edu (john.fowler@oregonstate.edu)) and additional details are available online (http://bpp.oregonstate.edu/content/graduate-programs/).

Undergraduate Programs

Major

- Biological Data Sciences (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/biological-data-sciences-bs-hbs/)
  Options:
  - Genomics (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/biological-data-sciences-bs-hbs/genomics-option/)
  - Ecological and Environmental Informatics (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/biological-data-sciences-bs-hbs/ecological-environmental-informatics-option/)
  - Computational Biology (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/biological-data-sciences-bs-hbs/computational-biology-option/)
- Botany (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-bs-hbs/)
  Options:
  - Comprehensive Botany (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-bs-hbs/comprehensive-botany-option/)
  - Customizable (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-bs-hbs/customizable-option/)
  - Ecology, Evolution, and Conservation (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-bs-hbs/ecology-evolution-conservation-option/)
  - Molecular, Cellular, and Genomic Botany (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-bs-hbs/molecular-cellular-genomic-botany-option/)
  - Plant Pathology (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-bs-hbs/plant-pathology-option/)

Minor

- Biological Data Sciences (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/biological-data-sciences-minor/)
- Botany (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-minor/)

Graduate Programs

Major

- Botany and Plant Pathology (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-plant-pathology-ms-phd/)

Minor

- Botany and Plant Pathology (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-plant-pathology-graduate-minor/)

Joseph Spatafora, *Department Head*

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Faculty

Professors Behrenfeld, Ciuffetti, Dolja, Fowler, Ingham, Johnson, Liston, McCune, Mundt, Pscheidt, Spatafora, Stone, Tyler, Wolpert
Associate Professors Chang, Goyer, Jaiswal, Jones, Megraw, Milligan, Ocamb, Parke, Santamaria
Assistant Professors Anderson, Busby, Dung, Frost, Graff, Hagerty, Hardison, KC, LeBoldus, Luh, Naithani, Westberry
Senior Instructor Putnam
Instructors Curtis, Link-Perez, Smyth

Courtesy Faculty

Professors Gent, Grunwald, Loper, Martin, Rothwell, Stockey
Associate Professors Hansen, Kentula, Mahaffee, Pyke, Stockwell, Zasada
Assistant Professors Cronn, Grevstad, Kaye, Meinke, Reichman, Weiland

Adjunct Faculty

Professor Freitag

Biological Data Sciences (BDS)

BDS 211, USE AND ABUSE OF DATA: CRITICAL THINKING IN SCIENCE, 3 Credits

Critically examine how data analysis can support legitimate conclusions from biological datasets and also how deceptive visualizations, misleading comparisons, and spurious reasoning can lead to false conclusions. Analyze data to break down the logical flow of an argument and identify key assumptions, even when they are not stated explicitly.
Prerequisite: (MTH 251 (may be taken concurrently) with C- or better or MTH 251H (may be taken concurrently) with C- or better) or MTH 227 with C- or better or MTH 241 with C- or better or MTH 245 with C- or better

BDS 311, COMPUTATIONAL APPROACHES FOR BIOLOGICAL DATA, 3 Credits

The theory and practice underlying widely used computational methods for biological data analysis. Focuses on the analysis and visualization of large data sets using Python, with broad applications to genomics, ecology, and other disciplines. Topics may include image processing, time series analysis, dimensionality reduction, and resampling methods. Develops student expertise in designing and implementing algorithms in the Python programming language.
Prerequisite: (BI 223 with C- or better or BI 223H with C- or better) and (MTH 252 [C-] or MTH 252H [C-] or MTH 228 [C-]) and (CS 161 [C-] or BOT 476 [C-])

BDS 406, SPECIAL PROJECTS, 1-99 Credits

This course is repeatable for 99 credits.

BDS 411, ^ANALYSIS OF BIOLOGICAL DATA: CASE STUDIES, 3 Credits

Case studies; synthesize previously acquired knowledge and skills in biology, mathematics, statistics, and computer science to implement, in writing, an analysis strategy. (Writing Intensive Course)
Attributes: CWIC – Core, Skills, WIC
Prerequisite: ((BI 311 with C- or better or BI 311H with C- or better) or (BB 314 with C- or better or BB 314H with C- or better) or MB 310 with C- or better) and ((MTH 252 with C- or better or MTH 252H with C- or better) or MTH 228 with C- or better) and CS 261 [C-] and (ST 352 [C-] or ST 412 [C-])

BDS 470, INTRODUCTION TO COMPUTING IN THE LIFE SCIENCES, 3 Credits

Covers the basics of writing a well-organized computer program to perform tasks that are commonly needed for effective data analysis in the life sciences. Incorporates reading data from a variety of file formats, parsing relevant information from data which comes in as text, putting this information into storage structures that make sense for the task at hand, applying basic mathematical functions to the data, and writing results to an output file. Provides students with the foundation to rapidly expand their knowledge of Python and other programming languages as needed in the future. CROSSLISTED as BDS 470/BOT 470 and BDS 570.
Equivalent to: BOT 470, BOT 476
Recommended: CS 161 or exposure to programming logic

