901 Investigating the Lung
Fall of even years. 2(2-0) Interdepartmental
with Large Animal Clinical Sciences; Pathology. Administered by Department of
Large Animal Clinical Sciences. R: Open
only to graduate students. Integrative biology of the lung; structure and
function; molecular, cellular, and organ responses to injury.

910 Cellular and Molecular Physiology
Fall. 4(4-0) RB: BMB 802; PSL 432 or PSL
501 or PSL 511; one calculus course. R: Open
to graduate students. Study of cells and organisms, with emphasis on
structure, function and metabolism. Cellular and molecular approaches to the study of cell life and death.

950 Topics in Physiology
Fall, Spring, Summer. 1 to 3 credits. A
student may earn a maximum of 9 credits in
all enrollments for this course. R: Approval
of department. Classical and modern concepts in selected areas of
physiology.

980 Problems in Physiology
Fall, Spring, Summer. 1 to 4 credits. A
student may earn a maximum of 8 credits in
all enrollments for this course. R: Approval
of department. Individual research problems in physiology.

999 Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 6 credits. A
student may earn a maximum of 99 credits in
all enrollments for this course. Doctoral dissertation research.

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:M: (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. 2(1-3) Interdepartmental with Biological Science; Microbiology and Molecular Genetics; Zoology. Administered by Natural Science. P:M: (BS111 or concurrently) Not open to students with credit in LBS 159H. Principles and applications of common techniques used in cell and molecular biology.

202 The Plant Kingdom
Spring. 3(2-3) P:M: (BS 110 or BS 111 or
PLB 105 or LBS 144 or LBS 148H or LBS
149H) SA: BOT 202
Morphology of the major plant groups with an emphasis on structure, reproduction and evolution. Field trips required.

218 Plants of Michigan
Fall, 3(2-3) P:M: (BS 110 or PLB 105 or LBS
144 or LBS 148H) SA: BOT 218

301 Introductory Plant Physiology
Fall, Spring. 3(2-3) P:M: (CEM 141 or CEM
151 or LBS 171 or CEM 181H) and (CEM
161 or LBS 171L) and (PLB 105 or BS 111
or LBS 145 or LBS 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.

319 Introduction to Earth System Science
Fall. 3(3-0) Interdepartmental with Entomology; Geological Sciences; Zoology; Sociology. Administered by Department of 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 spatial-temporal scales. Sustainability of the Earth system.

335 Plants Through Time
Spring of odd years. 3(3-0) Interdepartmental with Geological Sciences. P:M: (BS 110 or PLB 105 or GLG
201 or LBS 144 or LBS 148H) R: Open only 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:M: (CEM 142 or
CEM 143 or CEM 152 or CEM 182H) and
PLB 105 or LBS 145) or (BS 110 and BS
111 and LBS 111L or (LBS 148H and LBS
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 Department of Zoology. P:M: (BS 111 or LBS 145 or LBS 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, Summer. 3(3-0) Interdepartmental with
Zoology. Administered by Department of
Zoology. P:M: (BS 110 or LBS 144 or LBS
149H) SA: ZOL 250
Principles of population, community, and ecosystem ecology. Application of ecological principles to global sustainability.

355L Ecology Laboratory
Fall, Summer. 1(0-3) Interdepartmental with Zoology. Administered by Department of Zoology. P:M: (ZOL 355 or concurrently or PLB 355 or concurrently) and completion of Tier I writing requirement. SA: BOT 355L
Populations, community and ecosystem ecology utilizing plant and animal examples to demonstrate general field principles.

402 Biology of Fungi
Fall. 3(2-3) Interdepartmental with Plant Pathology. P:M: (BS 110 or BS 111 or PLB
105 or LBS 145 or LBS 148H or LBS 149H)
SA: BOT 402
Major groups of fungi: characteristics, habitats and diversity. Significance of fungi in nature and their economic importance.

407 Diseases and Insects of Forest and Shade Trees
Spring. 4(3-3) Interdepartmental with Plant Pathology; Entomology. Administered by Department of Plant Pathology. P:M: (PLB 105 or BS 110 or LBS 144 or LBS 149H) 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.

