

991. Seminar in Capital Markets
(AFA 991.) Winter. 5(5-0) F I 990.
The mathematical basis of portfolio theory. Development of capital asset pricing models. Empirical tests of capital market theories.

992. Seminar in Selected Finance Topics
Spring. 4(4-0) F I 991.
Study and research in finance topics selected from areas of interest to the instructor and doctoral candidates.

999. Doctoral Dissertation Research
Fall, Winter, Spring, Summer. 1 to 5 credits. May reenroll for a maximum of 36 credits. Approval of department.

FISHERIES AND WILDLIFE F W

College of Agriculture and Natural Resources

100. Introduction to Fisheries and Wildlife
Fall. 1(1-0) Freshmen Fisheries and Wildlife Majors.
Fisheries and wildlife as a profession. Academic and nonacademic needs to meet professional objectives, using current management problems as a focus for discussion.

203. Resource Ecology
(IDC 200.) Fall, Winter, Spring, Summer. 3(3-0) Interdepartmental with the departments of Forestry, Geography, Resource Development, and Zoology.
Basic concepts of ecology which are the unifying basis for resource management, conservation policy and the analysis of environmental quality. Extensive use of guest lecturers.

301. Fish and Wildlife of North America
Winter. 5(3-4) B S 212 or approval of department.
Comparative study of fish and wildlife groups in North America, their significant life history stages, morphology, migrations, habitats and populations. Common species are identified in the laboratory.

302. Ecosystem Processes
Spring. 3(3-0) CEM 132, PHY 238, B S 212, CSS 210, GLG 201, MTH 108, MTH 109 or MTH 111.
Concepts of ecosystem structure and function developed from basic scientific laws and relationships.

305. Principles of Fisheries and Wildlife Management
Winter. 3(3-0) IDC 200 or approval of department. Not open to majors in fisheries-limnology or wildlife-ecology options.
Ecological concepts in management. Effects of regulations, refuges, stocking, species introduction, habitat manipulation, artificial feeding, genetic improvement, land use and control of predators, diseases and competitors on the production of fish and game.

328. Vertebrate Pest Control
Fall. 3(3-0) B S 212 or approval of department.
Role of vertebrate animals as agents damaging to human interests; the concepts of damage control; damage control techniques, optional field trip.

340. Wildlife Biometry
Winter. 4(3-2) MTH 111, six credits in fisheries and wildlife.
Survey of statistical formulas, methods and applications of statistics to problems in fisheries and wildlife.

374. Biological Oceanography
Winter. 3(3-0) B S 212 or approval of department.
Biology of marine animals, with emphasis on physical, chemical and biological factors affecting their abundance and distribution.

376. Introductory Limnology
Winter. 3(3-0) B S 212; students may not receive credit for both FW 376 and FW 476.
Lake and stream ecology including effects of natural and human-induced perturbations on freshwater ecosystems.

402. Environmental Conservation Education
Fall. 4(3-2) Education majors or approval of department.
Nature, distribution, identification, and interrelationships of Michigan's flora and fauna which influence natural resource use. Includes techniques of teaching about the environment. Field trips required.

404. Fisheries and Wildlife Problems
Fall, Winter, Spring, Summer. 1 to 5 credits. May reenroll for a maximum of 12 credits. B S 212; 6 credits of fisheries and wildlife; approval of department.
To give undergraduate majors an opportunity to study special topics in fisheries and wildlife.

410. Upland Wildlife Management
Fall. 3(3-0) F W 302, F W 340, BOT 450.
Wildlife management based on upland ecological processes. Assessment and management of habitat. Mitigation of human impact.

412. Wetland Ecosystem Management
Fall. 3(3-0) F W 302, F W 340.
Ecosystem components and processes applied to wetland management. Mitigation of human impact.

413. Upland and Wetland Ecosystem Laboratory
Fall. 2(0-6) F W 410 or F W 412 or concurrently.
Wildlife habitat analysis and management in upland and wetland ecosystems. Field trips required.

420. Biology of Animal Parasites
Summer. 6 credits. B S 212 or approval of department. Given at W. K. Kellogg Biological Station. Interdepartmental with the departments of Microbiology and Public Health, and Zoology. Administered by the Department of Microbiology and Public Health.
Parasitism of animals by protozoa, helminths and arthropods with emphasis on the interrelationships of host-parasite associations with the natural environments.

424. Wildlife Population Analyses
Spring. 4(3-2) BOT 450 or ZOL 389, or concurrently.
Population mensuration; reproductive and survival rates, sex and age determination; handling and marking methods. Field trips.

