

**FISHERIES AND  
WILDLIFE**

**FW**

**Department of Fisheries  
and Wildlife  
College of Agriculture and  
Natural Resources**

- 455. Computer Applications for Financial Modeling**  
*Fall, Spring, Summer. 3(3-0) P: (FI 311) and (MSC 317 or STT 422 or STT 442) R: Open only to students in the Finance major.*  
Application of personal and mainframe computers and software to corporate, personal and international financial analysis.
- 478. Investment Strategies and Speculative Markets**  
*Fall. 3(3-0) P: (FI 312)*  
Pricing, trading, hedging and speculating in financial markets. Effects of risk and maturity on security prices. Strategies with futures, options, and other financial instruments in domestic and international markets. Ethical considerations.
- 490. Independent Study**  
*Fall, Spring, Summer. 1 to 3 credits. R: Open only to seniors. Approval of department.*  
Supervised independent study of special topics in finance.
- 801. Managerial Finance**  
*Fall, Spring. 3(3-0) P: ACC 800. R: Open only to students in the Program in Professional Accounting, to MBA students, and to students in programs for which FI 801 is a catalog-listed requirement.*  
Short-, intermediate- and long-term problems. Financial planning and control. Applications in domestic and international settings.
- 821. Financial Management**  
*Spring. 3(3-0) P: ACC 811. R: Open only to MBA students in the Advanced Management Program.*  
Managerial finance covering short-, intermediate- and long-term problems. Financial planning and control using financial theory and management techniques. Applications in domestic and international settings.
- 841. Risk Management for Commercial and Public Entities**  
*Fall. 3(3-0) R: Open only to graduate students in the College of Business.*  
Analysis of exposures, risk management alternatives, and their social, legal and economic implications. Cost and benefit analysis of decisions.
- 851. Introduction to Investments**  
*Fall, Spring. 3(3-0) P: FI 801. R: Open only to students in the Program in Professional Accounting and to MBA students.*  
Security risk and return concepts. Security analysis and concepts of market efficiency. Emphasis on equity investments. Bonds, options, futures, and international securities.
- 852. Financial Markets and Strategies**  
*Spring. 3(3-0) P: FI 851. R: Open only to students in the Program in Professional Accounting and to MBA students.*  
Theories concerning domestic and international financial markets and instruments. Effects of risk and maturity on prices. Arrangement of business and portfolio risk and returns with options and futures.
- 858. Financial Strategies**  
*Spring. 2(2-0) R: Open only to students in the Advanced Management Program.*  
Formulation and analysis of corporate strategies aimed at the creation and transfer of shareholder value. Relationship of corporate activities to overall firm performance and valuation.

- 860. International Financial Management**  
*Fall. 3(3-0) P: FI 801. R: Open only to graduate students in Business.*  
Capital budgeting, capital structure decisions, cash management, foreign currency markets and exchange rate risk management. Ethical and tax considerations.
- 862. Advanced Managerial Finance**  
*Fall, Spring. 3(3-0) P: FI 801. R: Open only to graduate students in Business.*  
Financial planning and control using financial theory and management techniques. Applications in international settings. Use of business cases.
- 865. Financial Decision Models**  
*Fall. 3(3-0) Interdepartmental with Accounting. P: FI 801. R: Open only to students in M.B.A. programs and to students in Program in Professional Accounting.*  
Development and application of computerized financial models in finance and accounting, and in control activities. Use of financial planning software on personal and mainframe computers. Use of models in case analysis.
- 878. Bank Management**  
*Spring. 3(3-0) P: FI 801. R: Open only to graduate students in Business.*  
Nature, structure and management of commercial banks. Focus on products and services offered, risks, policies, and strategies. Applications in domestic and international settings.
- 890. Independent Study**  
*Fall, Spring. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to graduate students in Business. Approval of department.*  
Faculty-guided research projects.
- 980. Theory of Finance**  
*Fall. 3(3-0) R: Open only to Ph.D. students in Business or approval of department.*  
Introduction to the financial theory of the firm. Theoretical models dealing with capital structure, cost of capital, dividend policy and leasing.
- 981. Corporate Finance Theory**  
*Spring of odd years. 3(3-0) P: FI 980. R: Open only to Ph.D. students in Business.*  
Theoretical foundations. Recent empirical research in capital structure, dividend policy, and agency theory.
- 982. Investment Theory**  
*Spring of even years. 3(3-0) P: FI 980. R: Open only to Ph.D. students in Business.*  
Market efficiency, stochastic processes, option pricing, efficient set mathematics, intertemporal asset pricing and arbitrage pricing theory.
- 993. Finance Workshop**  
*Fall. 3(3-0) P: FI 980. R: Open only to Ph.D. students in Finance.*  
Critical evaluation of original research papers by faculty and students.
- 999. Doctoral Dissertation Research**  
*Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to Ph.D. students in Finance and Insurance.*

