804B Neuroscience Laboratory II
Spring, 5(2-4) FSU 304A. Interdepartmental with the Department of Physiology, Psychology and Zoology and administered by the Department of Psychology.
Continuation of BYF 304A.

821. Molecular Biophysics
Winter of even-numbered years, 4(4-0). Approval of department.

822. Charge Transport and Solid State Processes
Spring of even-numbered years, 4(4-0). Approval of department.
Fundamental electrical properties, dielectric properties and photoconductivity effects and their relevance to the biological functioning of these molecules.

824. Membrane Biophysics
Winter of odd-numbered years, 4(3-2). Approval of department.
Membrane Biophysics will cover interfacial phenomena in biology and chemistry, structure and function, theoretical and experimental models for biological membranes, membrane biochemistry. Labs will emphasize biomolecular lipid membrane (BLM) techniques.

826. Cellular Biophysics
Spring of odd-numbered years, 4(4-0). Approval of department.
Basic cell structure and function at the molecular level. Emphasis will be on genetic and molecular control of cellular systems.

827. Basic Neurobiology
(828). Fall, 4(3-2) Approval of department.
Interdepartmental with the Department of Zoology.
A comparative survey of fundamental principles of nervous organization will be undertaken in lecture. Laboratory will emphasize examination of prepared neuroanatomical material and a demonstration of important neurophysiological phenomena.

834. Membranes: Natural and Artificial
Spring of odd-numbered years, 2 to 3 credits. Approval of department.
Emphasis is placed on the biophysical and biochemical characterization of biological membranes and their theoretical and experimental models. Presentation and discussion by students and staff of recent advances in membrane research.

885. Vertebrate Neural Systems I
Fall of odd-numbered years, 3(3-4) Approval of department. ANTP 325 and BYF 327 recommended. Interdepartmental with the departments of Zoology, Physiology and Psychology and administered by the Department of Psychology.
Structure and function of major component systems of vertebrate brains, their evolution, ontogeny and comparative analysis in mammals, birds, reptiles, amphibians and fish. Interrelation of behavioral, anatomical and physiological studies.

886. Vertebrate Neural Systems II
Winter of even-numbered years, 5(3-4) PSY 885. Interdepartmental with the departments of Psychology, Physiology and Zoology and administered by the Department of Zoology.
Continuation of BYF 885. Major component systems of vertebrate brains, their evolution, ontogeny, and comparative analysis in mammals, birds, reptiles, amphibians and fish. Interrelation of behavioral, anatomical, and physiological studies.

890. Readings in Biophysics
Fall, Winter, Spring, Summer. 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.

900. Biophysics Seminar
Fall, Winter, Spring, Summer. 1 credit. May reenroll for a maximum of 3 credits. Approval of department.

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

BOTANY AND PLANT PATHOLOGY

College of Agriculture and Natural Resources

College of Natural Science

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

301. Introductory Plant Physiology
Fall, Spring, 4(2-4) CEM 151 or CEM 151; CEM 151; CEM 151.
Introductory organic chemistry recommended. General principles of plant physiology relating plant structure to function. Topics include cell physiology, water relations, effects of light and temperature, respiration, photosynthesis, mineral nutrition, and hormone action.

302. Introductory Morphology
Fall, Winter, 4(2-4) S 212 or approval of department.
Structures and life cycles of representative plant groups showing progressive evolutionary developments.

318. Introductory Plant Systematics
Spring. 4(2-3) BOT 202 or S 212 or approval of department.
Plant diversity with emphasis on identification, classification, nomenclature, and evolutionary relationships of vascular plants.

335. Fossil Plants, Their History and Palaeoecology
Spring. 3(3-0) One course in geology or botany or biology or approval of department. Interdepartmental with and administered by the Department of Geology.
History of plants through geologic time; their form and evolution; how and where found; identified and reconstructed; their use in determining ancient geographic patterns, paleoenvironments, paleoclimates and community structure. Field trip.

336. Economic Plants
Spring. 3(3-0) History, characteristics, and origins of plants used in industrial processes, drug manufacture, and agriculture. Non-technical to broaden student's cultural interest in plants.