412 Environmental Plant Physiology
Fall. 3(3-0) P:M: (PLB 105 or BS 111 or LBS
145 or LBS 149H) and (CEM 141 or CEM
151) and (CEM 161) SA: BOT 412

414 Plant Physiology: Metabolism
Fall. 3(3-0) P:M: (CEM 251 or CEM 351)
and (PLB 105 or LBS 145) or (BS 110 and
BS 111 and LBS 111L) or (LBS 148H and
LBS 149H) SA: BOT 414
General principles underlying metabolic processes of plants. Photosynthesis, translocation and water relations, nitrogen metabolism, cell wall biosynthesis, and structures associated with these processes.

415 Plant Physiology: Growth, Development and the Environment
Spring. 3(3-0) P:M: (PLB 105 or BS 111 or LBS
145 or LBS 149H) and (CEM 251 or CEM
351) and (ZOL 143) SA: BOT 415
Principles of plant growth and development with emphasis on environmental and hormonal factors that control progression of the plant through its life cycle. Tissue culture and genetic engineering in plants.

416 Experiments in Plant Physiology and Molecular Biology
Fall. 4(2-5) P:M: (PLB 414 or PLB 415) and completion of Tier I writing requirement. RB:
Laboratory course in biochemistry. SA: BOT 416
Experiments illustrating principles of plant physiology and molecular biology. Advanced techniques such as agrobacterium mediated gene transfer, DNA cloning, enzyme linked immunosassays (ELISA), protein and DNA electrophoresis.
418  Plant Systematics  
**Spring. 3(2-3) Summer. 3 credits.** Given only at W.K. Kellogg Biological Station. P:M: (PLB 105 or BS 110 or LBS 144 or LBS 148H) SA: BOT 418

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

419  Advanced Earth System Science  
**Spring. 3(2-2) Interdepartmental with Entomology; Geological Sciences; Zoology; Sociology.** Administered by Department of Entomology. P:M: (ENT 319)

Systems science theory applied to analysis of the biological, geological, physical, and social causes and consequences of global changes. Issues of sustaining the Earth system.

423  Wetland Plants and Algae  
**Fall. 4(2-4) P:M: (PLB 105 or BS 110 or LBS 144 or LBS 148H) SA: BOT 423**

Identification, ecology and community relations of algae and aquatic vascular plants common to the Great Lakes area. Algae and aquatic plants as indicators of environmental change. Field trips required.

424  Algal Biology  
**Fall of even years. 4(2-4) Summer of odd years. 4 credits.** Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology. P:M: (BS 110 or LBS 144 or LBS 148H) and completion of Tier I writing requirement. RB: (ZOL 355 and ZOL 355L) or (PLB 441) SA: BOT 424

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

431  Comparative Limnology  
**Summer. 4(2-6) Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology; Fisheries and Wildlife.** Administered by Department of Zoology. P:M: (CEM 141 or CEM 151) and (ZOL 355)

Not open to students with credit in FW 472. Physical, chemical, and biological aspects of lakes and streams. Introduction to freshwater biology, and population and community ecology.

434  Plant Structure and Function  
**Fall of odd years. 4(2-4) P:M: (BS 110 and BS 111) or (PLB 105 and PLB 106) or (LBS 144 and LBS 145) or (LBS 148H and LBS 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. Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology.** Administered by Department of Zoology. P:M: (ZOL 355)

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

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


445  Evolution  
**Fall. 3(3-0) Interdepartmental with Zoology.** Administered by Department of Zoology. P:M: (ZOL 341) and completion of Tier I writing requirement. R: Not open to freshmen. SA: ZOL 345


485  Tropical Biology  
**Spring. 3(3-0) Interdepartmental with Zoology; Entomology.** Administered by Department of Zoology. P:M: (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:M: 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:M: 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 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:M: (BS 110 and BS 111) or (PLB 105 and PLB 106) or (LBS 144 and LBS 145) or (LBS 148H and LBS 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:M: (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, Spring. 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 Botany  
**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 botany.

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.

811  Plant Developmental Genetics  
**Fall. 3(2-2) Interdepartmental with Horticulture.** Administered by Department of Horticulture. RB: (ZOL 341 and CSS 350) and (PLB 415 and ZOL 320)

Genetic mechanisms controlling plant development. Model systems and internal, nonenvironmental factors. Methods for the study of plant development. The plant genome. Genetics underlying developmental diversity in higher plants.

820  Plant Reproductive Biology and Polyploidy  
**Spring, 1 credit. Interdepartmental with Botany; Crop and Soil Sciences; Forestry; Plant Pathology.** Administered by Department of Horticulture. RB: Introductory Genetics and Plant Biology

Genetic processes underlying variations in plant reproductive biology and polyploidy and the utilization of these characteristics in plant breeding.