871. Portfolio Theory and Capital Markets
Winter, Spring, 4(4-0) ACC 383; F 188.
Theoretical and empirical developments in portfolio analysis, capital markets, capital asset pricing model, arbitrage pricing theory, efficient market hypothesis, and studies of capital markets.

888. Financial Concepts and Analysis
Fall, Winter, 4(4-0) ACC 839.

889. Financial Decision Making
Fall, Winter, Spring, Summer, 4(4-0) ACC 840, F 188 or concurrently.
Financial planning and control using financial theory and management techniques for short, intermediate, and long term problems. Involves case problems.

890. Special Problems
Fall, Winter, Spring, Summer. 1 to 4 credits.
Independent study of special topics in finance or insurance.

990. Seminar in Financial Management Theory
Fall, 4(4-0) Doctoral candidates with approval of department.
The financial theory of the firm. Theoretical models dealing with capital structure, cost of capital, and dividend policy.

991. Seminar in Capital Markets
Winter, 5(5-0) F 1990.

992. Seminar in Selected Finance Topics
Spring, 4(4-0) F 1991.
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 39 credits. Approval of department.

FISHERIES AND WILDLIFE

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
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.

207. Great Lakes: Biology and Management
Spring, 3(3-0) Interdepartmental with the Department of Resource Development.
Living aquatic resources of the Great Lakes: environmental history, biological resources and their management.

301. Fish and Wildlife of North America
Winter, 3(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(0-6) CEM 143, PHY 238, B S 212, CSS 210, GLG 201, 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) F W 203 or approval of department.
Not open to majors with Fishery Biology and Limnology or Wildlife Biology and Ecology option.

328. Vertebrate Pest Control
Winter, 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.
Biological marine animals, with emphasis on physical, chemical and biological factors affecting their abundance and distribution.

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 in fisheries and wildlife; approval of department.

410. Upland Wildlife Management
Fall, 3(3-0) F W 302 or FOR 304, FOR 238 or BOT 318.
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. 3(0-6) F W 410 or F W 412 or concurrently.
   Wildlife habitat analysis and management in upland and wetland ecosystems. Field trips required.

415. Parasitic Diseases of Animals: Ecosystem Approach
   Spring of even-numbered years. 4(3-2)
   F W 301 or ZOL 396 or approval of instructor.
   Diseases of fish and wildlife caused by selected viruses, bacteria, helminths, and arthropods. Biology of infectious agents and their interrelationships with animal populations.

424. Wildlife Population Analyses
   Spring. 4(3-2) BOT 450 or ZOL 389, or concurrently.
   Population measurement; 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
   Spring. 4(4-0) Seniors. Interdepartmental with Agriculture and Natural Resources and the departments of Forestry, Park and Recreation Resources, and Resource Development. Administered by the Department of Forestry.

455. Natural Resource Economics
   Fall. 4(3-2) EC 300 or EC 301. 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 institutional principles and techniques that govern the production and consumption of natural resources. Natural resource evaluation, project analysis, and distributional considerations.

471. Ichthyology
   Spring. 4(3-3) F W 301 or ZOL 370 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(2-0) CEM 141B, 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.
   ENT 301, ENT 302 recommended. Interdepartmental with the Department of Zoology.
   Methods and instruments of limnological field investigations on lakes and streams.

478. Stream Ecology
   Fall. 3(3-0) ENT 420, ZOL 389 or BOT 450 or F W 302 or approval of department.
   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.

801. Seminar in Fisheries and Wildlife
   Fall, Winter, Spring, 1(1-0). May reenroll for a maximum of 7 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.

810. Human Dimensions of Fish and Wildlife Management
   Fall of even-numbered years. 3(3-0)
   Approval of department.
   Methods of surveying, educating, and involving the public to achieve fish and wildlife management goals. Human dimensions research. Case studies of current management issues.

825. Waterfowl Ecology and Management
   Winter of even-numbered years. 4(3-3)
   F W 412, F W 424 or approval of department.
   Application of physiological, behavioral, and population characteristics of waterfowl to current issues and management.

828. Conservation and Genetics
   Winter of odd-numbered years. 3(3-0)
   ZOL 441 or CSS 350 or ANS 314 or approval of department.
   Application of population genetic principles to ecology and management of fish and wildlife.

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)
   F W 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.

869. 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 habitats.

871. Ecology of Fishes
   Summer or even-numbered years. 4 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(3-9)
   Approval of department.
   Processes by which fish influence the structure and function of aquatic ecosystems.

874. Advanced Biological Limnology
   Fall of odd-numbered years. 3(4-0)
   F W 477, or approval of department.
   Historical and current contributions to concepts of community structure, energy flow and material cycling in aquatic ecosystems.

