

## PLANT BIOLOGY PLB

### Department of Plant Biology College of Natural Science

#### 105 Plant Biology

Fall, Spring. 3(3-0) SA: BOT 105

Plant structure, function, development, genetics, diversity and ecology.

#### 106 Plant Biology Laboratory

Fall, Spring. 1(0-3) P: PLB 105 or concurrently SA: BOT 106

Cell structure, anatomy, physiology, growth and development, and diversity of plants.

#### 111L Cell and Molecular Biology Laboratory

Fall, Spring, Summer. 2(1-3) Interdepartmental with Biological Science and Microbiology and Molecular Genetics and Zoology. Administered by Biological Science. P: BS111 or concurrently Not open to students with credit in LBS 159H.

Principles and applications of common techniques used in cell and molecular biology.

#### 203 Biology of Plants

Fall. 3(3-0) P: (BS 110 and BS 111) or PLB 105

Evolution and diversification of plants. Structural innovations and physiological attributes of vascular land plants.

#### 218 Plants of Michigan

Fall. 3(2-2) P: BS 110 or PLB 105 or LB 144 or BS 148H SA: BOT 218

Plant taxa of Michigan and the Great Lakes region and the major habitats in which they occur. Principles and rationale of classification. Relationships between life histories, morphology and environment.

#### 301 Introductory Plant Physiology

Fall, Spring. 3(2-3) P: (CEM 141 or CEM 151 or LB 171 or CEM 181H) and (CEM 161 or LB 171L) and ((PLB 105 or BS 111 or LB 145 or BS 149H) and completion of Tier I writing requirement) SA: BOT 301

General principles of plant physiology relating plant structure to function. Cell physiology, water relations, effects of light and temperature, respiration, photosynthesis, mineral nutrition, and hormone action.

#### 316 Experiments in Plant Biology

Spring. 4(2-5) P: ((CEM 142 or concurrently) and (CEM 161 or concurrently) and (CEM 251 or concurrently) or ((CEM 152 or concurrently) and (CEM 161 or concurrently) and (CEM 251 or concurrently) and PLB 203) and completion of Tier I writing requirement)

Exploration of fundamental topics in plant biology using modern techniques for studies at the molecular and ecological levels.

#### 319 Introduction to Earth System Science

Fall. 3(3-0) Interdepartmental with Entomology and Geological Sciences and Sociology and Zoology. Administered by Entomology. RB: Completion of one course in biological or physical science.

Systems approach to Earth as an integration of geochemical, geophysical, biological and social components. Global dynamics at a variety of spatio-temporal scales. Sustainability of the Earth system.

#### 335 Plants Through Time

Spring of odd years. 3(3-0) Interdepartmental with Geological Sciences. Administered by Plant Biology. P: BS 110 or PLB 105 or GLG 201 or LB 144 or BS 148H R: Open to juniors or seniors. SA: BOT 335

Evolutionary history of plants, development of ecosystems, and use of plant fossils in the reconstruction of ancient environments and climate.

#### 336 Useful Plants

Fall of odd years. 3(3-0) P: ((CEM 142 or CEM 143 or CEM 152 or CEM 182H) and (PLB 105 or LB 145)) or (BS 110 and BS 111 and BS 111L) or (BS 148H and BS 149H) SA: BOT 336

Use of plants for myriad purposes from food and construction materials to medicines and perfumes. Potential for expanding the uses of plants through biotechnology.

#### 341 Fundamental Genetics

Fall, Spring, Summer. 4(4-0) Interdepartmental with Zoology. Administered by Zoology. P: BS 111 or LB 145 or BS 149H

Principles of heredity in animals, plants and microorganisms. Classical and molecular methods in the study of gene structure, transmission, expression and evolution.

#### 355 Ecology

Fall, Spring, Summer. 3(3-0) Interdepartmental with Zoology. Administered by Zoology. P: BS 110 or LB 144 or BS 148H SA: ZOL 250

Plant and animal ecology. Interrelationships of plants and animals with the environment. Principles of population, community, and ecosystem ecology. Application of ecological principles to global sustainability.

#### 355L Ecology Laboratory

Fall, Spring, Summer. 1(0-3) Interdepartmental with Zoology. Administered by Zoology. P: ((ZOL 355 or concurrently) or (PLB 355 or concurrently)) or completion of Tier I writing requirement

Population, community, and ecosystem ecology, utilizing plant and animal examples to demonstrate general field principles.

#### 400 Introduction to Bioinformatics

Spring. 3(2-2) Interdepartmental with Biochemistry and Molecular Biology and Microbiology and Molecular Genetics. Administered by Plant Biology. P: (STT 200 or STT 201 or STT 231 or STT 421) and (PLB 203 or MMG 201 or BMB 200) RB: An introductory biology course covering basic genetics, macromolecules, evolution, energy metabolism, genetic materials, and signal transduction is recommended for non-biology majors. A statistic course covering random variable, distributions, and ba Not open to students with credit in MMG 433.