BDS 474X, INTRODUCTION TO GENOME BIOLOGY, 3 Credits

Explores how genomes underlie and influence biological phenomena, across the diversity of life, from prokaryotic microbes to eukaryotic multicellular organisms. Covers genome organization: the structure of chromosomes and chromatin; genes and gene families; and mechanisms that remodel genomes, such as mutation, recombination and transposable elements in the first part of the course. Focuses on genome expression and regulation: gene expression, cellular functions and biochemical pathways; transcriptional and post-transcriptional regulatory mechanisms; and genotype-to-phenotype relationships in the second part of the course. Emphasizes the use of recent technological advances and genome-wide assays that enable investigation of these topics.
Prerequisite: BI 311 (may be taken concurrently) with C- or better or BB 314 (may be taken concurrently) with C- or better
Equivalent to: BOT 474X

BDS 475, COMPARATIVE GENOMICS, 4 Credits

Explores principles of comparative genomics. Examines methods for genome assembly and annotation. Discusses genomic approaches for the study of structural change, whole genome duplication, gene family evolution, gene networks, gene regulation and epigenetics. Lab topics include the analysis of next generation sequencing data and conducting comparative genomic analyses. CROSSLISTED as BDS 475/BOT 475 and BDS 575/BOT 575/MCB 575.
Prerequisite: (BB 314 with D- or better or BB 314H with D- or better) and (BI 311 [D-] or BI 311H [D-] or PBG 430 [D-])
Equivalent to: BOT 475
Recommended: Basic working knowledge of cell and molecular biology and genetics

BDS 478, FUNCTIONAL GENOMICS, 3 Credits

Introduces conceptual approaches and associated laboratory techniques that rely on genome-scale datasets to investigate the function of, and interactions between, genes as well as their RNA/protein products. Examples include: predicting protein function based on nucleotide and amino acid sequence analysis; large-scale genetic approaches to identifying novel genotype-phenotype associations; and analysis of transcriptomic, proteomic and metabolomic datasets, which measure changes in RNA transcripts, proteins and metabolites, respectively, to explore gene function and cellular/organismal networks. Provides a conceptual framework for understanding how the wide range of available large-scale technologies can be applied to solve biological problems. CROSSLISTED as BDS 478/BOT 478 and BDS 578/BOT 578.
Prerequisite: BB 314 with C- or better or BB 314H with C- or better
Equivalent to: BOT 460, BOT 478

BDS 491, CAPSTONE PROJECTS IN BIOLOGICAL DATA SCIENCE I, 3 Credits

Quantitative skills and biological thinking will be used to analyze and draw conclusions from real-world biological datasets. Projects will be completed in the context of small groups. Draws on skills in mathematics, statistics, computer science, and biology.
Prerequisite: (ST 352 with C- or better or ST 412 with C- or better) and (CS 162 [C-] or BOT 476 [C-] or BB 485 [C-] or MTH 427 [C-])

BDS 492, CAPSTONE PROJECTS IN BIOLOGICAL DATA SCIENCE II, 3 Credits

Quantitative skills and biological thinking will be used to analyze and draw conclusions from biological datasets retrieved in BDS 412. This is a synthesis course that draws skills in mathematics, statistics, computer science, and biology, in which the students will process their curated datasets and draw conclusions.
Prerequisite: BDS 491 with C- or better

BDS 570, INTRODUCTION TO COMPUTING IN THE LIFE SCIENCES, 3 Credits

Covers the basics of writing a well-organized computer program to perform tasks that are commonly needed for effective data analysis in the life sciences. Incorporates reading data from a variety of file formats, parsing relevant information from data which comes in as text, putting this information into storage structures that make sense for the task at hand, applying basic mathematical functions to the data, and writing results to an output file. Provides students with the foundation to rapidly expand their knowledge of Python and other programming languages as needed in the future. CROSSLISTED as BDS 470/BOT 470 and BDS 570.

BDS 574X, INTRODUCTION TO GENOME BIOLOGY, 3 Credits

Explores how genomes underlie and influence biological phenomena, across the diversity of life, from prokaryotic microbes to eukaryotic multicellular organisms. Covers genome organization: the structure of chromosomes and chromatin; genes and gene families; and mechanisms that remodel genomes, such as mutation, recombination and transposable elements in the first part of the course. Focuses on genome expression and regulation: gene expression, cellular functions and biochemical pathways; transcriptional and post-transcriptional regulatory mechanisms; and genotype-to-phenotype relationships in the second part of the course. Emphasizes the use of recent technological advances and genome-wide assays that enable investigation of these topics.
Equivalent to: BOT 574X

BDS 575, COMPARATIVE GENOMICS, 4 Credits

Explores principles of comparative genomics. Examines methods for genome assembly and annotation. Discusses genomic approaches for the study of structural change, whole genome duplication, gene family evolution, gene networks, gene regulation and epigenetics. Lab topics include the analysis of next generation sequencing data and conducting comparative genomic analyses. CROSSLISTED as BDS 475/BOT 475 and BDS 575/BOT 575/MCB 575.
Equivalent to: BOT 575, MCB 575
Recommended: BB 314 and (BI 311 or PBG 430) and basic working knowledge of cell and molecular biology and genetics

BDS 578, FUNCTIONAL GENOMICS, 3 Credits

Introduces conceptual approaches and associated laboratory techniques that rely on genome-scale datasets to investigate the function of, and interactions between, genes as well as their RNA/protein products. Examples include: predicting protein function based on nucleotide and amino acid sequence analysis; large-scale genetic approaches to identifying novel genotype-phenotype associations; and analysis of transcriptomic, proteomic and metabolomic datasets, which measure changes in RNA transcripts, proteins and metabolites, respectively, to explore gene function and cellular/organismal networks. Provides a conceptual framework for understanding how the wide range of available large-scale technologies can be applied to solve biological problems. CROSSLISTED as BDS 478/BOT 478 and BDS 578/BOT 578.
Equivalent to: BOT 560, BOT 578

BDS 599, SPECIAL TOPICS, 1-4 Credits

This course is repeatable for 99 credits.

