Courses of Descriptions - Fisheries and Wildlife

478. Stream Ecology
Spring. 3(3-0) ENT 429, ZOL 389 or BOT 430 or F W 402 or approval of department. Students may not receive credit in both F W 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.

501. 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.

502. Advanced Topics
Fall, Winter, Spring. 1 to 6 credits. May reenroll for a maximum of 15 credits. Approval of department. Study of selected advanced topics in detail and depth.

510. 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.

511. Aquatic Toxicology
Spring of odd-numbered years. 3(3-0)FW 930 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, population, community, ecosystem.

520. 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.

541. 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.

572. 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.

573. Ecology and Management of Stream Fish
Winter of odd-numbered years. 3(3-0)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.

574. 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.

575. 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.

576. 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.

577. 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.

578. 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 biodegradability and toxicity. Statistical and deterministic predictive simulation models.

579. 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.

589. Master's Thesis Research
Fall. Winter, Spring, Summer. Variable credit. Approval of department.

900. 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

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.

225. 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 servicing 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.

326. 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, bacteriological agents, pest control, personnel hygiene, biological hazards, and regulatory agencies. Field trips required.
Food Science and Human Nutrition - Descriptions of Courses

329. Unit Operation and Food Processing I
Fall. 4(3-2) PHY 237, MTH 109. Interdepartmental with and administered by Agricultural Engineering Technology.
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. 4(3-2) PHY 237, FSC 211, or approval of department.
Unit operations for food preservation by low temperature, heat, dehydration, evaporation and separation processes.

333. Food Chemistry
Spring. 4(3-3) FSC 211 and CEM 241 or approval of department.
Emphasis is placed upon the chemical and physical properties of foods and food constituents.

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

401. Industrial Food Fermentations
Fall. 3(0-3) 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(0-3) One term organic chemistry.
Chemical and physical properties of edible fats and oils. Refining 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 foods, 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) AET 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. 5(3-4) MPH 200 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.

445. Meat, Poultry and Fishery Products III
Spring. 4(2-4) FSC 335 or approval of department.
Processing, formulation and quality control.

455. Food Analysis I
Fall. Spring, Summer. 4(2-4) CEM 182, CEM 241 or approval of department.
Modern methods of analysis for fat, protein, moisture and other macromolecules of food. Application of spectrophotometry in determination of microconstituents; use of dye-binding, complexometric and titrimetric techniques in food analysis.

456. Food Analysis II
Winter. 4(2-6) CEM 152 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.
Organizational and tools used for quality control: control charts, acceptance and auditing inspections, critical control points, reliability, safety, recall and liability.

460. Fruit and Vegetable Processing
Fall. 4(3-3) FSC 330 or approval of department.
Product composition, harvesting, quality indexes, post-harvest changes, thermal process systems and freezing techniques.

470. Cereal Products Technology
Spring. 3(3-0) FSC 330 or approval of department.
Classification and composition of food grains, milling processes, quality parameters, baking technology, breakfast cereals, and extrusion technology.

480. Special Problems in Food Science
Fall. Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 9 credits.
Advanced undergraduates may select research work in food chemistry, food microbiology, food engineering, food plant management, processing dairy products, meat, poultry and fishery products, fruits and vegetables, cereals or beverages.

490. Seminar
Fall. 1-1(0) Approval of department.
Preparation and presentation of reports on a specialized aspect of food science.

532. Microbiology of Food Processing
Winter. 3(2-3) FSC 440 or approval of department.
Control of food spoilage and food poisoning microorganisms in food processing and the role of bacterial spores in process selection.

534. Flavor Quality Control
Spring of odd-numbered years. 4(3-3) Approval of department.
Sensory methods used for food evaluation and panel analyses. Flavor chemistry and analytical methods. Sampling plans, control charts, and acceptance sampling for statistical quality control.

535. Carbohydrates in Foods
Fall of odd-numbered years. 3(3-0) FSC 333.
The chemistry and food technology of mono-, oligo-, and poly-saccharides.

580. Selected Topics in Food Science
Fall, Winter, Spring. 2 to 4 credits. May reenroll for a maximum of 12 credits. Approval of department.
Advanced studies; food utilization, texture, additives, toxicants, food proteins, ingredient safety, nutrient stability, new processing techniques, flavors, quality control, storage stability, state and federal food regulations.

589. Master's Thesis Research
Fall, Winter, Spring. Variable credit. Approval of department.

932. Histological and Chemical Techniques
Winter. 3(1-6) Approval of department.
Research techniques in thin-layer and gas chromatography, differential thermal analysis, bioelectric focusing, histology, histochemistry, biological testing, polarography and pH stat measurements.

933. Instrumental Methods of Analysis
Spring. 3(2-3) FSC 455 or FSC 456 or approval of department.
Spectroscopy (ultraviolet, visible, infrared, flame, atomic absorption, fluorescence), manometry, ion exchange, countercurrent distribution, radioactive tracers.