Bioinformatic theory and practice. How to manage and analyze sequences, structures, gene expression, and other types of biological data.

#### 402 Biology of Fungi

Fall of odd years. 3(2-3) Interdepartmental with Plant Pathology. Administered by Plant Biology. P: BS 110 or BS 111 or PLB 105 or LB 145 or BS 148H or BS 149H SA: BOT 402

Characteristics, habitats, and diversity of major groups of fungi. Ecologic and economic importance of fungi.

#### 407 Diseases and Insects of Forest and

##### Shade Trees

Spring. 4(3-3) Interdepartmental with Entomology and Plant Pathology. Administered by Plant Pathology. P: (PLB 105 or BS 110 or LBS 144 or LBS 148H) and ((PLB 218 or FOR 204 or HRT 211) and completion of Tier I writing requirement) SA: BOT 407

Diseases, insects, and environmental problems affecting trees in forests, parks, suburbs, and nurseries. Methods of control.

#### 415 Plant Physiology

Spring. 3(3-0) P: (CEM 143 or CEM 251 or CEM 351) and (BS 111 or LB 145 or BS 149H) SA: PLB 414

Principles of plant metabolism, growth, and development. Photosynthesis, water relations, nitrogen metabolism, and cell wall biosynthesis. Environmental and hormonal factors that control plant growth and development. Gene regulation and genetic engineering of plants.

#### 417 Wetland Ecology and Management

Fall. 3(2-3) Interdepartmental with Fisheries and Wildlife. Administered by Fisheries and Wildlife. P: (ZOL 355) and completion of Tier I Writing requirement SA: FW 412

Biological, physical, and chemical processes controlling wetland structure and function. Utilization, mitigation, and conservation of wetlands on a sustainable basis.

#### 418 Plant Systematics

Spring, Summer. 3(2-3) P: PLB 105 or BS 110 or LB 144 or BS 148H SA: BOT 418

Classification and evolution of higher plants, with emphasis on identification, characteristics of plant families, and systematic theory and practice.

#### 424 Algal Biology

Fall of even years, Summer of odd years. 4(2-4) Interdepartmental with Zoology. Administered by Plant Biology. P: (BS 110 or LB 144 or BS 148H) and completion of Tier I writing requirement RB: ZOL 355 and ZOL 355L SA: BOT 424

Algal taxonomy, systematics, physiology, ecology, and environmental assessment. Lab focus on identification of freshwater algal genera collected from regional habitats.

#### 434 Plant Structure and Function

Spring of odd years. 4(2-4) P: (BS 110 and BS 111) or (PLB 105 and PLB 106) or (LB 144 and LB 145) or (BS 148H and BS 149H) SA: BOT 434

Plant anatomy from a structural and functional perspective. Physiological, developmental, and ecological significance of cell types, tissue types, and meristems of vegetative and reproductive plant parts.

#### 440 Field Ecology and Evolution

Summer. 4 credits. Interdepartmental with Zoology. Administered by Zoology. P: ZOL 355

Solving conceptual and practical research problems in ecology and evolution under field conditions.

#### 441 Plant Ecology

Fall. 3(3-0) P: (BS 110 or LB 144 or PLB 105 or BS 148H or ZOL 355) and completion of Tier I writing requirement SA: BOT 441

Ecology of plants and their communities. Effects of biotic and climatological factors influencing global distribution of plant communities. Community structure and function, microclimatology, ecophysiology, and adaptation.