- 100. Introduction to Fisheries and Wildlife**  
*Fall, Spring. 3(2-2) R: Open only to freshmen or sophomores.*  
Fisheries and wildlife management, history, philosophy and careers; conservation ethics.
- 109. Conservation of Freshwater Ecosystems**  
*Fall. 3(3-0) R: Not open to students in the Department of Fisheries and Wildlife. Not open to students with credit in FW 414 or FW 472 or ZOL 431.*  
Fundamentals of freshwater ecology emphasizing human impacts. Basic ecological principles of conservation and management. Applied problems: their symptoms, causes, and solutions.
- 110. Conservation and Management of Marine Resources**  
*Spring. 3(3-0)*  
Marine environment, resource distribution, and human impacts on selected marine commercial fisheries. Conflicts in management goals between government and industry. Management goals and techniques in preserving and conserving marine resource biodiversity.
- 203. Resource Ecology**  
*Fall, Spring. 3(3-0)*  
Basic concepts of ecology which provide a foundation for examining environmental problems and their solutions.
- 205. Principles of Fisheries and Wildlife Management**  
*Spring. 3(3-0)*  
Characteristics of the fish and wildlife resource. Ecological and societal factors influencing the management of fish and wildlife. Management techniques.
- 207. Great Lakes: Biology and Management**  
*Fall. 3(3-0) Interdepartmental with Resource Development.*  
Living aquatic resources of the Great Lakes: environmental history, biological resources and their management. Policy issues.
- 211. Introduction to Gender and Environmental Issues**  
*Spring. 3(3-0) Interdepartmental with Forestry; Public Resource Management; Resource Development; and Women's Studies. R: Not open to freshmen.*  
The concept of gender. Overview of environment and habitat. Historical gender roles in environmental management. Gender-based theoretical perspectives. Case studies on developing and developed countries. Environmental management with emphasis on fisheries, wildlife and wetlands. Women environmental professionals.