934. Research Techniques with Proteins
Fall. 3(2-3) BCH 461 or BCH 463.
Physical and chemical techniques applicable to protein characterization (including electrophoretic techniques, thin-layer chromatography, gel filtration, ultracentrifugation and amino acid analysis).

951. Muscle Biochemistry
Spring. 3(3-0) BCH 451 or approval of department.
The structure and function of living muscle. Emphasis is placed upon the chemical and energy changes of muscle in contraction. Changes occurring after death during rigor development are also discussed.

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**Human Nutrition and Foods**

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**Food Processing**

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**Interdisciplinary Courses**

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442. Foodservice Management: Problem Analysis and Decision Making
Fall. 2(2-3) HNF 441.
Problem-solving techniques. Cause and effect factors, situational components, and development of alternative solutions to problems in non-commercial foodservice.

461. Energy Nutrients and Proteins for Human Nutrition
Fall. 4(4-0) BCH 200, PSL 432 or PSL 241.
Metabolism of protein, fats and carbohydrates as applied to the nutritional requirements and food supplies of people.

462. Vitamins and Minerals for Human Nutrition
Winter. 3(3-0) HNF 461.
Metabolism of vitamins and minerals as applied to the nutritional requirements and food supplies of people.

463. Nutrition and Human Development
Winter. 4(3-2) HNF 462 or approval of department.
The role of nutrients in physiological systems and biochemical processes as related to the perspective of human growth and development.

470. Clinical Nutrition
Spring. 3(3-0) HNF 462, PHM 350 or approval of department.
Changes in physiological and/or biochemical functions or processes due to illness and uses of modified diets as an essential part of treatment.

470P. Clinical Nutrition Practicum
Spring. 1(0-2) 470 concurrently.
Assessment of nutritional status, modification of the hospital general menu for implementation of diets prescribed for treatment of disease.

473. Interpretation of Clinical Laboratory Tests in Dietetics
Spring. 4(3-2) HNF 470 or concurrently.
Principles, procedures and interpretation of clinical laboratory methods with particular emphasis on their interpretation relative to nutritional status and therapeutic nutrition.

475P. Community Nutrition Fieldwork
Fall, Winter, Spring. Summer. 1(0-3) Seniors; HNF 375 or concurrently.
Application of community nutrition principles in field settings. Instructor arranged projects in nutrition survey techniques or delivery of nutrition education services. Approved through Summer 1984.

479. Dietetics: Theory-Practice Interrelationships II
Spring. 3(2-3) HNF 379, HNF 420 or approval of department.
Continuation of HNF 379. Development of skills in nutritional and employee counseling, resource management and professional behavior using simulated and real life situations.

490A. Professional Literature II: Foods
Fall. 2(2-3) HNF 290, HNF 300 or HNF 403 or approval of department.
Selected topics in food research. Emphasis on experimental data and basic scientific principles related to food quality, nutritive stability and food safety.

490B. Professional Literature II: Nutrition
Spring. Summer of even-numbered years. 2(2-4) HNF 290, HNF 462 or approval of department.
Emphasis on experimental data and scientific principles related to basic nutrition research. Focus on current developments in nutrient requirements, metabolism and interactions.

490C. Professional Literature II: Clinical Nutrition
Spring. 2(2-0) HNF 290, HNF 470 or concurrently or approval of department.
Selected topics in clinical nutrition research. Emphasis on human investigative data and scientific principles related to nutritional care of patients/clients including pathophysiologic correlations, nutritional assessment, diet planning, nutrition counseling.

490D. Professional Literature II: Foodservice Management
Winter. 2(2-0) HNF 290, HNF 441 or approval of department.
Examination of trends, problems and research in food service systems operation. Focus on current issues and developments relating to materials handling, labor needs, operational accountability and public responsibility.

490E. Professional Literature II: Foods and Nutrition Information
Spring. 2(2-0) HNF 290, HNF 411 or HNF 462 or approval of department.
Selected topics in food and nutrition information. Emphasis on research related to method and effectiveness of nutrition education.

495. Independent Study
Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 9 credits. Seniors; approval of department.
Individual study of selected topics in nutrition and food service management under staff guidance.

498. Field Study
Fall, Winter, Spring, Summer. 3 to 12 credits. May reenroll for a maximum of 12 credits. Approval of department.
Planned program of research, observation, study or work in selected organizations under staff guidance.

500. Seminar in Foods and Nutrition
Fall, Winter, Spring. 1(1-0) HNF 463 or HNF 493.

502. Seminar in Food Service Management
Spring. 2 to 4 credits. May reenroll for a maximum of 4 credits. Approval of department.

505. Experimental Foods III
Spring. 4(1-9) HNF 404 or approval of department.
Planning, executing, and reporting individual research project. Data collection, evaluation and interpretation to demonstrate understanding of research techniques and attitudes, and an awareness of significant problems in the field.

513A. Supervised Individual Study in Nutrition
Fall, Winter, Spring. Summer. 1 to 4 credits. May reenroll for a maximum of 10 credits. HNF 491.

813B. Supervised Individual Study in Experimental Foods
Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 10 credits. Approval of department.