400. Aquatic Plants
Fall. 3(3-2) BOT 318 and/or BOT 302. Aquatic plants, their classification, ecology and economic importance. Relationships to problems in fisheries, wildlife management, and 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 reenroll for a maximum of 16 credits. BOT 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
Winter. 4(2-6) S 212 or LBC 141 or approval of department.
Survey of the fungi including characteristics, habits and diversity. Background course for biology students or those expecting to specialize in mycology, plant pathology, or other fields involving fungi.

405. Introductory Plant Pathology
Fall. 4(2-4) BOT 302 or S 212 or approval of department. Students may not receive credit in both BOT 405 and BOT 407.
General principles of plant pathology including detailed study of selected diseases as examples of important groups.
406. Medical Mycology
Fall, Spring. 4(2-6) BOT 409 or approval of department. Interdepartmental with the Department of Microbiology and Public Health.

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

407. Diseases of Forest and Shade Trees
Spring. 3(3-2) BOT 301, BOT 302, BOT 318 or FOR 204. Students may not receive credit in both BOT 407 and 406.

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

408. Freshwater Ecology
Summer. 6 credits. B S 211 or approval of department. Given at W. K. Kellogg Biological Station. Interdepartmental with Biological Science and the Department of Zoology and administered by Biological Science.

The ecology of fresh water ecosystems, their biotic structure, and the functional interrelationships of environmental variables regulating population dynamics, productivity, and community structure. Extensive field investigations.

410. Terrestrial Ecology
Summer. 5 credits. B S 212 or approval of department. Given at W. K. Kellogg Biological Station. Interdepartmental with Biological Science and the Department of Zoology and administered by Biological Science.

Factors determining distribution and abundance. Interrelationships of plants, animals, and environment. Extensive field investigations of several types of terrestrial communities in light of current theory.

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.

413. Environmental Plant Physiology
Fall. 3(3-0) B S 210 or LBC 141 or BOT 205.

Major topics include plant soil-water relationships and gas exchange. Mineral nutrition, energy budgets, and stress physiology will be discussed briefly.

414. Plant Physiology: Metabolism
Winter. Summer of odd-numbered years. 3(3-4) CEM 241, B S 310 or LBC 141 or BOT 205. BOT 301 or BOT 413.

General principles underlying plant metabolic processes. Nutrient requirements, photosynthesis, translocation, respiration, nitrogen metabolism, and structures associated with these processes.

415. Plant Physiology: Growth and Development
Spring. Summer of even-numbered years. 3(3-4) B OT 414 or approval of department.

Growth and development in plants. Topics include the chemistry and effects of hormones, tropisms, thermoperiodicity, reproduction, vernalization and photoperiodism, photomorphogenesis, dormancy, and biological clocks.

427 Cell Biology
Winter. Summer of odd-numbered years. 4(4-4) B OT 290 and one year of general botany or general zoology.

Cell organization and distribution of standard inclusions. Structure and function of the nucleus and other cytoplasmic organelles.

431. Methods in Cytology - Histology
Winter. 4(2-6) BOT 302.

Preparation of plant materials for microscopic analyses. Emphasis on theory and use of optical microscopy (bright-field, phase contrast, fluorescence, cytophotometry, photomicrography, etc.) and electron microscopy (TEM and SEM).

434. Plant Anatomy
Fall. Summer of even-numbered years. 4(2-4) BOT 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) BOT 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) B OT 318; BOT 301 or BOT 414.

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

470. Nematode Diseases of Economic Plants
Winter. 4(3-3) B S 212 or BOT 205. Interdepartmental with and administered by the Department of Entomology.

Major nematode diseases of economically important plants, with emphasis on diagnostic symptoms, nematode biology and principles of control.

480. Insects in Relation to Plant Diseases
Fall of even-numbered years. 3(2-2) BOT 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 bacteria. Mode of transmission and means of control. Transmission techniques and important plant-pathogen-insect relationships.

499. Senior Seminar
Winter. 1(1-4) May 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.

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

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

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

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

505. Special Problems in Mycology
Fall, Winter, Spring. 1 to 15 credits. Approval of department.

508. Special Problems in Cytology and Genetics
Fall, Winter, Spring. 1 to 15 credits. Approval of department.

512. Ecology and Epidemiology of Plant Pathogens
Winter of even-numbered years. 4(2-4) BOT 402, BOT 405, or approval of department.

