

**880. Special Topics in Biophysics**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 15 credits.

Special topics within the five subdivisions of biophysics: structure, organization and function of biological phenomena, sensory perception, and psychophysics and biomechanics.

**890. Readings in Biophysics**  
Fall, Winter, Spring. 3 to 6 credits. Approval of department.

Reading course in special topics adapted to the individual preparation and needs of the student.

**899. Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

**990. Biophysics Seminar**  
Fall, Winter, Spring, Summer. 1 credit. May re-enroll for a maximum of 3 credits. Approval of department.

**999. Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

## **BOTANY AND PLANT PATHOLOGY BOT**

### **College of Natural Science**

**200. Resource Ecology and Man**  
For course description, see Interdisciplinary Courses.

**301. Introductory Plant Physiology**  
Fall, Spring. 4(2-4) CEM 131 or 141; 161; B S 211 and introductory organic chemistry recommended.

General principles of plant physiology relating plant function to structure.

**302. Introductory Morphology**  
Fall, Winter. 4(2-4) B S 212 or approval of department.

Structures and life cycles of representative plant groups showing progressive evolutionary developments.

**304. Plant World**  
Fall, Winter, Spring, Summer. 4(2-6) N S 191 or approval of department.

Basic plant science and its use in teaching. Lectures cover basic subject matter necessary to understanding plant kingdom, evidence and trends of evolution, economic uses and importances, basic principles of ecology. Laboratories give students opportunity to expand subject matter in one of several types of special projects: greenhouse, trees and shrubs, spring or summer flora, what plants do for man.

**305. Poisonous Plants**  
Spring. 2(0-4) N S 193. Primarily for Veterinary Medicine students.

Plants poisonous to livestock and human beings, particularly those occurring in Michigan.

**318. Introductory Plant Systematics**  
Spring. 4(2-3) 302 or B S 212 or approval of department.

Plant diversity with emphasis on identification, classification, nomenclature, and evolutionary relationships of vascular plants.

**336. Economic Plants**  
Fall. 3(3-0)

Historics, characteristics, and origins of plants used in industrial processes, drug manufacture, and agriculture. Nontechnical to broaden student's cultural interest in plants.

**400. Aquatic Plants**  
Spring. 3(1-4) One year of botany and zoology or approval of department.

Aquatic plants, their classification, ecology and economic importance. Relationships to problems in fisheries, in wildlife management, and to role in limnology. Experience for student in plant ecology, aquatic biology, and water sanitation.

**400H. Honors Work**  
Fall, Winter, Spring. 3(0-6) Approval of department; Seniors.

**401. Special Problems**  
Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 16 credits. 302, Seniors, approval of department. Students with special ability may carry on laboratory research or study of published literature on a selected topic.

**402. Introductory Mycology**  
Fall, Winter. 4(2-6) B S 212 or approval of department.

Survey of the fungi, a background course for students taking plant pathology or other courses in mycology.

**405. Introductory Plant Pathology**  
Fall. 4(2-4) 302 or B S 212 or approval of department. Students may not receive credit in both 405 and 407.

General principles of plant pathology including detailed study of selected diseases as examples of important groups.

**406. Medical Mycology**  
Winter, Spring. 4(2-6) 402 or approval of department.

Characteristics, habits, and laboratory identification of fungus diseases infecting humans. Emphasis on laboratory techniques and morphological characteristics of the various mycoses.

**407. Diseases of Forest and Shade Trees**  
Spring. 4(3-3) 301; 302; 318 or FOR 204. Students may not receive credit in both 405 and 407.

Diseases which affect trees in forests, parks, suburbs and nurseries, and methods of control.

**411. Systematic Botany**  
Summer. 4(2-6) B S 212 or approval of department.

Taxonomy, identification, and evolutionary relationships of vascular plants, illustrated by the local flora; extensive field studies.

**414. Plant Physiology: Metabolism**  
Winter, Summer of odd-numbered years. 4(3-4) 302; 1 year chemistry including organic.

Comprehensive study of metabolic activities of plants. Emphasis on mineral nutrition of plants and processes of photosynthesis, protein synthesis, and respiration.

**415. Plant Physiology: Growth**  
Spring. Summer of even-numbered years. 4(3-4) 414.

Comprehensive study of growth processes of plants, with emphasis on germination, dormancy, hormones, and physiological phenomena associated with phases of development.