Botany and Plant Pathology (BOT)

BOT 101, *BOTANY: A HUMAN CONCERN, 4 Credits

Introductory botany for non-majors, emphasizing the role of plants in the environment, agriculture and society. Includes molecular approaches to the study of plant function and genetic engineering. Lec/lab. (Bacc Core Course)
Attributes: CPBS — Core, Pers, Biological Science

BOT 220, *INTRODUCTION TO PLANT BIOLOGY, 4 Credits

Introduction to plant biology including an overview of major groups of plants, plant cells and cell types, plant anatomy and architecture, physiology and function, and ecology and the roles of plants in the environment. Laboratory exercises build on lecture themes and provide hands-on learning experiences including field trips. Lec/lab. (Bacc Core Course)
Attributes: CPBS – Core, Pers, Biological Science
Available via Ecampus

BOT 313, PLANT STRUCTURE, 4 Credits

The structural components of vascular plants and how plant structure relates to function, development, environment, evolution, and human use of plants. Field trip. Lec/lab.
Prerequisite: ((BI 212 with D- or better or BI 212H with D- or better) and ((BI 211 with D- or better or BI 211H with D- or better) or (BI 213 with D- or better or BI 213H with D- or better))) or ((BI 221 with D- or better or BI 221H with D- or better) and (BI 222 [D-] or BI 222H [D-])) or (BI 205 [D-] and BI 206 [D-])
Recommended: BI 213 or BI 213H or BI 223 or BI 223H
Available via Ecampus

BOT 321, PLANT SYSTEMATICS, 4 Credits

Vascular plant classification, diversity, and evolutionary relationships. Lab emphasizes the collection and identification of ferns, gymnosperms, and flowering plants in Oregon. Field trips. Lec/lab.
Recommended: BI 213 or BI 213H or BI 223 or BI 223H
Available via Ecampus

BOT 322, ECONOMIC AND ETHNOBOTANY: ROLE OF PLANTS IN HUMAN CULTURE, 3 Credits

Economic and cultural (ethnobotanical) uses of plants and fungi by humans, including domesticated cultivated plants as well as wild-growing plants, and uses of plants and fungi by indigenous cultures. Ecampus course only.
Available via Ecampus

BOT 323, ^FLOWERING PLANTS OF THE WORLD, 3 Credits

Global perspective of plant biodiversity with a focus on evolutionary origins, classification, and evolutionary relationships of the major groups of plants. Development and application of scientific writing and utilization of online information resources in plant evolutionary biology. (Writing Intensive Course)
Attributes: CWIC – Core, Skills, WIC
Recommended: (BI 211, BI 212, BI 213) or (BI 221, BI 222, BI 223) or (BI 204, BI 205, BI 206)
Available via Ecampus

BOT 324, *FUNGI IN SOCIETY, 3 Credits

Explores the diverse roles played by fungi in relation to human civilization and the natural environment. (Bacc Core Course)
Attributes: CSST – Core, Synthesis, Science/Technology/Society
Recommended: One course in biological sciences.
Available via Ecampus

BOT 325, *INTERSECTIONS BETWEEN PLANTS AND HUMANITY, 3 Credits

The unique attributes of plants--including aspects of their biochemistry, growth, structure, and physiology--have influenced all aspects of life on earth, from biogeochemical cycles to the rise and expansion of human civilizations. Plants are sources of medicines, stimulants, hallucinogens, fibers and woods, resins and latex, oils and waxes; plants have inspired technological innovation, exploration, and exploitation of people and the environment. This course critically examines the intersections of plants with society and technology by exploring the roles plants have played in both historical and modern contexts. (Bacc Core Course)
Attributes: CSST – Core, Synthesis, Science/Technology/Society
Recommended: One course in biological sciences and junior standing.