## Descriptions—Fisheries and Wildlife of Courses

- 275. Seafood Systems Management**  
*Spring. 3(3-0) Interdepartmental with Food Science; and Animal Science.*  
Domestic and international perspectives on major aquatic foods. Cultural and nutritional value; wild harvest; aquaculture; processing technology; food handling and food safety.
- 284. Natural History and Conservation in Michigan**  
*Fall. 3(2-3)*  
Identification, habitat requirements, and distribution of Michigan's flora and fauna. Interrelationships which influence natural resource use. Field trips required.
- 324. Wildlife Biometry**  
*Spring. 3(2-3) P: (MTH 116 or MTH 104 or concurrently or LBS 117) (ZOL 355)*  
Quantitative techniques to analyze and interpret fisheries and wildlife data.
- 326. Introduction to Waste Management**  
*Fall. 3 credits. Interdepartmental with Resource Development. Administered by Resource Development. P: RD 200, RD 320.*  
Waste management definitions, techniques, technologies, and strategies. Integrative approach to waste management as an environmental, social, and political subject.
- 328. Vertebrate Pest Control**  
*Spring. 3(3-0) P: (BS 110)*  
Role of vertebrate animals as agents damaging to human interests. Damage evaluation. Damage control strategies and techniques.
- 364. Ecosystem Processes**  
*Spring. 3(2-2) P: (CEM 141 and FW 324 and ZOL 355) or (BE 230)*  
Concepts of ecosystem structure and function developed from basic scientific laws and relationships.
- 369. Introduction to Zoo and Aquarium Science**  
*Spring. 3(3-0) Interdepartmental with Park, Recreation and Tourism Resources; Zoology; Landscape Architecture; and Veterinary Medicine. Administered by Zoology. P: (BS 110 or LBS 144 or LBS 148H)*  
Fundamentals of zoo and aquarium operations including research, interpretation, design, nutrition, captive breeding, conservation, ethics and management.
- 410. Upland Ecosystem Management**  
*Spring. 3(2-3) P: (ZOL 355 or FOR 404) and completion of Tier I writing requirement. (FW 364) for students in FW major.*  
Analysis and management of upland ecosystems to meet wildlife management and biodiversity objectives. Mitigation of human impact.
- 412. Wetland Ecosystem Management**  
*Fall. 3(3-0) P: (ZOL 355) and completion of Tier I writing requirement. (FW 364) for students in FW major.*  
Ecosystem components and processes applied to wetland management. Mitigation of human impact.
- 413. Wildlife Research and Management Techniques**  
*Fall. 4(2-4) P: (FW 324 and FW 410 and FW 412 or concurrently)*  
Field and laboratory techniques used in collecting, analyzing, and communicating data on wild animal populations and their habitats. Field trip required.
- 414. Aquatic Ecosystem Management**  
*Fall. 3(3-0) P: (ZOL 355) and completion of Tier I writing requirement. (FW 364) for students in FW major.*  
Management of aquatic habitats and populations for ecological and socioeconomic objectives; human impacts on aquatic ecosystems.
- 419. Applications of Geographic Information Systems to Natural Resources Management**  
*Spring. 4(2-4) Interdepartmental with Forestry; Geography; Park, Recreation and Tourism Resources; Resource Development; and Biosystems Engineering. P: (GEO 221)*  
The application of geographic information systems, remote sensing, and global positioning systems to integrated planning and management for fish, wildlife, and related resources.
- 420. Stream Ecology**  
*Fall. 3(3-0) Interdepartmental with Zoology. P: (BS 110) (CEM 141 and ZOL 355)*  
Biological and environmental factors determining structure and function of stream ecosystems.
- 422. Aquatic Entomology**  
*Fall of odd years. 3(2-3) Interdepartmental with Entomology; and Zoology. Administered by Entomology. P: (BS 110)*  
Biology, ecology and systematics of aquatic insects in streams, rivers and lakes. Field trips and aquatic insect collection required.  
SA: ENT 420
- 424. Population Analysis and Management**  
*Fall. 4(3-2) P: (FW 324 and ZOL 355)*  
Statistical, ecological and management concepts and methods needed to analyze and interpret demographic data and manage fish and wildlife populations.
- 431. Comparative Limnology**  
*Summer. 4(2-6) Given only at W.K. Kellogg Biological Station. Interdepartmental with Zoology; and Botany and Plant Pathology. Administered by Zoology. P: (CEM 141 or CEM 151) and (ZOL 355) Not open to students with credit in FW 472.*  
Physical, chemical, and biological aspects of lakes and streams. Introduction to freshwater biology, and population and community ecology.
- 434. Human Dimensions of Fisheries and Wildlife Management**  
*Spring. 3(3-0) P: (FW 410 or concurrently or FW 412 or FW 414) R: Open only to juniors or seniors in the Department of Fisheries and Wildlife.*  
Sociological implications of public policy and planning processes in fisheries and wildlife management.
- 440. Field Ecology and Evolution**  
*Summer. 4 credits. Given only at W.K. Kellogg Biological Station. Interdepartmental with Botany and Plant Pathology; and Zoology. Administered by Zoology. P: ZOL 355, ZOL 355L.*  
Solving conceptual and practical research problems in ecology and evolution under field conditions.
- 443. Restoration Ecology**  
*Spring. 3(2-2) Interdepartmental with Biosystems Engineering; and Zoology. P: (CSS 210 or BE 230) and (FOR 404 or FW 364 or ZOL 355)*  
Principles of ecological restoration of disturbed or damaged ecosystems. Design, implementation, and presentation of restoration plans. Field trips required.
- 444. Conservation Biology**  
*Fall. 3(3-0) Interdepartmental with Zoology. P: (BS 110) and completion of Tier I writing requirement.*  
Ecological theories and methodologies to manage species, communities and genetic diversity on a local and global scale.
- 462. Ecology and Management of Invertebrates**  
*Spring. 4(3-3) P: (BS 110) (ZOL 355)*  
Ecology, conservation, and management of selected non-insect invertebrate species including commercially important, exotic, non-game, and selected threatened and endangered species.
- 464. Natural Resource Economics and Social Science (W)**  
*Fall. 3 credits. Interdepartmental with Forestry; Park, Recreation and Tourism Resources; and Resource Development. Administered by Forestry. P: EC 201 or EC 202. R: Not open to freshmen and sophomores. Completion of Tier I writing requirement.*  
Application of economic and social science principles and techniques to production and consumption of natural resources. Benefit-cost analysis. Regional impact analysis. Social impact assessment.
- 465. Ecological Risk Assessment**  
*Spring. 3(3-0) Interdepartmental with Resource Development. P: (CEM 143 or CEM 251) and (ZOL 355) and (FW 324 or STT 200 or STT 201)*  
Ecotoxicology. Monitoring and modeling the fate of toxins in ecosystems. Dose response relationships. State and federal regulations related to environmental contaminants.
- 466. Natural Resources Planning and Policy**  
*Spring. 3(2-2) Interdepartmental with Forestry; Park, Recreation and Tourism Resources; and Resource Development. Administered by Forestry. R: Open only to seniors or graduate students in the Department of Forestry or Department of Fisheries and Wildlife or Department of Park, Recreation and Tourism Resources or Department of Resource Development.*  
Scientific, environmental, social, and institutional factors affecting planning and policy-making. Focus on ecosystem-based planning and policy issues through development of a multiple-use plan. Case studies.