**431. Histological Techniques**  
Winter. 4(2-6) 302.

Preparation of plant materials for microscopic study. Special emphasis on the many variations in microtechnique, including paraffin and celloidon embedding, freezing microtomy and ultra-thin sectioning for electron microscopy.

**434. Plant Anatomy**  
Fall. Summer of even-numbered years. 4(2-4) 302.

Principles underlying the differentiation and growth of vegetative plant structures with special emphasis upon their functional and developmental genetic relationships.

**441. Phytogeography**  
Winter. 3(3-0) 302.

Distribution of plants over the earth, with special reference to North America. Geological history and environmental factors which influence distribution.

**447. Fresh Water Algae**  
Spring. 4(2-4) One year botany or zoology. Primarily for students in Fisheries Biology, Wildlife Management and Sanitary Engineering.

Identification of fresh water algae, especially those forms concerned with fish food problems, water contamination and limnology. Methods for making analyses of samples for biological survey work on lakes and streams. Economic aspects and life histories of the algae.

**450. Ecology**  
Spring. 4(2-4) 318; 301 or 414

Interrelationship of plants and environment. Factors which govern their distribution.

**455. Experimental Ecology**  
Spring. 5(2-9) Approval of department. Interdepartmental with and administered by the Zoology Department.

Dynamics, regulation and production of biological populations, structure composition and stability of biotic communities; biogeochemical and energetic characteristics of ecosystems.

**470. Introductory Nematology**  
Winter of odd-numbered years. 3(2-3) Interdepartmental with and administered by the Department of Entomology.

Biology, taxonomy and control of plant parasitic and saprophytic nematodes.

**480. Insects in Relation to Plant Diseases**  
Winter of even-numbered years. 4(2-4) 302. Interdepartmental with and administered by the Department of Entomology.

Relationships of insects, mites and nematodes to important plant diseases incited by bacteria, fungi, viruses and toxins. Mode of transmission and means of control. Transmission techniques and important plant-pathogen-insect relationships.

**499. Senior Seminar**  
Winter. 1(1-0) May re-enroll for a maximum of 3 credits. B S 212 and 1 course in botany or approval of department.

Reports by students, faculty, and guest lecturers, with emphasis on current developments in research.