BOT 331, PLANT PHYSIOLOGY, 4 Credits

Survey of physiological processes in plants, including photosynthesis and plant metabolism, mineral nutrition and ion uptake processes, plant cell/water relations, regulation of plant growth and development, and transpiration and translocation. Lec/rec.
Prerequisite: ((BI 212 with D- or better or BI 212H with D- or better) and (BI 213 [D-] or BI 213H [D-])) or ((BI 221 [D-] or BI 221H [D-]) and (BI 222 [D-] or BI 222H [D-])) or (BI 205 [D-] and BI 206 [D-]) and (CH 123 [D-] or (CH 233 [D-] and CH 263 [D-]))
Recommended: (BI 213 or BI 213H or BI 223 or BI 223H) and (CH 123 or (CH 233 and CH 263))
Available via Ecampus

BOT 332, LABORATORY TECHNIQUES IN PLANT BIOLOGY, 3 Credits

Laboratory experiences in the manipulation and observation of physiological processes in plant systems. Analysis and interpretation of physiological data generated in experimentation with plant systems. Training in basic laboratory skills, including the principles and procedures involved in the use of common items of laboratory instrumentation. Lab.
Recommended: BOT 331 or BI 314 or BB 314
Available via Ecampus

BOT 341, PLANT ECOLOGY, 4 Credits

Study of higher plants in relation to their environment. The relationship of plant physiology and reproduction to environmental factors; competition and other species interactions; the structure, dynamics and analysis of vegetation. Field trips. Lec/lab.
Recommended: BOT 321 and ((BI 213 or BI 213H) or (BI 223 or BI 223H))
Available via Ecampus

BOT 350, INTRODUCTORY PLANT PATHOLOGY, 4 Credits

Symptoms, causal agents, diagnosis, and prevention of plant diseases, with emphasis on fungi, bacteria, nematode, and virus pathogens. Lec/lab.
Prerequisite: ((BI 211 with D- or better or BI 211H with D- or better) and (BI 212 [D-] or BI 212H [D-]) and (BI 213 [D-] or BI 213H [D-])) or ((BI 221 [D-] or BI 221H [D-]) and (BI 222 [D-] or BI 222H [D-]) and (BI 223 [D-] or BI 223H [D-])) or (BI 204 [D-] and BI 205 [D-] and BI 206 [D-])
Available via Ecampus

BOT 401, RESEARCH, 1-16 Credits

This course is repeatable for 16 credits.

BOT 403, THESIS, 1-16 Credits

This course is repeatable for 16 credits.

BOT 405, READING AND CONFERENCE, 1-16 Credits

This course is repeatable for 16 credits.

BOT 406, PROJECTS: CURATORIAL ASSISTANT, 1-6 Credits

Students assist with curatorial projects in the OSU Herbarium. Admission is by application to the Department of Botany & Plant Pathology.
This course is repeatable for 6 credits.

BOT 407, SEMINAR, 1 Credit

Section 1: Departmental seminar. Section 2: Lichens and Bryophytes Research (1). Weekly one-hour meetings for reporting and discussion of active research projects, discussion of proposal research, review and discussion of recent literature, and mini-workshops on particular problems. Normally graded P/N.
Equivalent to: BI 407H, BOT 407H
This course is repeatable for 16 credits.

BOT 407H, SEMINAR, 1 Credit

Section 1: Departmental seminar. Section 3: Lichens and Bryophytes Research (1). Weekly one-hour meetings for reporting and discussion of active research projects, discussion of proposal research, review and discussion of recent literature, and mini-workshops on particular problems. Normally graded P/N.
Attributes: HNRS – Honors Course Designator
Equivalent to: BOT 407
This course is repeatable for 16 credits.

BOT 408, WORKSHOP, 1-16 Credits

This course is repeatable for 16 credits.

BOT 410, INTERNSHIP, 1-16 Credits

This course is repeatable for 16 credits.

BOT 413, FOREST PATHOLOGY, 3 Credits

Effects of diseases on forest ecosystems. Recognition of important groups, prediction of pathogen responses to environmental changes, and management strategies for protection of forest resources. Field trips. Lec/lab. CROSSLISTED as BOT 413/FOR 413.
Prerequisite: BI 204 with C or better or BI 212 with C or better or BI 212H with C or better or BI 213 with C or better or BI 213H with C or better or BI 221 with C or better or BI 221H with C or better
Equivalent to: FOR 413

BOT 414, AGROSTOLOGY, 4 Credits

Classification and identification of grasses, with emphasis on the modern system of grass classification; laboratory practice in keying grass specimens to genus and species. Lec/lab.
Recommended: BOT 321

BOT 416, AQUATIC BOTANY, 4 Credits

Taxonomy and ecology of aquatic vegetation, emphasizing freshwater and marine algae and the submergent vascular plants. Morphology, physiology, and classification of the algae; morphological and physiological adaptations of aquatic vascular plants; and primary production in aquatic ecosystems. Laboratory practice in the identification of local taxa. Field trips. Lec/lab.
Recommended: (BI 213 or BI 213H) or (BI 223 or BI 223H)

BOT 417X, PHYCOLOGY, 4 Credits

A field and laboratory based introduction to micro- and macro-algal biology, reproduction and evolution. Emphasis is placed on how the endosymbiosis theory ties algae together as a functional group. Algal diversity will be explored through lectures, laboratory and field trips. The laboratory experience will include methods for isolation, culturing and maintenance of algae for aquaculture and research.
Recommended: One year of biology

BOT 425, FLORA OF THE PACIFIC NORTHWEST, 3 Credits

Vascular plant identification, terminology, and diagnostic characteristics of plant families. Lab emphasizes the use of keys for identification to the species level and ability to recognize by sight those plant families found in the Pacific Northwest. Field trips. Lec/lab.
Recommended: BOT 321

BOT 440, FIELD METHODS IN PLANT ECOLOGY, 4 Credits

Concepts and tools for describing, monitoring, and experimenting on vegetation. Combines Web-based material, field experience at the student's location, and student projects.
Recommended: Course in ecology and a course in statistics.
Available via Ecampus