875. Chemical Limnology
   Winter. 4(3-3) F W 476, F W 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) F W 874 or F W 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)
   F W 478, F W 479 or approval of department.
   Movement of contaminants through aquatic ecosystems. Chemical and physical processes controlling decomposition and dispersion of contaminants. Relationship of chemical form to bioavailability and toxicity. Statistical and deterministic predictive simulation models.
328. Food Plant Sanitation
FSC 332. Winter. 3(3-0) FSC 211, MPH 200, CEM 141B.
Sanitary aspects of food processing operations, water quality, equipment design, bacteriological agents, pest control, personal hygiene, biological hazards, and regulatory agencies. Field trips required.

328L. Laboratory in Food Plant Sanitation
Winter. 1(0-3) FSC 328 or concurrently. Sanitary aspects of food processing operations water quality, and related hygiene aspects. Field trips required.

329. Unit Operation and Food Processing I
Fall. 4(3-2) PHY 237, MTH 109. Interdepartmental with and administered by Agricultural Technology and Systems Management. Engineering concepts related to the unit operations found in the food industry. Fluid mechanics, heat transfer and rate processes including psychrometrics and refrigeration.

330. Food Processing Operations
FSC 331. Winter. 3(3-0) PHY 237, FSC 211 or approval of department. Unit operations for food preservation by low temperature, heat, dehydration, evaporation and separation processes.

330L. Laboratory in Food Processing Operations
Winter. 1(0-2) FSC 330 or concurrently. Demonstrations, workshops, and pilot-scale processing illustrating selected unit operations in food manufacture.

333. Food Chemistry
Spring. 3(3-0) FSC 211 and CEM 241 or approval of department. Chemical changes in foods that affect the texture, color, flavor, odor, stability, and nutritive quality during processing and storage.

333L. Laboratory in Food Chemistry
Spring. 1(0-3) FSC 211, CEM 241 and FSC 333 or concurrently. Chemical changes in food that affect quality and stability.

400. Milk Processing Technology
Fall. 4(3-3) CEM 241 or approval of department. The fluid milk industry. Composition, quality, sanitation, nutritive value, processing, packaging and distribution of milk and milk products.

401. Industrial Food Fermentations
Fall. 3(3-0) FSC 440 and organic chemistry or approval of department. Physical, microbiological and chemical procedures in utilizing microbial cultures in controlled fermentations of foods and food constituents.

402. Chemistry and Technology of Lipids
Winter. 3(3-0) One term organic chemistry. Chemical and physical properties of edible fats and oils. Refined and processing of lipids into margarine, butter, shortening and salad oils. Chemical methods for analysis of lipids.

405. Technology of Manufactured Dairy Products
Winter. 4(3-3) FSC 400 or approval of department. Manufacturing technology of fermented dairy products, frozen dairy desserts, and imitation dairy products.

421. Food Plant Management
Spring. 3(3-0) Seniors or approval of department. Business and technical management concepts associated with food plants. Efficiency factors, regulatory obligations, and administrative aspects.

430. Thermal Processes for Foods
Winter. 3(2-2) ATM 329, FSC 328 or concurrently. Process design concepts with emphasis on heating and cooling of foods in containers. Parameters used to describe thermal resistance of product components. Process time calculations for thermal processes.

440. Food Microbiology
Spring. 3(3-0) MPH 300 or MPH 301 or approval of department. Interdepartmental with the Department of Microbiology and Public Health. Major groups of microorganisms of importance to the food industry are studied with emphasis on ecological, physiological, and public health aspects.

441. Food Microbiology Laboratory
Spring. 2(0-4) FSC 440 or concurrently or approval of department. Interdepartmental with the Department of Microbiology and Public Health. Laboratory practice with major groups of microorganisms of importance to the food industry. Concurrent enrollment in FSC 440 recommended.

445. Meat, Poultry and Fish Processing
Spring. 4(2-6) FSC 333 or approval of department. Muscle food and egg processing technology. Product formulation and quality control. Manufacturing of cured meat, sausage and processed products.

455. Food Analysis I
Fall. Spring. 4(2-4) CEM 162, CEM 241 or approval of department. Modern methods of analysis for fat, protein, moisture and other macroconstituents of food. Application of spectrophotometry in determination of microconstituents; use of dye-binding, complexometric and iodimetric techniques in food analysis.

456. Food Analysis II
Winter. 4(2-6) CEM 162 and CEM 241 or approval of department. Use of colorimetry and spectrophotometry, chromatographic methods and other techniques for the analysis of food constituents and additives.

457. Quality Control in the Food Industry
Winter of even-numbered years. 3(3-0) STT 201 or approval of department. Organization of and tools used for quality control; control charts, acceptance and auditing inspections, critical control points, reliability, safety, recall and liability.