**800. Special Problems in Taxonomy**  
Fall, Winter, Spring. 1 to 15 credits. Approval of department.

**801. Special Problems in Anatomy and Morphology**  
Fall, Winter, Spring. 1 to 15 credits. Approval of department.

**802. Special Problems in Pathology**  
Fall, Winter, Spring, Summer. 1 to 15 credits. Approval of department.

**803. Special Problems in Physiology**  
Fall, Winter, Spring, Summer. 1 to 15 credits. Approval of department.

- 805. Special Problems in Mycology**  
Fall, Winter, Spring, Summer. 1 to 15 credits. Approval of department.
- 806. Special Problems in Cytology and Genetics**  
Fall, Winter, Spring. 1 to 15 credits. Approval of department.
- 807. Special Problems in Algae**  
Fall, Winter, Spring, Summer. 1 to 15 credits. Approval of department.
- 809. Special Problems in Ecology**  
Fall, Winter, Spring, Summer. 1 to 15 credits. Approval of department.
- 812. Advanced Plant Pathology**  
Winter. 4(2-4) 402, 405; or approval of department.  
Epidemiology of plant diseases. Detailed study, primarily from the literature of selected classical examples of plant diseases.
- 813. Special Problems**  
Fall, Winter, Spring. 1 to 4 credits. May re-enroll for a maximum of 16 credits. Approval of department.
- 815. Lichenology**  
Spring of even-numbered years. 3(2-4) Approval of department.  
Morphology and taxonomy of lichens. The laboratory will be devoted to the collection and identification of lichens.
- 816. Industrial Mycology**  
Fall of even-numbered years. 3(2-4) 402 or approval of department.  
Industrially important fungi, their uses and characteristics. Methods of commercial production, including acids, enzymes, cheeses, mushrooms, and antibiotics. Several field trips will be taken.
- 817. Plant Morphology I**  
Fall. 4(2-6) 302.  
First course in a series dealing with evolutionary morphology within the various groups of plants. The morphology and life histories of the several phyla of both fresh water and marine algae as a basis for an evolutionary study of land plants.
- 818. Plant Morphology II**  
Winter. 4(2-6) 817.  
Structure and life histories of mosses and ferns in relation to origin of land flora and evolution of higher plants. Contributes to understanding of relationships between existing groups of plants.
- 819. Plant Morphology III**  
Spring. 4(2-6) 818.  
Morphology and evolution of seed plants. Development and evolution of plant structures and habits which play critical roles in human economy and social evolution.
- 820. Ecology of Hydrophytes**  
Summer of every third year; given in 1967. 3 credits. 400 and 447 or approval of department. Given at W. K. Kellogg Biological Station.  
Physiological and ecological relationships of periphyton, macroalgae, and vascular aquatic plants; field and laboratory methods of analysis of growth factors.
- 823. Plant Taxonomy I**  
Fall of odd-numbered years. 4(3-3) 318; ZOI. 441 recommended.  
First course of a series on classification and relationships of vascular plants. Family characteristics, patterns, geographic distribution, and evolutionary trends are stressed. Contributions from classical taxonomy, cytobotany and experimental taxonomy are discussed.
- 824. Plant Taxonomy II**  
Winter of even-numbered years. 4(3-3) 823.  
Second course of a series on classification and relationships of vascular plants.
- 825. Tropical Biology: An Ecological Approach**  
Winter, Summer. 12 credits. Approval of department and acceptance by Organization for Tropical Studies. Interdepartmental with the Zoology Department.  
An introduction in the field to the principles of ecology as they operate in the tropics, especially concerning the tropical environment and biota, ecologic relations, communities and evolution in the tropics. Given in Costa Rica by Organization for Tropical Studies.
- 826. Advanced Tropical Botany**  
Winter, Summer. 12 credits. Approval of department and acceptance by Organization for Tropical Studies.  
A field course on the adaptation, evolution, and physiological characteristics of tropical plants. The subject will vary from term to term, but will include such topics as the reproductive biology of tropical plants, tropical forest ecology, biology of tropical epiphytes, biology of tropical grasses, biology of tropical ferns, etc.
- 827. General Cytology**  
Spring and Summer of odd-numbered years. 4(3-2) One year general chemistry and 1 year general botany or general zoology. Designed primarily for biological science students.  
Plant and animal materials. Cell morphology and variation, organization and distribution of standard inclusions, structure of the nucleus and the mechanism of mitosis.
- 830. Paleobotany**  
Fall. 4(3-4) Approval of department. Interdepartmental with the Geology Department.  
Survey of fossil plants: their preservation, occurrence, geology, paleogeography, paleoecology, evolutionary history, classification and representative types. One weekend field trip to fossil plant locality.
- 831. Palynology**  
Spring. 4(3-4) Approval of department. Interdepartmental with and administered by the Geology Department.  
An introduction to the principles and techniques of spore and pollen analysis, both fossil and recent, and utilization of plant microfossils for stratigraphic determinations and paleoecologic interpretation of most sedimentary accumulations and rocks. (Includes certain algae, protozoans, similar organisms of uncertain affinity and dissociated fragments of larger organisms.)
- 835. Morphogenesis of Reproductive Structures**  
Spring of even numbered years. 4(3-4) 434.  
Principles underlying the differentiation and growth of reproductive plant structures with special emphasis upon their functional and developmental genetic relationships.
- 836. Advanced Mycology: Current Biological Advances**  
Winter. 4(4-0) Approval of department.  
Recent and current advances in the biology of fungi, with emphasis upon experimental studies of structural and functional differentiation during ontogeny.
- 837. Advanced Mycology: Morphology and Taxonomy**  
Spring. 4(3-2) 402.  
Recent morphological studies, taxonomic methods, and phylogeny. The laboratory will be devoted to special problems related to the student's interests.
- 838. Advanced Paleobotany**  
Winter. 3(2-4) Approval of department. Interdepartmental with the Geology Department.  
Morphology, anatomy, phylogenetic relationships and classification of fossil plants. Microscopic analysis of tissues and organs prepared by thin section, transfers, peels, polished and etched surfaces, and macerations.
- 839. Population Ecology**  
Summer of odd-numbered years. 6 credits. Approval of department. Given at W. K. Kellogg Biological Station. Interdepartmental with and administered by the Zoology Department.  
A synopsis of growth and regulation of plant and animal populations; interrelationships of biotic and environmental factors that control population responses and interactions. Laboratory and field experiments.
- 841. Physiology of the Algae**  
Spring of even-numbered years. 4(3-2) Approval of department.  
Physiology, chemistry, biochemistry, and aspects of the ultra-structure of the various algal divisions. Discussion of use of algae for the study of classical physiological and developmental problems.
- 845. Current Problems in Plant Metabolism**  
Fall, Winter, Spring. 1(1-0) 414.
- 846. Seminar in Plant Pathology**  
Fall, Winter, Spring. 1(1-0) Approval of department.
- 855. Effects of Ionizing Radiations on Plants**  
Spring of odd-numbered years. 3(3-0) Approval of department.  
Nature of ionizing radiations related to their effects upon plant growth and development including aspects of radiation sensitivity, dosimetry, direct and indirect effects, genetic, evolution and environmental implications related to modes of action at the cell, organism, and population levels.
- 880. Plant Virology**  
Fall. 5(2-6) 405 or approval of department.  
External and internal symptomatology, transmission, interactions, purifications, assay and serology of plant viruses.
- 881. Parasitism and Pathogenesis**  
Winter of odd-numbered years. 4(2-4) 415, 405, or approval of department.  
Physiology of parasitism and disease development in plants. Parasitism by plant pathogens is compared with parasitism in other groups.
- 883. Plant Disease Control**  
Fall of even-numbered years. 3(2-3) 405.  
Principals and methods in controlling plant diseases. Considerable emphasis is placed on the chemistry of fungicides, and their role in controlling plant diseases. Other factors affecting disease epidemiology are covered.
- 885. Plant Diseases in the Field**  
Spring. 4 credits. 405 and approval of department.  
Diagnosis, distribution and sequential developments of plant diseases in the field.