BOT 442, PLANT POPULATION ECOLOGY, 3 Credits

Ecological aspects of plant form and reproduction; demography and population modeling; species interactions, including competition, mutualism, and herbivory. Lec/lab.
Recommended: BOT 341

BOT 458, ECOSYSTEMS GENOMICS, 3 Credits

Genomic approaches used to understand species interactions with a focus on plant-associated microbes. Learning the conceptual framework and computational techniques of genomics to study the ecology of plant-microbe interactions at the ecosystem level.
Prerequisite: (BI 311 with D- or better or BI 311H with D- or better) and (BI 314 [D-] or BI 314H [D-] or BB 314 [D-] or BB 314H [D-])

BOT 460, FUNCTIONAL GENOMICS, 3 Credits

Functional genomics describes a set of conceptual approaches and associated laboratory techniques that rely on large-scale DNA sequence datasets to investigate the function of, and interactions between, genes as well as their RNA/protein products. This course will provide an overview of these techniques, including a) approaches to predicting protein function based on sequence analysis, b) large-scale genetic approaches to identifying novel genotype-phenotype associations, and c) transcriptomic, proteomic and metabolomic approaches that reveal gene functions by measuring changes in abundance/modification of associated RNA transcripts, proteins and metabolites.
Prerequisite: (BI 311 with C- or better or BI 311H with C- or better) and (BI 314 [C-] or BI 314H [C-] or BB 314 [C-] or BB 314H [C-])

BOT 461, MYCOLOGY, 4 Credits

Broad taxonomic survey of the fungi and their biology. Examines fungal life histories, systematics, ecology, and genetics, as well as ethnomycology. Introduces approaches to mycology in the field, including collection and preparation of specimens.
Prerequisite: ((BI 211 with C- or better or BI 211H with C- or better) and (BI 212 [C-] or BI 212H [C-]) and (BI 213 [C-] or BI 213H [C-])) or (BI 204 [C-] and BI 205 [C-] and BI 206 [C-]) or ((BI 221 [C-] or BI 221H [C-]) and (BI 222 [C-] or BI 222H [C-]) and (BI 223 [C-] or BI 223H [C-]))

BOT 465, LICHENOLOGY, 4 Credits

Biology of lichens; includes structure, life histories, classification, and ecology. Field trip fee. Lec/lab. Offered alternate years.
Recommended: ((BI 213 or BI 213H) or (BI 223 or BI 223H)) and two botany courses

BOT 466, BRYOLOGY, 4 Credits

Biology of bryophytes; includes structure, life histories, classification, and ecology. Field trip fee. Lec/lab. Offered alternate years.
Recommended: ((BI 213 or BI 213H) or (BI 223 or BI 223H)) and two botany courses

BOT 470, INTRODUCTION TO COMPUTING IN THE LIFE SCIENCES, 3 Credits

Covers the basics of writing a well-organized computer program to perform tasks that are commonly needed for effective data analysis in the life sciences. Incorporates reading data from a variety of file formats, parsing relevant information from data which comes in as text, putting this information into storage structures that make sense for the task at hand, applying basic mathematical functions to the data, and writing results to an output file. Provides students with the foundation to rapidly expand their knowledge of Python and other programming languages as needed in the future. CROSSLISTED as BDS 470/BOT 470 and BDS 570.
Equivalent to: BDS 470, BOT 476
Recommended: CS 161 or exposure to programming logic

BOT 474X, INTRODUCTION TO GENOME BIOLOGY, 3 Credits

Explores how genomes underlie and influence biological phenomena, across the diversity of life, from prokaryotic microbes to eukaryotic multicellular organisms. Covers genome organization: the structure of chromosomes and chromatin; genes and gene families; and mechanisms that remodel genomes, such as mutation, recombination and transposable elements in the first part of the course. Focuses on genome expression and regulation: gene expression, cellular functions and biochemical pathways; transcriptional and post-transcriptional regulatory mechanisms; and genotype-to-phenotype relationships in the second part of the course. Emphasizes the use of recent technological advances and genome-wide assays that enable investigation of these topics.
Prerequisite: BI 311 (may be taken concurrently) with C- or better or BB 314 (may be taken concurrently) with C- or better
Equivalent to: BDS 474X

BOT 475, COMPARATIVE GENOMICS, 4 Credits

Explores principles of comparative genomics. Examines methods for genome assembly and annotation. Discusses genomic approaches for the study of structural change, whole genome duplication, gene family evolution, gene networks, gene regulation and epigenetics. Lab topics include the analysis of next generation sequencing data and conducting comparative genomic analyses. CROSSLISTED as BDS 475/BOT 475 and BDS 575/BOT 575/MCB 575.
Prerequisite: (BB 314 with D- or better or BB 314H with D- or better) and (BI 311 [D-] or BI 311H [D-] or PBG 430 [D-])
Equivalent to: BDS 475
Recommended: Basic working knowledge of cell and molecular biology and genetics

BOT 476, INTRODUCTION TO COMPUTING IN THE LIFE SCIENCES, 3 Credits

Introduction to management of large datasets (e.g., nucleic acids, protein), computer programming languages, application of basic mathematical functions, and assembly of computational pipelines pertinent to life sciences.
Recommended: Cell and molecular biology or genetics. Familiarity with text editing software and unix/linux operating system is advantageous