## Plant Biology—PLB

- 445 Evolution (W)**  
Fall. 3(3-0) Interdepartmental with Zoology. Administered by Zoology. P: (ZOL 341) and completion of Tier I writing requirement R: Not open to freshmen. SA: ZOL 345  
Processes of evolutionary change in animals, plants. Microbes. Population genetics, microevolution, speciation, adaptive radiation, macroevolution. Origin of Homo sapiens.
- 485 Tropical Biology**  
Spring. 3(3-0) Interdepartmental with Entomology and Zoology. Administered by Zoology. P: ZOL 355 R: Open only to juniors or seniors.  
Tropical biota emphasizing evolutionary and ecological principles compared across tropical ecosystems.
- 490 Directed Studies**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P: Completion of Tier I writing requirement. RB: One year of college biology. R: Approval of department. SA: BOT 490  
Directed study of published literature in an area of plant biology.
- 490H Honors Directed Studies**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P: Completion of Tier I writing requirement. RB: One year of college biology. R: Approval of department. SA: BOT 490H  
Directed study of published literature in an area of plant biology.
- 495 Botanical Garden Internship**  
Fall, Spring, Summer. 2 to 8 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Approval of department. SA: BOT 495  
Activities, functions and organization of botanical gardens. Principles of live plant curation.
- 498 Undergraduate Research**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. P: (BS 110 and BS 111) or (PLB 105 and PLB 106) or (LB 144 and LB 145) or ((BS 148H and BS 149H) and completion of Tier I writing requirement) R: Approval of department. SA: BOT 498  
Laboratory and/or field research in an area of plant biology.
- 499 Senior Seminar**  
Spring. 2(2-0) A student may earn a maximum of 4 credits in all enrollments for this course. P: (PLB 498) and completion of Tier I writing requirement SA: BOT 499  
A capstone experience that focuses on current developments and issues in plant biology. Scientific writing and oral presentation.
- 800 Seminar in Plant Biology**  
Fall. 1(1-0) A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to graduate students. SA: BOT 800  
Current research and approaches in plant biology.
- 802 Selected Topics in Plant Biology**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources. SA: BOT 802  
Recent developments in plant biology.
- 803 Integrative Topics in Plant Biology**  
Spring. 1 to 2 credits. A student may earn a maximum of 4 credits in all enrollments for this course.  
Integrative topics in plant biology. Molecular, physiological, ecological, and evolutionary perspectives. Proposal writing and presentation.
- 805 Special Problems in Physiology and Biochemistry**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources. SA: BOT 805  
Faculty directed individualized study of a selected problem.
- 806 Special Problems in Genetics and Molecular Biology**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources. SA: BOT 806  
Faculty directed individualized study of a selected problem.
- 807 Special Problems in Mycology**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources. SA: BOT 807  
Faculty directed individualized study of a selected problem.
- 809 Special Problems in Ecology, Systematics, and Evolution**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in College of Natural Science or College of Agriculture and Natural Resources. SA: BOT 809  
Faculty directed individualized study of a selected problem.
- 810 Theories and practices in Bioinformatics**  
Spring. 3(2-2) Interdepartmental with Biochemistry and Molecular Biology and Microbiology and Molecular Genetics. Administered by Plant Biology. P: (STT 200 or STT 201 or STT 231 or STT 421) and (PLB 203 or MMG 201 or BMB 200) RB: An introductory biology course covering basic genetics, macromolecules, evolution, energy metabolism, genetic materials, and signal transduction is recommended for non-biology majors. A statistic course covering random variable, distributions, and ba Not open to students with credit in MMG 433.  
Introduction of the theories and algorithms behind widely used bioinformatics tools. Basic tool development by writing scripts in the Python programming language for data analysis.
- 820 Plant Reproductive Biology and Polyploidy**  
Spring of odd years. 1(3-0) Interdepartmental with Crop and Soil Sciences and Forestry and Horticulture and Plant Pathology. Administered by Horticulture. RB: Introductory Genetics and Plant Biology  
Genetic processes underlying variations in plant reproductive biology and polyploidy. Utilization of these characteristics in plant breeding.
- 821 Crop Evolution**  
Spring of odd years. 1 credit. Interdepartmental with Crop and Soil Sciences and Forestry and Horticulture and Plant Pathology. Administered by Horticulture. RB: Introductory Genetics and Plant Biology  
Cultural and biological aspects of the evolution of domestic plants.
- 822 Historical Geography of Crop Plants**  
Spring of odd years. 1 credit. Interdepartmental with Crop and Soil Sciences and Forestry and Horticulture and Plant Pathology. Administered by Horticulture. RB: Introductory Genetics and Plant Biology  
Development and spread of the major crop species.
- 826 Tropical Biology: An Ecological Approach**  
Spring, Summer. 8 credits. Interdepartmental with Zoology. Administered by Plant Biology. R: Approval of department; application required. SA: BOT 826  
Principles of tropical ecology at the population, community, and ecosystem levels. Given at various sites in Costa Rica by the Organization for Tropical Studies.
- 828 Conservation and Genetics**  
Fall of even years. 3(2-2) Interdepartmental with Fisheries and Wildlife and Zoology. Administered by Fisheries and Wildlife. RB: ZOL 341 or CSS 350 or ANS 314  
Population and evolutionary genetic principles applied to ecology, conservation, and management of fish and wildlife at the individual, population, and species level.
- 835 Biogeography**  
Spring of odd years. 3(3-0) Interdepartmental with Fisheries and Wildlife and Geography and Zoology. Administered by Fisheries and Wildlife. RB: Courses in evolution and ecology at undergraduate level.  
Geographical distributions of plants and animals; biogeographic realms. Ecological and evolutionary mechanisms determining distributional patterns. Application of biogeography to conservation problems.
- 847 Advanced Mycology**  
Spring of even years. 4(2-4) Interdepartmental with Plant Pathology. Administered by Plant Pathology. RB: BOT 402 SA: BOT 847  
Systematics, identification, physiology, genetics, and molecular biology of plant pathogenic fungi.
- 849 Evolutionary Biology**  
Spring. 3(3-0) Interdepartmental with Zoology. Administered by Plant Biology. RB: ZOL 341 and (STT 422 or concurrently) SA: BOT 849  
Major conceptual, theoretical and empirical questions in evolutionary biology. Readings and lectures are synthesized in student discussions and papers.