**890. Selected Topics in Plant Pathology**  
Fall, Winter, Spring. 2 to 5 credits.  
Approval of department.

Topics will be selected from the following areas: parasitism, plant viruses, ecology, genetics, nematology, fungicidal action, and soil microbiology.

**899. Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Research for thesis at the master's degree level in one of the following fields: anatomy, cytology, ecology, genetics, lichenology, morphology, mycology, pathology, phycology, physiology, and taxonomy.

**918. Advanced Genetics**  
Winter of odd-numbered years. 3(3-0)  
Approval of department.

Role of the gene in differentiation and development, with special emphasis upon the genetic mechanisms responsible for the control of phenogenesis.

**919. Cytogenetics**  
Fall. 3(3-0) 918.

**920. Advanced Plant Taxonomy**  
Spring of even-numbered years. 4(4-0)  
824, ZOL 441.

Consideration of the recent scientific developments affecting plant classification.

**930. Advanced Plant Ecology**  
Spring of odd-numbered years. 3(2-4)  
415, 450, 824.

Fundamental theories and modern research horizons.

**951. Advanced Plant Physiology I**  
(943.) Fall of even-numbered years.  
3(3-0) Approval of department.

Selected topics concerning absorption and inorganic nutrition.

**952. Plant Physiology and Biochemistry I**  
(944.) Winter of odd-numbered years.

3(3-0) Approval of department. Interdepartmental with and administered by the Biochemistry Department.

Selected topics concerning photosynthesis and related processes.

**953. Advanced Plant Physiology II**  
(945.) Spring of odd-numbered years.

3(3-0) Approval of department.  
Selected topics concerning the chemistry, physiology and mechanism of action of plant growth hormones.

**954. Advanced Plant Physiology III**  
(946.) Fall of odd-numbered years.

3(3-0) Approval of department.

Selected topics from environmental physiology.

**955. Plant Physiology and Biochemistry II**  
(947.) Winter of even-numbered years.

3(3-0) Approval of department. Interdepartmental with and administered by the Biochemistry Department.

Metabolic pathways of unique significance to plants.

**956. Advanced Plant Physiology IV**  
(948.) Spring of even-numbered years.

3(3-0) Approval of department.  
Factors influencing vegetative and reproductive physiology.

**999. Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Research for thesis at the doctor's degree level in one of the following fields: anatomy, cytology, ecology, genetics, lichenology, morphology, mycology, paleobotany, pathology, phycology, physiology, and taxonomy.

## BUILDING CONSTRUCTION

See Packaging

## BUSINESS LAW AND OFFICE ADMINISTRATION BOA

### College of Business

**201. Shorthand I**  
Fall, Winter, Spring, Summer. 3(4-0)  
234 or 1 term typewriting.

Gregg shorthand theory, dictation and transcription for students with no previous training.