BOT 478, FUNCTIONAL GENOMICS, 3 Credits

Introduces conceptual approaches and associated laboratory techniques that rely on genome-scale datasets to investigate the function of, and interactions between, genes as well as their RNA/protein products. Examples include: predicting protein function based on nucleotide and amino acid sequence analysis; large-scale genetic approaches to identifying novel genotype-phenotype associations; and analysis of transcriptomic, proteomic and metabolomic datasets, which measure changes in RNA transcripts, proteins and metabolites, respectively, to explore gene function and cellular/organismal networks. Provides a conceptual framework for understanding how the wide range of available large-scale technologies can be applied to solve biological problems. CROSSLISTED as BDS 478/BOT 478 and BDS 578/BOT 578.
Prerequisite: BB 314 with C- or better or BB 314H with C- or better
Equivalent to: BDS 478, BOT 460

BOT 480, PHOTOSYNTHESIS AND PHOTOBIOLOGY, 3 Credits

Explores the diverse use of light in biological systems, with particular emphasis on photosynthesis. Lectures will discuss the nature of light, light in the natural environment, light absorption in biological systems, use of light energy for photosynthesis, communication, defense, motility, and vision, as well as deleterious effects of light and its use for global monitoring satellite systems.
Recommended: One course in plant physiology or ecology

BOT 488, ENVIRONMENTAL PHYSIOLOGY OF PLANTS, 3 Credits

Introduces students to mechanisms of plant responses to environmental change caused by humans, including atmospheric, nutrient, water, and global climate factors. Concepts are built around principles of plant environment relations. Lec/lab.
Recommended: One course in plant physiology or one course in ecology.

BOT 499, SPECIAL TOPICS, 0-16 Credits

Equivalent to: BOT 499H
This course is repeatable for 16 credits.

BOT 499H, SPECIAL TOPICS, 0-16 Credits

Attributes: HNRS – Honors Course Designator
Equivalent to: BOT 499
This course is repeatable for 16 credits.

BOT 501, RESEARCH, 1-16 Credits

Graded P/N.
This course is repeatable for 16 credits.

BOT 503, THESIS, 1-16 Credits

This course is repeatable for 999 credits.

BOT 505, READING AND CONFERENCE, 1-16 Credits

This course is repeatable for 16 credits.

BOT 507, SEMINAR, 1-16 Credits

Section 1: Departmental seminar (F, W, S). Section 2: Communication in Ecology (F). Section 3: Community and Habitat Analyses (W). Section 4: Lichens and Bryophytes Research (S). Weekly one-hour meetings for reporting and discussions of proposal research, review and discussion of recent literature, and mini-workshops on particular problems. Graded P/N.
This course is repeatable for 16 credits.

BOT 508, WORKSHOP, 1-16 Credits

This course is repeatable for 16 credits.

BOT 510, INTERNSHIP, 1-16 Credits

This course is repeatable for 16 credits.

BOT 513, FOREST PATHOLOGY, 3 Credits

Effects of diseases on forest ecosystems. Recognition of important groups, prediction of pathogen responses to environmental changes, and management strategies for protection of forest resources. Field trips. Lec/lab. CROSSLISTED as BOT 513/FOR 513.
Equivalent to: FOR 513
Recommended: BI 204 or BI 212 or BI 212H or BI 213 or BI 213H

BOT 514, AGROSTOLOGY, 4 Credits

Classification and identification of grasses, with emphasis on the modern system of grass classification; laboratory practice in keying grass specimens to genus and species. Lec/lab.
Recommended: BOT 321

BOT 516, AQUATIC BOTANY, 4 Credits

Taxonomy and ecology of aquatic vegetation, emphasizing freshwater and marine algae and the submergent vascular plants. Morphology, physiology, and classification of the algae; morphological and physiological adaptations of aquatic vascular plants; and primary production in aquatic ecosystems. Laboratory practice in the identification of local taxa. Field trips. Lec/lab.
Recommended: BI 213 or BI 213H

BOT 517X, PHYCOLOGY, 4 Credits

A field and laboratory based introduction to micro- and macro-algal biology, reproduction and evolution. Emphasis is placed on how the endosymbiosis theory ties algae together as a functional group. Algal diversity will be explored through lectures, laboratory and field trips. The laboratory experience will include methods for isolation, culturing and maintenance of algae for aquaculture and research.
Recommended: One year of biology

BOT 525, FLORA OF THE PACIFIC NORTHWEST, 3 Credits

Vascular plant identification, terminology, and diagnostic characteristics of plant families. Lab emphasizes the use of keys for identification to the species level and ability to recognize by sight those plant families found in the Pacific Northwest. Field trips. Lec/lab.
Recommended: BOT 321

BOT 540, FIELD METHODS IN PLANT ECOLOGY, 4 Credits

Concepts and tools for describing, monitoring, and experimenting on vegetation. Combines Web-based material, field experience at the student's location, and student projects.
Recommended: Course in ecology and a course in statistics.
Available via Ecampus

BOT 542, PLANT POPULATION ECOLOGY, 3 Credits

Ecological aspects of plant form and reproduction; demography and population modeling; species interactions, including competition, mutualism, and herbivory. Lec/lab.
Recommended: BOT 341

BOT 543, PLANT COMMUNITY ECOLOGY, 3 Credits

The structure, diversity, and successional dynamics of terrestrial plant communities; methods of analysis. Lec/lab.
Recommended: BOT 341 or equivalent.