Production, liberation and dispersal of inoculum; effect of leaf and root exudates on pathogens; pathogen survival in the absence of the host plant; microbial antagonism. Nature and causes of epidemics.

513. Special Problems
Fall, Winter, Spring. 1 to 4 credits. May enroll for a maximum of 16 credits. Approval of department.

516. Industrial Mycology
Winter of odd-numbered years. 3(2-4) BOT 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.

520. Ecology of Hydrophytes
Summer of every third year, given in 1977. 3 credits. BOT 401 and BOT 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.

523. Plant Taxonomy I
Fall of odd-numbered years. 4(3-3) B OT 318, ZOL 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, cytogenetics, and experimental taxonomy are discussed.

524. Plant Taxonomy II
Winter of even-numbered years. 4(3-3) B OT 623.

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 Department of Geography.
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. Cytogenetics
Fall. 4(2-4) BOT 437 or ZOL 441 or approval of department.
Detailed discussions of meiosis and mitosis; mechanisms of chromosome movement; fine structure of chromosomes and spindle apparatus; changes of chromosome number and structure and their genetic significance.

830. Paleobotany
Fall. 4(3-4) Approval of department. Interdepartmental with the Department of Geology.
Survey of fossil plants: Their preservation, occurrence, geology, paleo-geography, paleoecology, evolutionary history, classification and representative types. One weekend field trip to fossil plant locality.

831. Palynology
Spring of even-numbered years. 3(3-0) Approval of department. Interdepartmental with and administered by the Department of Geology.
An introduction to the principles and techniques of spore and pollen analysis, both fossil and recent, and utilization of plant micro-fossils for stratigraphic determinations and paleoecological 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 the Phycomycetes
Spring of even-numbered years. 4(3-4) BOT 431. Principles underlying the differentiation and growth of reproductive plant structures with especial emphasis upon their functional and developmental genetic relationships.

836. Advanced Mycology: Biology of the Phycomycetes
Spring of even-numbered years. 3(3-0) BOT 402. Approval of department. Selected topics on the biology of phycomycetous fungi.

837. Advanced Mycology: Ascomycetes
Fall of even-numbered years. 4(2-6) BOT 404. Morphological features and adaptations of the major groups of ascomycetous fungi and the imperfect fungi. Evolutionary trends and relationships with reference to recent classification schemes.

838. Advanced Paleobotany
Winter. 3(3-4) Approval of department. Interdepartmental with the Department of Geology. Morphology, anatomy, phyletogeographic relationships and classification of fossil plants. Microscopic analysis of tissues and organs prepared by thin section, transfer, peels, polished and etched surfaces, and macerations.

839. Population Ecology
Summer. 6 credits. Approval of department. Given at W. K. Kellogg Biological Station, Interdepartmental with and administered by the Department of Zoology.
An experimental field approach to the study of populations and communities. Selected topics will deal with population growth, composition, prediction, community structure and species abundance. This course is intended to complement ZOL 892.

841. Physiology of the Algae
Fall of even-numbered years. 3(3-0) Approval of department. Physiology, biochemistry, 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.

846. Seminar in Plant Pathology
Fall, Winter, Spring. 1(1-0) Approval of department.

850. Agrostology
Fall of even-numbered years. 3(1-4) One year of botany or approval of department. Comprehensive treatment of the systematics, evolution, ecology, geography and economic significance of the grass family, including pertinent aspects of genetics, cytology, anatomy and physiology.

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.

863. Advanced Environmental Physiology
Winter. 3(3-0) BOT 413 or approval of department. The plant in relation to its environment; energy exchange: coupling between CO2 assimilation and transpiration; hydraulics in the stationary and nonstationary states; transport of ions, carbohydrates, and hormones; stress physiology.

865. Advanced Growth and Development
Fall. 3(3-0) BOT 415 or approval of department. Advanced treatment of the physiological processes of growth and development. The mechanism underlying these processes and the roles played by hormones, light, etc., in controlling them will be analyzed.

871. Biology of Nematodes
Spring. 4(2-6) ENT 470 or approval of department. Interdepartmental with and administered by the Department of Entomology. Ontogeny, taxonomy, morphology, pathology and ecology of nematodes, with special reference to plant-parasitic and phyto-pathogenic species.