**469. Biomonitoring of Streams and Rivers**

*Summer. 3(2-3) Given only at W.K. Kellogg Biological Station. Interdepartmental with Entomology. Administered by Entomology. P: (BS 110)* Practical field and lab rapid bioassessment methodologies used to sample and assess the biota of streams and rivers. Sampling and identification of fish, macroinvertebrates and other biota will be emphasized.

**471. Ichthyology**

*Fall. 4(3-3) Interdepartmental with Zoology. P: (BS 110) and completion of Tier I writing requirement.*

Fish morphology, physiology. Development, behavior, evolution and ecology. World fishes with emphasis on freshwater fishes.

**472. Limnology**

*Fall. 3(3-0) Interdepartmental with Zoology. P: (CEM 141 and ZOL 355) Not open to students with credit in BOT 431 or FW 431 or ZOL 431.*

Ecology of lakes with emphasis on interacting physical, chemical, and biological factors affecting their structure and function.

**474. Limnological and Fisheries Techniques**

*Fall. 3(1-6) Interdepartmental with Zoology. P: (FW 472 or concurrently)*

Field and laboratory investigations of physical, chemical, and biological parameters of lakes and streams. Field trips required.

**475. Aquaculture**

*Spring. 3(3-0) P: (ANS 313 or ZOL 355)*

Propagation and rearing of aquatic organisms used for food, bait and recreational fisheries management. Culture principles and techniques for important aquatic species. Commercial potential.

**477. Pest Management I: Pesticides in Management Systems**

*Fall. 3(3-0) Interdepartmental with Entomology; Crop and Soil Sciences; and Horticulture. Administered by Entomology. P: CEM 143; BOT 405 or CSS 402, ENT 404 or ENT 470 or FW 328.*

Chemistry, efficient use, and environmental fate of pesticides. Legal and social aspects of pesticide use.