434. Wildlife Resource Policy and Management
Winter. 4(3-2) F W 410, F W 412, F W 424.
The impact of public policy on wildlife management. Objectives of and approaches to wildlife management. Planning, implementing, and evaluating wildlife management programs.

450. Natural Resource Administration
Winter. 4(4-0) Seniors; not open to forestry majors. Interdepartmental with Agriculture and Natural Resources and the departments of Forestry, Park and Recreation Resources, and Resource Development. Administered by the Department of Forestry.
Concepts and methods of administering wildland properties. The legal, economic and social environment. Benefit-cost analysis of management changes. Unit organization, personnel management and accounting. Presents a systems view of administration.

455. Natural Resource Economics
Fall. 4(4-0) Approval of department. Interdepartmental with Agriculture and Natural Resources and the departments of Forestry, Park and Recreation Resources, and Resource Development. Administered by the Department of Forestry.
Basic economic and political principles and techniques that govern the production and consumption of forest land products, including basic forest valuation procedures.

471. Ichthyology
Spring. 3(2-3) F W 301 or ZOL 320 or ZOL 428. Interdepartmental with the Department of Zoology.
Classification and natural history of fishes. Emphasis on food, game, and forage fishes.

473. Fishery Biology and Management
Fall. 5(3-4) F W 471.
Biology of fishes with special reference to distribution and natural history, and application of this knowledge to problems of obtaining maximum return from fishery resources.

475. Fish Culture
Spring. 3(3-0) F W 473.
Artificial propagation of freshwater fish including hatchery management, nutritional and environmental requirements, disease and parasite control and intensive fishery management. Utilization of hatchery stock in fisheries management.

476. Limnology
Winter. 3(3-0) CEM 131 and CEM 161; BOT 450 or ZOL 389. Students may not receive credit for both F W 376 and F W 476. Interdepartmental with the Department of Zoology.
Ecology of lakes and streams with special reference to physical, chemical and biological factors affecting their productivity.

477. Limnological Methods
Winter. 3(0-9) F W 476 concurrently; ZOL 481; ENT 301, ENT 302 recommended. Interdepartmental with the Department of Zoology.
Methods and instruments of limnological field investigation on lakes and streams.

