319 Introduction to Earth System Science
Fall. 3(3-0) Interdepartmental with Entomology and Geological Sciences and Sociology. 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.

316 Experiments in Plant Biology
Spring. 4(2-5) P.M.: (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.

315 Plants Through Time
Spring of odd years. 3(3-0) Interdepartmental with Geological Sciences. Administered by Plant Biology. 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.

314 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
Principles underlying metabolic processes of plants. Photosynthesis, translocation and water relations, nitrogen metabolism, cell wall biosynthesis, and associated structures.

313 Plant Physiology: Growth, Development and the Environment
Spring. 3(3-0) P.M: PLB 105 or BS 111 or LBS 145 or LBS 148H or CEM 251 SA: BOT 415
Principles of plant growth and development. Environmental and hormonal factors that control progression of the plant through its life cycle. Tissue culture and genetic engineering in plants.

312 Introduction to Earth System Science
Fall, Spring. 3(3-0) SA: BOT 105
Plant structure, function, development, genetics, diversity and ecology.

311L 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.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.

310 Introductory Plant Physiology
Fall. 3(3-0) P.M: (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.M: BS 110 or PLB 105 or LBS 144 or LBS 148H SA: BOT 218

203 Biology of Plants
Fall. 3(3-0) P.M: (BS 110 and BS 111) or PLB 105
Plant structure, function, development, genetics, diversity and ecology.

417 Wetland Ecology and Management
Fall. 3(2-3) Interdepartmental with Fisheries and Wildlife. Administered by Fisheries and Wildlife. P.M: (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.

416 Plant Systematics
Spring. 3(2-3) 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.

415 Advanced Earth System Science
Spring. 3(2-2) Interdepartmental with Entomology and Geophysical Sciences and Sociology and Zoology. Administered by 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.

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
Principles underlying metabolic processes of plants. Photosynthesis, translocation and water relations, nitrogen metabolism, cell wall biosynthesis, and associated structures.

413 Plant Physiology: Growth, Development and the Environment
Spring. 3(3-0) P.M: PLB 105 or BS 111 or LBS 145 or LBS 148H or CEM 251 SA: BOT 415
Principles of plant growth and development. Environmental and hormonal factors that control progression of the plant through its life cycle. Tissue culture and genetic engineering in plants.

412 Algal Biology
Fall of even years. Summer of odd years. 4(2-4) Interdepartmental with Zoology. Administered by Plant Biology. P.M: (ZOL 355) 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.

411 Plant Structure and Function
Spring 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.

409 Field Ecology and Evolution
Summer. 4 credits. Interdepartmental with Zoology. Administered by 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 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 Entomology and Zoology. Administered by 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 to 8 credits. A student may earn a maximum of 6 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. 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
Fall, 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.

811 Plant Developmental Genetics
Fall. 3(2-2) Interdepartmental with Horticulture. Administered by 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
Fall of odd years. 1/2 credit. 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.

842 Application of Ecological Principles
Spring. 2 credits. A student may earn a maximum of 8 credits in all enrollments for this course. Interdepartmental with Zoology. Administered by Plant Biology. SA: BOT 842
Workshops and discussions with experts from industry, regulatory agencies, conservation groups, and academe on application of basic ecology and evolutionary biology to real-world 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
Spring. 3(3-0) Interdepartmental with Biochemistry and Molecular Biology. Administered by Biochemistry and Molecular Biology. RB: BMB 401 or BMB 462SA: 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) RB: PLB 415 SA: BOT 865
Physiology and biochemistry of growth and development as regulated by internal and external factors. Biosynthesis and action of plant hormones. Environmental factors: light and temperature.

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.

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.