- 851 Quantitative Methods in Ecology and Evolution**  
 Fall. 3(3-0) Interdepartmental with Zoology. Administered by Zoology. RB: STT 465  
 Interpretation and analysis of ecological and evolutionary biology data. Statistical computer software.
- 855 Molecular Evolution: Principles and Techniques**  
 Fall of odd years. 3(3-0) Interdepartmental with Microbiology and Molecular Genetics and Zoology. Administered by Zoology. RB: ZOL 341 or ZOL 445  
 Current techniques used to characterize and compare genes and genomes. Genetic variation, assays of variation. Data analysis and computer use to conduct a phylogenetic analysis to compare organisms and infer relationships.
- 856 Plant Molecular Biology**  
 Spring. 3(3-0) Interdepartmental with Biochemistry and Molecular Biology and Crop and Soil Sciences. Administered by Plant Biology. RB: ZOL 341 SA: BOT 856  
 Recent advances in genetics and molecular biology of higher plants.
- 857 Theoretical Ecology**  
 Spring of even years. 3(2-2) Interdepartmental with Fisheries and Wildlife and Zoology. Administered by Fisheries and Wildlife. RB: One course in ecology and calculus. Programming experience helpful.  
 Theoretical ecology of animal behavior, population dynamics, and multispecies communities. Basic mathematical approaches and use of modeling software to perform mathematical functions and develop models.
- 863 Environmental Plant Physiology**  
 Spring of odd years. 3(3-0) Interdepartmental with Horticulture. Administered by Plant Biology. RB: PLB 301 or PLB 414 or PLB 415 SA: BOT 863  
 Interaction of plant and environment. Photobiology, thermophysiology, and plant-water relations.
- 864 Plant Biochemistry**  
 Fall of even years. 3(3-0) Interdepartmental with Biochemistry and Molecular Biology. Administered by Biochemistry and Molecular Biology. RB: BMB 401 or BMB 462 SA: BCH 864  
 Biochemistry unique to photosynthetic organisms. Photosynthetic and respiratory electron transport, nitrogen fixation, carbon dioxide fixation, lipid metabolism, carbon partitioning, cell walls, biosynthesis of plant hormones.
- 865 Plant Growth and Development**  
 Fall. 3(3-0) Interdepartmental with Horticulture. Administered by Plant Biology. RB: PLB 415 SA: BOT 865  
 Genetics and biochemistry of development in higher plants as influenced by genes and environment. Biosynthesis, action and signal transduction of phytohormones and other signaling molecules. Patterning, meristem organization and formation of tissues and organs. Genetic mechanisms underlying developmental diversity.
- 884 Prokaryotic Diseases of Plants**  
 Fall of even years. 3(3-0) Interdepartmental with Plant Pathology. Administered by Plant Pathology. RB: PLP 405 SA: BOT 884  
 Prokaryotic genera associated with plant diseases. Genetics and host-pathogen interactions. Prokaryotic disease control strategies.
- 891 Current Topics in Ecology and Evolution**  
 Summer. 1 to 2 credits. A student may earn a maximum of 10 credits in all enrollments for this course. Interdepartmental with Crop and Soil Sciences and Zoology. Administered by Zoology.  
 Presentation and critical evaluation of theoretical and empirical developments in ecology and evolutionary biology by visiting scientists.
- 896 Population and Community Ecology**  
 Fall. 4(4-0) Interdepartmental with Zoology. Administered by Zoology.  
 Population dynamics of animals and plants utilizing life tables and projection matrices. Species interaction. Life history theory. Structure and dynamics of communities. Succession.
- 897 Ecosystem Ecology**  
 Spring. 4(4-0) Interdepartmental with Fisheries and Wildlife and Zoology. Administered by Zoology.  
 Structure and function of natural ecosystems. Succession, food web analysis, energy flow, nutrient cycling, and effects of human activities on ecosystems. Global environmental change. Ecosystem management and restoration.
- 899 Master's Thesis Research**  
 Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Open only to graduate students. SA: BOT 899  
 Research in anatomy, bryology cell biology, ecology, genetics, molecular biology, morphology, mycology, paleobotany, pathology, physiology and systematics.
- 999 Doctoral Dissertation Research**  
 Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to doctoral students. SA: BOT 999  
 Research in anatomy, bryology cell biology, ecology, genetics, molecular biology, morphology, mycology, paleobotany, pathology, physiology and systematics.