**Descriptions – Fisheries and Wildlife
of
Courses**

- 478. Stream Ecology**
Spring. 3(3-0) ENT 420, ZOL 389 or BOT 450 or FW 302 or approval of department. Students may not receive credit in both FW 478 and ENT 421. Interdepartmental with the departments of Entomology and Zoology. Biological, chemical, physical, and geological processes which determine the structure and function of stream ecosystems.
- 484. Outdoor Environmental Education**
Fall. 4(3-2) Juniors or approval of department. Using the outdoors as a teaching laboratory for ecological studies of plant and animal communities. Designed primarily for secondary teachers.
- 485. Environmental Conservation Program Design**
Winter of even-numbered years. 3(3-0) Seniors or approval of department. Materials and methods for integrating environmental conservation into educational programs in schools, nature centers, youth groups and communities.
- 801. Seminar in Fisheries and Wildlife**
Fall, Winter, Spring. 1(1-0) May reenroll for a maximum of 3 credits. Approval of department. Graduate problems and current developments of importance.
- 802. Advanced Topics**
Fall, Winter, Spring Summer. 1 to 6 credits. May reenroll for a maximum of 15 credits. Approval of department. Study of selected advanced topics in detail and depth.
- 830. Environmental Requirements of Fish**
Winter of odd-numbered years. 3(3-0) Approval of department. Adaptations and responses of fish to environmental changes; research methods for evaluating environmental limitations and effects of pollutants on fish growth, reproduction and survival. Applications for developing water quality criteria.
- 831. Aquatic Toxicology**
Spring of odd-numbered years. 3(3-0) FW 830 or approval of department. Acute and chronic toxicity of compounds and elements on aquatic organisms. Monitoring and predicting structural and functional changes: biochemical, histological, physiological, organismal, behavioral, populational, community, ecosystem.
- 860. Wildlife Nutrition**
Winter of odd-numbered years. 4(3-2) Approval of department. Application of nutritional concepts to wildlife management. Design of nutritional investigations including methods of sampling and analysis. Improvement of the nutritional status of wildlife habitat.
- 871. Ecology of Fishes**
Summer of even-numbered years. 3 credits. Approval of department. Given at the W. K. Kellogg Biological Station. Interdepartmental with and administered by the Department of Zoology. Exploration of ecological problems with particular emphasis on growth, food and habitat selection, population biology and niche relations. Field and experimental investigations of fish communities.
- 872. Fish Communities and Aquatic Ecosystems**
Winter of even-numbered years. 3(3-0) Approval of department. Processes by which fish influence the structure and function of aquatic ecosystems.
- 873. Ecology and Management of Stream Fish**
Winter of odd-numbered years. 3(4-0) FW 376, ZOL 389 or BOT 450; or FW 476 or concurrently. Flowing water habitat as it affects fish, with influences of climate, vegetation, land use, water withdrawal; damming, channel alteration and fishery management.
- 874. Advanced Biological Limnology**
Fall of odd-numbered years. 3(4-0) FW 477, or approval of department. Historical and current contributions to concepts of community structure, energy flow and materials cycling in aquatic eco-systems.
- 875. Chemical Limnology**
Winter. 4(3-3) FW 476, FW 477 or approval of department. Application of analytical chemistry concepts and technologies to fundamental chemical mechanisms in natural and polluted water systems. Special consideration given to selected heterogeneous equilibria.
- 876. Applied Limnology**
Spring. 3(3-0) FW 874 or FW 875 or approval of department. Aquatic ecology: quantitative relationship between physical, chemical and biological parameters in polluted and unpolluted lakes and streams.
- 877. Fish Population Dynamics**
Winter of odd-numbered years. 3(3-0) Approval of department. Quantitative analysis of fish populations; rates of change and their underlying causes.
- 878. Dynamics of Aquatic Contaminants**
Spring of even-numbered years. 4(2-4) FW 476, FW 477 or approval of department. Movement of contaminants through aquatic ecosystems. Chemical and physical processes controlling decomposition and disposition of contaminants. Relationship of chemical form to bioavailability and toxicity. Statistical and deterministic predictive simulation models.
- 897. Ecosystem Ecology**
Fall. 3(3-0) ZOL 389 or BOT 450. Interdepartmental with and administered by the Department of Zoology. Concepts of ecosystem structure, energy flow, and nutrient cycling in representative terrestrial and aquatic ecosystems.
- 899. Master's Thesis Research**
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
- 940. Quantitative Wildlife Ecology**
Fall of even-numbered years. 3(3-0) Approval of department. Fundamentals of population demographics. Rates of increase, dynamic and static life tables, logistic theory, the Leslie matrix model, age specific and time specific parameters. Current hypotheses on mechanisms promoting population stability.
- 999. Doctoral Dissertation Research**
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

**FOOD SCIENCE AND
HUMAN NUTRITION**

**College of Agriculture and Natural Resources
College of Human Ecology**

Food Science FSC

- 101. Food and Society (N)**
Fall, Winter. 3(3-0) Interdepartmental with Human Nutrition and Foods. Analysis of the scientific, social and environmental aspects of food in determining the quality of human life. Introduction into the principles of food preservation and safety.
- 205. Food Laws and Regulations**
Spring. 3(3-0) Interdepartmental with Human Nutrition and Foods. Food laws and regulations that govern food processing and food service systems; procedures involved in adopting and enforcing food laws and regulations.
- 211. Introduction to Food Science**
Spring. 3(3-0) Modern food processing, world food problems, and the basic characteristics of processed foods.
- 256. Meats, Poultry and Fishery Products I**
(242.) Fall. 3(2-2) Interdepartmental with the Department of Animal Science. Principles of evaluation and nutritive value. Identification of grades and cuts of beef, pork, lamb and poultry products.
- 300. Dairy Products**
Spring. 3(2-2) CEM 143 or approval of department. Chemical and physical properties of milk and milk products. Survey of dairy products and the technologies involved in their manufacture.
- 310. Food Safety and Microbiology**
Fall. 4(3-3) CEM 143 or concurrently or approval of department. Not open to students with credit in FSC 440. Interdepartmental with the Department of Microbiology and Public Health. Effects of food handling, preparation and service on food safety. Microorganisms in foods, sanitation, food borne disease and food service regulations.
- 311. Food Processing and Preservation**
Winter. 3(3-0) CEM 132. Not open to majors in Food Science. Effects of processing, packaging and preservation on the quality of foods. Demonstrations of use of ingredients, evaluation of products and results of various processing methods.
- 328. Food Plant Sanitation**
(FSC 332.) Winter. 4(3-3) FSC 211, MPH 200, CEM 141B. Sanitary aspects of food processing operations, water quality, equipment design, bactericidal agents, pest control, personnel hygiene, biological hazards, and regulatory agencies. Field trips required.