**478. Pest Management II: Biological Components of Management Systems (W)**

*Spring of even years. 3 credits. Interdepartmental with Entomology; Crop and Soil Sciences; Forestry; and Horticulture. Administered by Entomology. P: ENT 404 or ENT 470 or BOT 405 or CSS 402 or FW 328. R: Completion of Tier I writing requirement.*

Principles of host plant resistance and biological control and their relationship to the design of agroecosystems. Classification of insect biological control agents.

**479. Fisheries Management**

*Spring. 3(2-2) P: (FW 424) and (FW 414 or FW 472)*

Manipulation of aquatic populations and their habitats to achieve societal goals for fishery resources. Management of human impact and biotic diversity.

**480. International Studies in Fisheries and Wildlife**

*Summer. 3 to 6 credits. A student may earn a maximum of 12 credits in all enrollments for this course. P: (ZOL 355) R: Not open to freshmen; Approval of department, application required.*

Fisheries and wildlife ecology and management study in regions beyond the United States. Ecological, economic, social, and cultural influences on fisheries and wildlife resources.

**484. Environmental Education**

*Spring. 3(3-0) P: (AEE 101 or AEE 110 or PRR 351 or RD 300 or TE 150) R: Not open to freshmen or sophomores.*

Methods, materials and theory for teaching environmental education in formal and nonformal educational settings.

**489. Seminar in Zoo and Aquarium Science**

*Fall, Spring. 1(1-0) A student may earn a maximum of 3 credits in all enrollments for this course. Interdepartmental with Landscape Architecture; Zoology; and Park, Recreation and Tourism Resources. Administered by Zoology. R: Approval of department.*

Scientific writing and oral presentations related to zoo and aquarium studies.

**490. Independent Study in Fisheries and Wildlife**

*Fall, Spring, Summer. 1 to 5 credits. A student may earn a maximum of 5 credits in all enrollments for this course. P: (BS 110) R: Not open to freshmen or sophomores. Approval of department; application required.*

Supervised individual research and study in fisheries and wildlife.

**491. Special Topics in Fisheries and Wildlife**

*Fall, Spring, Summer. 1 to 5 credits. A student may earn a maximum of 5 credits in all enrollments for this course. R: Not open to freshmen or sophomores. Approval of department; application required.*

Selected topics of current interest and importance in fisheries and wildlife.

**493. Professional Internship in Fisheries and Wildlife**

*Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P: (FW 100 or FW 203 or FW 205) R: Open only to sophomores or juniors or seniors. Approval of department; application required. A student may earn a maximum of 6 credits in the following courses: AEE 493, ANR 493, ANS 493, FW 493, PKG 493, PRM 493, PRR 493, and RD 493.*

Supervised professional experiences in agencies and businesses related to fisheries and wildlife professions.

**498. Internship in Zoo and Aquarium Science**

*Fall, Spring, Summer. 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. Interdepartmental with Zoology; and Landscape Architecture. Administered by Zoology. R: Open only to juniors or seniors. Approval of department.*

Experience in applying zoological experience in a zoo or aquarium setting outside the university.

**810. Human Dimensions Research in Fisheries and Wildlife**

*Fall of even years. 3(3-0)*

Methods of surveying, educating and involving the public to achieve fish and wildlife management goals. Review of human dimensions research and current case studies.

**811. Fisheries and Wildlife Laws and Regulation**

*Fall of odd years. 3(3-0) R: Open only to graduate students or to seniors with approval of department.*

Legal and regulatory systems related to fisheries and wildlife management. State, federal and international laws, policies and agencies. Non-governmental organizations. Conservation of biodiversity and endangered species.

**824. Analysis of Wildlife Populations**

*Spring of even years. 3(2-3)*

Statistical and ecological concepts, methods and computer techniques needed to analyze and interpret demographic data from fish and wildlife studies.

**826. Ecology and Management of Waterfowl**

*Fall of even years. 3(2-3) P: FW 412, FW 424.*

Physiological, behavioral, and population characteristics of waterfowl. Current issues and management.

**828. Conservation and Genetics**

*Fall of odd years. 3(3-0) P: ZOL 341 or CSS 350 or ANS 314.*

Population genetic principles applied to ecology and management of fish and wildlife.