**202. Shorthand II**  
Fall, Winter, Spring, Summer. 3(3-1)  
201, 234 or 1 term shorthand and typewriting.

Development of theory and transcription competency, speed building.

**203. Shorthand III**  
Fall, Winter, Spring. 3(3-1) 202,  
235.

Continuation of 202.

**204. Advanced Shorthand**  
Fall, Winter, Spring. 3(3-1) 203,  
236.

Continuation of 203.

**234. Typewriting I**  
Fall, Winter, Spring, Summer. 2(2-2)  
Approval of department.

Mastery of keyboard; building speed and accuracy; elementary typewriting problems.

**235. Typewriting II**  
Fall, Winter, Spring. 2(2-2) 234 or  
approval of department.

Improvement of speed and accuracy; arrangement of business letters, tabulation and manuscripts; production typewriting.

**236. Advanced Typewriting**  
Fall, Winter, Spring, Summer. 3(3-1)  
235 or 1½ to 2 years typewriting.

Instruction in specialized typewriting problems to develop high-level competency.

**308. Secretarial Administration I**  
Fall, Winter, Spring. 4(4-0) 204,  
236. Sophomores.

Development of proficiency in transcription skills.

**309. Secretarial Administration II**  
Fall, Winter, Spring. 4(4-2) 236,  
Sophomores.

Machine dictation-transcription; duplication and copying processes; machine calculations; records management.

**326. Business Writing**  
Fall, Winter, Spring, Summer. 4(4-0)  
Juniors.

Study and analysis of business and industrial communication problems; extensive instruction and practice in writing.

**326H. Writing in a Business Culture**  
Fall, Winter. 4(4-0) Honors College  
students.

This intensive honors course in business writing ranges from letters to review articles on professional journals. Historical and linguistic study to illuminate business and technological culture.

**341. Survey of Business Law**  
Fall, Winter, Spring, Summer. 4(4-0)  
Juniors. Not open to business administration  
students.

Historical development of the law; courts, court procedures and civil remedies, torts, crimes; contracts, agency, sales, negotiable instruments, real and personal property, including bailments and liens. Textbook and lecture rather than case approach.

**370. Office Administration**  
Fall, Winter, Spring, Summer. 3(3-0)  
Juniors.

Analysis of office function and relationship to business organization; information handling and data processing; office design and layout; responsibilities of office administrators.

**400H. Honors Work**  
Fall, Winter, Spring, Summer. 1 to 15  
credits. Approval of department.

Independent and informal study in law, office administration or business communications.

**416. Secretarial Administration III: Seminar**  
Winter, Spring. 4(4-0) Seniors or  
approval of department.

Analysis of the role of the executive secretary.

**427. Business and Technical Reports**  
Fall, Spring. 4(4-0) Juniors

Discussion and illustration of report writing techniques; study of use, form, and structure of different types; practice in preparing the most frequently used. One complete research report required.

**440. Law and Society**  
Fall, Winter, Spring, Summer. 3(3-0)  
Seniors or approval of department.

Legal reasoning and legal institutions. Court systems and court procedures. Relationships of citizen and businessman to governmental agencies. Torts, crimes.

**441. Law of Contracts and Business Organizations**  
Fall, Winter, Spring, Summer. 5(5-0)  
440.

Law of contracts, including the concept of freedom of contract and its importance as the focal point of business transactions. Study of the legal framework within which formal business organizations must operate.

**443. Property, Sales, Negotiable Instruments**  
Spring. 4(4-0) 441.

Law of real and personal property, including bailments, liens and security transactions, sales, and negotiable instruments. Case study method used.

**445. Real Estate Law**  
Winter. 3(3-0) 441.

Law of real and personal property, including fixtures, easements, land descriptions, titles, deeds, recording requirements, brokers, land contracts, escrows, closing of sale, abstracts, mortgages, mechanics liens, co-ownership, descent and distribution, administration of estates, zoning, taxes, landlord and tenant. Combined text and case approach.

**446. Interstate and International Business Law**  
Spring. 3(3-0) 341, 440 or 441.

Laws of contracts, sales, negotiable instruments, agency, business associations in the interstate and international spheres. Maritime contracts. International commercial arbitration. Area directed studies.