BOT 547, NUTRIENT CYCLING, 3 Credits

Reviews and discusses ecosystem-level biogeochemical concepts for terrestrial and freshwater ecosystems, primarily by reading and discussing classic and current literature to determine the state-of-knowledge and uncertainties associated with it. Topics include root nutrient uptake mechanisms, soil chemical and biochemical transformations in different soil and ecosystems, measuring soil solution and watershed fluxes, soil organic matter formation and structure, the meaning of sustainability, the concept of N saturation in terrestrial ecosystems, and the use of natural abundance and tracer isotopes in ecosystem biogeochemistry. While forest biogeochemical processes will be emphasized, desert, aquatic, wetland, and prairie ecosystems will also be explored. CROSSLISTED as BOT 547/SOIL 547.
Equivalent to: FS 547, SOIL 547
Recommended: College-level chemistry and biology and one class in ecology (eg. BI 370) and/or soils (eg. SOIL 205)

BOT 550, PLANT PATHOLOGY, 5 Credits

Causal agents of plant disease, diagnosis, pathogenesis, epidemiology, and disease management principles and strategies. Field trip. Lec/lab/rec.
Recommended: BI 213 or BI 213H

BOT 552, PLANT DISEASE MANAGEMENT, 4 Credits

Analysis of host, pathogen, and environmental factors influencing the increase and spread of plant disease. Epidemiological theory will be used as a basis for developing and evaluating principles and concepts of plant disease management. Lec/lab/rec. Offered alternate years.
Recommended: BOT 350 or BOT 550

BOT 553, PLANT DISEASE DIAGNOSIS, 3 Credits

Diagnosis of plant diseases and identification of causal agents. Laboratory practice in identification techniques. Observation of symptoms exhibited by diseased plants in greenhouse and field locations. Field trips. Lec/lab. Offered alternate years in summer term.
Recommended: BOT 350 or BOT 550

BOT 554, BIOLOGY OF NEMATODES, 4 Credits

Survey of basic biology and biodiversity of nematodes. Includes taxonomy, identification, life cycles, ecology and pathology, and interaction with other organisms. Lec/lab. Offered alternate years.
This course is repeatable for 4 credits.
Recommended: Plant pathology

BOT 558, ECOSYSTEMS GENOMICS, 3 Credits

Genomic approaches used to understand species interactions with a focus on plant-associated microbes. Learning the conceptual framework and computational techniques of genomics to study the ecology of plant-microbe interactions at the ecosystem level.
Recommended: BI 311 and BI 314

BOT 560, FUNCTIONAL GENOMICS, 3 Credits

Functional genomics describes a set of conceptual approaches and associated laboratory techniques that rely on large-scale DNA sequence datasets to investigate the function of, and interactions between, genes as well as their RNA/protein products. This course will provide an overview of these techniques, including a) approaches to predicting protein function based on sequence analysis, b) large-scale genetic approaches to identifying novel genotype-phenotype associations, and c) transcriptomic, proteomic and metabolomic approaches that reveal gene functions by measuring changes in abundance/modification of associated RNA transcripts, proteins and metabolites.
Recommended: (BI 311 or BI 311H) and (BI 314 or BI 314H)

BOT 561, MYCOLOGY, 4 Credits

Broad taxonomic survey of the fungi and their biology. Examines fungal life histories, systematics, ecology, and genetics, as well as ethnomycology. Introduces approaches to mycology in the field, including collection and preparation of specimens.

BOT 565, LICHENOLOGY, 4 Credits

Biology of lichens; includes structure, life histories, classification, and ecology. Field trip fee. Lec/lab. Offered alternate years.
Recommended: (BI 213 or BI 213H) and two botany courses.

BOT 566, BRYOLOGY, 4 Credits

Biology of bryophytes; includes structure, life histories, classification, and ecology. Field trip fee. Lec/lab. Offered alternate years.
Recommended: (BI 213 or BI 213H) and two botany courses.

BOT 570, COMMUNITY STRUCTURE AND ANALYSIS, 4 Credits

Quantitative methods for the analysis of biotic communities, including community concepts, estimation of community composition parameters, theoretical aspects of multivariate methods of analyzing species-importance data, and overview of multivariate tools; hands-on computer analysis of data sets. Lec/lab.
Equivalent to: BI 570
Recommended: BI 370 and (ST 412 or ST 512) and calculus

BOT 574X, INTRODUCTION TO GENOME BIOLOGY, 3 Credits

Explores how genomes underlie and influence biological phenomena, across the diversity of life, from prokaryotic microbes to eukaryotic multicellular organisms. Covers genome organization: the structure of chromosomes and chromatin; genes and gene families; and mechanisms that remodel genomes, such as mutation, recombination and transposable elements in the first part of the course. Focuses on genome expression and regulation: gene expression, cellular functions and biochemical pathways; transcriptional and post-transcriptional regulatory mechanisms; and genotype-to-phenotype relationships in the second part of the course. Emphasizes the use of recent technological advances and genome-wide assays that enable investigation of these topics.
Equivalent to: BDS 574X