**842. Population Genetics, Genealogy and Genomics**

*Fall. 3(3-0) Interdepartmental with Forestry; Animal Science; Crop and Soil Sciences; Genetics; and Horticulture. Administered by Forestry. RB: Pre-calculus, basic genetics*

Population genetic processes underlying patterns of molecular genetic variation. Genealogical approaches to the study of genomic diversity, phylogenetic reconstruction, and molecular ecology.

**852. Systems Modeling and Simulation**

*Fall of even years. 3(3-0) Interdepartmental with Biosystems Engineering; Forestry; and Resource Development. P: STT 422 or STT 442 or STT 464 or GEO 463.*

General systems theory and concepts. Modeling and simulation methods. Applications of systems approach and techniques to natural resource management, and to ecological and agricultural research.

**853. Applied Systems Modeling and Simulation for Natural Resource Management**

*Spring of odd years. 3(2-2) Interdepartmental with Biosystems Engineering; Forestry; Resource Development; and Zoology. P: FW 820 or BE 486 or ZOL 851 or approval of department. R: Open only to seniors and graduate students*

Mathematical models for evaluating resource management strategies. Stochastic and deterministic simulation for optimization. System control structures. Team modelling approach.

## Descriptions—Fisheries and Wildlife of Courses

### 854. Adaptive Management of Natural Resource Systems

Fall of odd years. 3(2-2) P: (ZOL 355) and (FW 434)

Principles and practices of adaptive environmental assessment and management. Applications to ecosystem and natural resource management.

### 860. Wildlife Nutrition

Fall of odd years. 3(2-2) R: Open only to graduate students in the Colleges of Agriculture and Natural Resources, and Natural Science.

Nutritional ecology of wild species. Techniques for analyzing and improving nutritional qualities.

### 872. Fishery Habitat Analysis and Management

Spring of odd years. 3(3-0) R: Open only to graduate students in the Colleges of Agriculture and Natural Resources, Engineering, and Natural Science.

Fish habitat use. Analysis and manipulation of habitats to enhance fish production in freshwater ecosystems.

### 873. Plankton Biology

Spring of even years. 4(3-3) P: (FW 472)

Biology of plankton organisms in freshwater and marine systems. Field and laboratory methods. Individual research projects. Field trips required.

### 874. Advanced Fisheries Ecology and Food Web Management

Spring of odd years. 3(3-0) P: (ZOL 355) and (FW 472) and (FW 479)

Application of food web theory to fisheries management. Evaluation of abiotic and biotic mechanisms as they affect aquatic community structure and food web dynamics.

### 875. Advanced Aquaculture

Fall of odd years. 3(3-0) P: FW 475.

Adaptations and responses of aquatic organisms to environmental change in aquaculture systems. Research methods and applications for aquaculture planning and management decisions.

### 877. Fish Population Dynamics

Fall of even years. 3(2-2) R: Open only to graduate students in the College of Agriculture and Natural Resources or College of Natural Science.

Quantitative analysis of fish populations. Evaluation, causes, and impacts of the rates of change in survival, growth, reproduction, and recruitment for fish populations and their yield.

### 879. Advanced Limnology

Spring of even years. 3(3-0) P: (FW 472 or ZOL 431)

Theory and management of streams, rivers, lakes, reservoirs, and other deepwater habitats from ecosystem and landscape perspectives.

### 891. Advanced Topics

Fall, Spring, Summer. 2 to 4 credits. A student may earn a maximum of 10 credits in all enrollments for this course.

In depth study of advanced topics in fisheries and wildlife.

### 892. Biodiversity

Spring. 2(2-0) A student may earn a maximum of 4 credits in all enrollments for this course. Interdepartmental with Zoology. Administered by Zoology. P: ZOL 250.

Status of world biota and factors in the decline and extinction of major groups of plants and animals. Theory and design of natural reserves. Assessment and ecological meaning of diversity. Management for global and local diversity.

### 893. Seminar in Fisheries and Wildlife

Fall, Spring. 1(1-0) A student may earn a maximum of 7 credits in all enrollments for this course. Study and research in advanced problems and current development in fisheries and wildlife.