878. Comparative Limnology
Summer. 6 credits. Approval of department. Given at W. K. Kellogg Biological Station, Interdepartmental with and administered by the Department of Zoology.
Theoretical concepts and methods of analysis of environmental parameters influencing productivity of freshwaters. Comparative field investigations of lakes, streams, and other aquatic habitats.

880. Plant Virology
Fall of odd-numbered years. 5(2-6) BOT 405 or approval of department.
External and internal symptomatology, transmission, interactions, purification, assay and serology of virus cultures.

881. Pathogenesis and Disease Resistance
Winter of even-numbered years. 3(3-0) ZOL 443. Botany of disease. Inheritance of resistance and susceptibility, virulence and avirulence; types of resistance, aggressiveness in parasites, use of genetics in studies of host-parasite interactions, practical application in disease control.

882. Genetics of Host/Parasite Interactions
Winter of even-numbered years. 3(3-0) ZOL 441. Botany of disease. Inheritance of resistance and susceptibility, virulence and avirulence; types of resistance, aggressiveness in parasites, use of genetics in studies of host-parasite interactions, practical application in disease control.

883. Plant Disease Control
Fall of even-numbered years. 3(2-2) BOT 405. Princples 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. BOT 405 and approval of department. Diagnosis, distribution, and sequential development of plant diseases in the field. Field trips permit observation of diseases in the natural setting.

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.

893. Research
Fall, Winter, Summer. Variable credit. Approval of department. Research for thesis. Study of the master's degree level in one of the following fields: anatomy, cytology, ecology, genetics, ichthyology, morphology, mycology, pathology, physiology, and taxonomy.

915. 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 phenogenetics.
### Descriptions – Botany and Plant Pathology

#### Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>920</td>
<td>Advanced Plant Taxonomy</td>
<td>Spring of even-numbered years. Credits: 4(4-0)</td>
</tr>
<tr>
<td>930</td>
<td>Advanced Plant Ecology</td>
<td>Winter of odd-numbered years; Summer of even-numbered years.</td>
</tr>
<tr>
<td>952</td>
<td>Plant Physiology and Biochemistry I</td>
<td>Winter of even-numbered years. Credit: 3(3-0)</td>
</tr>
<tr>
<td>956</td>
<td>Advanced Plant Physiology IV</td>
<td>Spring of even-numbered years. Credit: 3(3-0)</td>
</tr>
<tr>
<td>999</td>
<td>Research</td>
<td>Fall, Winter, Spring, Summer. Variable credit.</td>
</tr>
</tbody>
</table>

### BUILDING CONSTRUCTION

See Agricultural Engineering

### BUSINESS LAW AND OFFICE ADMINISTRATION

**BOA**

*Note: Name change effective December 15, 1976. Formerly Business Law, Insurance and Office Administration.*

#### College of Business

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>Shorthand I</td>
<td>Fall, Winter, Spring, Summer. Credit: 3(4-0)</td>
</tr>
<tr>
<td>202</td>
<td>Shorthand II</td>
<td>Fall, Winter, Spring, Summer. Credit: 3(3-1)</td>
</tr>
</tbody>
</table>

### Legal Environment of Business

- **Legal Environment of International Business**
  - Spring, Summer; Credit: 4(4-0)
  - Commercial and financial transactions in international business, foreign agencies, branches, subsidiaries. Analysis of labor relations and antitrust legislation. Credit: 4(4-0)
  - Business law and ethics in international commerce. Credit: 4(4-0)
  - Seminar: Office Administration
  - Winter, Summer; Credit: 3 credits. May reenroll for a maximum of 8 credits. Approval of department.
  - Problems, practices, and policies in business organizations. Credit: 4(4-0)
  - Contracts and Sales
  - Fall, Winter, Spring; Credit: 3(5-0)
  - Contracts, including concept of freedom of contract and limitations. Credit: 4(4-0)
  - Business Law
  - Spring; Credit: 4(4-0)
  - Law and society; Credit: 4(4-0)
  - Legal and social implications of business decisions. Credit: 4(4-0)
  - Special Problems
  - Fall, Winter, Spring; Credit: Variable credit. Approval of department.