BOT 575, COMPARATIVE GENOMICS, 4 Credits

Explores principles of comparative genomics. Examines methods for genome assembly and annotation. Discusses genomic approaches for the study of structural change, whole genome duplication, gene family evolution, gene networks, gene regulation and epigenetics. Lab topics include the analysis of next generation sequencing data and conducting comparative genomic analyses. CROSSLISTED as BDS 475/BOT 475 and BDS 575/BOT 575/MCB 575.
Equivalent to: BDS 575, MCB 575
Recommended: BB 314 and (BI 311 or PBG 430) and basic working knowledge of cell and molecular biology and genetics

BOT 576, INTRODUCTION TO COMPUTING IN THE LIFE SCIENCES, 3 Credits

Introduction to management of large datasets (e.g., nucleic acids, protein), computer programming languages, application of basic mathematical functions, and assembly of computational pipelines pertinent to life sciences. CROSSLISTED as BOT 576/MCB 576.
Equivalent to: MCB 576
Recommended: Cell and molecular biology or genetics. Familiarity with text editing software and unix/linux operating system is advantageous

BOT 578, FUNCTIONAL GENOMICS, 3 Credits

Introduces conceptual approaches and associated laboratory techniques that rely on genome-scale datasets to investigate the function of, and interactions between, genes as well as their RNA/protein products. Examples include: predicting protein function based on nucleotide and amino acid sequence analysis; large-scale genetic approaches to identifying novel genotype-phenotype associations; and analysis of transcriptomic, proteomic and metabolomic datasets, which measure changes in RNA transcripts, proteins and metabolites, respectively, to explore gene function and cellular/organismal networks. Provides a conceptual framework for understanding how the wide range of available large-scale technologies can be applied to solve biological problems. CROSSLISTED as BDS 478/BOT 478 and BDS 578/BOT 578.
Equivalent to: BDS 578, BOT 560

BOT 580, PHOTOSYNTHESIS AND PHOTOBIOLOGY, 3 Credits

Explores the diverse use of light in biological systems, with particular emphasis on photosynthesis. Lectures will discuss the nature of light, light in the natural environment, light absorption in biological systems, use of light energy for photosynthesis, communication, defense, motility, and vision, as well as deleterious effects of light and its use for global monitoring satellite systems.
Recommended: One course in plant physiology or ecology

BOT 588, ENVIRONMENTAL PHYSIOLOGY OF PLANTS, 3 Credits

Introduces students to mechanisms of plant responses to environmental change caused by humans, including atmospheric, nutrient, water, and global climate factors. Concepts are built around principles of plant environment relations. Lec/lab.
Recommended: One course in plant physiology or ecology

BOT 590, SELECTED TOPICS IN MYCOLOGY, 1-3 Credits

Advanced topics in mycology through analysis of current literature. Detailed study of an aspect of mycology beyond those covered in regular classes. Seminar and discussion format.
This course is repeatable for 16 credits.
Recommended: BOT 461 or BOT 561

BOT 599, SPECIAL TOPICS, 0-16 Credits

This course is repeatable for 16 credits.

BOT 601, RESEARCH, 1-16 Credits

Graded P/N.
This course is repeatable for 16 credits.

BOT 603, THESIS, 1-16 Credits

This course is repeatable for 999 credits.

BOT 605, READING AND CONFERENCE, 1-16 Credits

This course is repeatable for 16 credits.

BOT 607, SEMINAR, 1 Credit

Section 1. Departmental seminar
This course is repeatable for 16 credits.

BOT 608, WORKSHOP, 1-16 Credits

This course is repeatable for 16 credits.

BOT 651, MOLECULAR BASIS OF PLANT PATHOGENESIS, 3 Credits

Analysis of current concepts in the physiology, biochemistry, and genetics of host-parasite interactions. Topics covered include specificity, recognition, penetration, toxin production, altered plant metabolism during disease, resistance mechanisms and regulatory aspects of gene expression during host-parasite interactions. Offered alternate years.
Equivalent to: MCB 651
Recommended: BOT 550

BOT 668, PLANT DISEASE DYNAMICS, 4 Credits

Evaluation of processes affecting the dynamics of plant disease and pathogen populations through analysis of current literature. Students will be expected to conduct extensive reading and analysis of literature and to meet with the instructor for small group discussions. Offered alternate years.
Recommended: BOT 550 and ST 412

BOT 691, SELECTED TOPICS-PLANT ECOLOGY, 1-3 Credits

Recent advances and developing problems in plant ecology, with critical evaluation of current literature. Topics vary from year to year.
This course is repeatable for 99 credits.
Recommended: Graduate-level ecology.

BOT 692, SELECTED TOPICS: PLANT PATHOLOGY, 1-3 Credits

Selected topics concerning plant pathogens and plant disease processes, emphasizing current literature and theory. Topics vary from year to year.
Equivalent to: MCB 692
This course is repeatable for 99 credits.
Recommended: BOT 550

BOT 699, SPECIAL TOPICS, 1-16 Credits

This course is repeatable for 16 credits.