### 897. Community and Ecosystem Ecology

Spring. 4(4-0) Interdepartmental with Zoology; and Botany and Plant Pathology. Administered by Zoology.

Structure and function of natural communities and ecosystems. Community analysis along environmental gradients. Succession, food web analysis, energy flow, nutrient cycling, and effects of human activities on ecosystems.

### 898. Master's Research

Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 10 credits in all enrollments for this course. R: Open only to graduate students in Fisheries and Wildlife.

### 899. Master's Thesis Research

Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to graduate students in Fisheries and Wildlife.

### 943. Techniques of Analyzing Unbalanced Research Data

Spring. 4(4-0) Interdepartmental with Animal Science; Crop and Soil Sciences; Forestry; and Horticulture. Administered by Animal Science. P: STT 464. R: Open only to graduate students in the College of Agriculture and Natural Resources.

Linear model techniques to analyze research data characterized by missing and unequal number of observations in classes. Simultaneous consideration of multiple factors. Estimable comparisons. Hypothesis testing. Computational strategies. Variance and covariance components. Breeding values.

### 976. Multivariate Methods in Agriculture and Natural Resources

Spring. 4(4-0) Interdepartmental with Forestry; and Animal Science. Administered by Forestry. P: STT 422, MTH 314. R: Open only to graduate students in the College of Agriculture and Natural Resources and in the Interdepartmental Graduate Specializations in Ecology and Evolutionary Biology.

Application of multivariate methods to research problems. Hotelling's T-test, profile analysis, discriminant analysis, canonical correlation, principal components, principal coordinates, correspondence analysis, and cluster analysis.

### 999. Doctoral Dissertation Research

Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to Doctoral level graduate students in Fisheries and Wildlife.

## FOOD SCIENCE

## FSC

### Department of Food Science and Human Nutrition College of Agriculture and Natural Resources College of Human Ecology

### 150. Introduction to Nutrition and Food Science

Fall, Spring, Summer. 3(3-0) Interdepartmental with Human Nutrition and Foods. Administered by Human Nutrition and Foods.

Nutrition needs in life stages from a human ecological perspective. Domestic and international factors affecting the availability of a safe, nutritious food supply. Relationships of food choices to health and disease.

### 211. Principles of Food Science

Fall. 3(3-0) P: (CEM 141) Not open to students with credit in FSC 299.

Scientific principles, historical perspective, and current status of technology related to food composition, safety, toxicology, processing, preservation, and distribution.

### 229. Unit Operations in Food Processing

Fall. 3(3-0)

Principles, technologies, and applications involved in conversion of raw products into high quality foods. Processing principles such as thermal processing, irradiation, freezing, membrane concentration, enzyme technologies, dehydration, and refrigeration.

### 275. Seafood Systems Management

Spring. 3 credits. Interdepartmental with Animal Science; and Fisheries and Wildlife. Administered by Fisheries and Wildlife.

Domestic and international perspectives on major aquatic foods. Cultural and nutritional value; wild harvest; aquaculture; processing technology; food handling and food safety.

### 320. Muscle Foods

Spring. 3(2-3) Interdepartmental with Animal Science. Administered by Animal Science. P: (ANS 210 or FSC 211 or HNF 150)

Structure of muscle. Meat technology and merchandising concepts.

### 329. Fundamentals of Food Engineering

Spring. 3(3-0) Interdepartmental with Biosystems Engineering. Administered by Biosystems Engineering. P: FSC 211, MTH 124, PHY 231. R: Not open to freshmen or sophomores.

Unit operations in food industry: fluid mechanics, heat transfer, rate processes, refrigeration, freezing, and dehydration. Thermal process calculations.

SA: FE 329

### 339. Food Processing and Engineering Laboratory

Spring. 2(0-6) P: (FSC 329 or concurrently) and completion of Tier I writing requirement. (FSC 229)

Application of principles of material and energy balance, fluid flow, heat transfer, and water activity to the batch and continuous processing of raw product into high quality food.