813C. Supervised Individual Study in Foodservice Management
Fall, Winter, Spring. 2 to 4 credits. May reenroll for a maximum of 10 credits. Approval of department.
Special studies in facility management, personnel coordination and tools and methods of operational control.

816. Applied Human Nutrition
Spring. 3(3-0) HNF 462.
Advanced studies in nutrition: assessment and surveillance, community, clinical, growth and development, behavior, infectious disease and environment, oral health, obesity, aging, diet.

841. Nutrition and Obesity
Winter of even-numbered years. 2(2-0) One undergraduate course in nutrition, biochemistry or physiology. Assessment, energy metabolism, and risk factors associated with obesity. Significance of nutrition and other factors for weight control and reduction.

842. Nutritional Counseling
Fall of odd-numbered years. 2(3-3) HNF 470 or approval of department.
Provision of nutritional counseling for clients. Assessment, planning, implementation and evaluation of nutritional counseling.

899. Master's Thesis Research
Fall, Winter, Spring. Variable credit. Approval of department.

921. Pathology of Nutritional and Metabolic Diseases
Spring of odd-numbered years. 4(3-0) Approval of department. BCH 452, HNF 492 recommended. Interdepartmental with and administered by the Department of Large Animal Clinical Sciences.
Development, physiopathology and morphologic pathology of nutritional and metabolic diseases including carbohydrate, protein, fatty acid, vitamin and mineral deficiencies, their experimental induction and their medical or economic significance.

926. Comparative Nutrition-Lipids and Carbohydrates
Winter of odd-numbered years. 4(4-0) BCH 452 and a previous course on principles of nutrition. Interdepartmental with Animal Husbandry.
Regulatory aspects of carbohydrate and lipid metabolism as influenced by nutrition in mammals. Emphasis on normal and abnormal physiologic states such as obesity, ketosis and diabetes.

927. Comparative Nutrition-Protein Metabolism and Developmental Biology
Winter of even-numbered years. 4(4-0) BCH 452, PSL 802 or concurrently. Interdepartmental with Animal Husbandry.
Protein quality assessment, protein status, protein caloric malnutrition, amino acid metabolism, protein turnover, digestion and absorption, hormonal control of protein metabolism, developmental aspects of protein metabolism and growth.
202. Introduction to Forestry
Fall, Spring, 3(3-0)
Forestry in its broadest sense, including historical development, forest growth, protection and management, products, national and world economy and policy. Emphasis on multiple uses concepts. One day field trips required.

203. Resource Ecology
(IDC 200 ) Fall, Winter, Spring, Summer, 3(3-0) Interdepartmental with the departments of Fisheries and Wildlife, Geology, Resource Development, and Zoology. Administered by the Department of Fisheries and Wildlife.
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.

204. Forest Vegetation
Fall, Spring, 3(3-4)
Nomenclature, classification, and identification of important trees, shrubs, and herbaceous plants of forest and field.

209. Wood Technology
Fall, 4(3-3)
Structure of wood. Mechanical and physical properties of wood. Wood anatomy and relation to growth.

301. Quantitative Methods for Natural Resources
Winter, 4(3-2) MTH 109 or MTH 111.
Collection and analysis of information pertaining to natural resources. Survey design, field procedures, equipment, and analytical techniques.

304. Forest Ecology
Fall, 4(3-3) FOR 204; BOT 205; CSS 210 or concurrently.
The forest is viewed as a biological community. Forest site relationships are quantified by examining the existing physical environment and relating it to the forest species occupying that community.

305. Silviculture
Spring, 4(3-3) FOR 204, FOR 304, FOR 402, FOR 424, FOR 425, FOR 429 concurrently.
Natural and artificial forest reproduction methods; interspecific and stand treatments; non-silvicultural aspects of silviculture; field study of silvicultural methods. Extended field trips required.

306. Forest Fire Protection and Use
Winter of odd-numbered years, 3(2-3) Juniors or approval of department.
Causes and effects of forest fires. Combustion, fire behavior and fire weather. Prevention and control planning and techniques. Fire in forest land management.

310. Wood Structure and Properties
Spring, 3(2-2) Not open to students with credits in FOR 309.
Properties and characteristics of solid wood, plywood, particleboard and hardboard with emphasis on their use in packaging. Laboratory is concerned with wood identification and strength testing.

401. Plants and Their Environment
Winter, 3(3-0) Interdepartmental with Agriculture and Natural Resources.
Relationships between plants and fundamental climatic, edaphic, and biotic factors; structure and function of different ecosystems in relation to environmental factors.

402. Forest Inventory
Spring, 4(2-4) FOR 301, FOR 305, FOR 424, FOR 425, FOR 429 concurrently.
Field and office techniques of forest inventory, with primary emphasis on timber resources. Extended field trips required.

409. Forest Hydrology
Winter, 3(3-0) FOR 424, Seniors or approval of department.
Hydrologic cycle, with emphasis on soil, water and ground water regimes; instrumentation and measurement of the various components. Effects of forest management on water sheds and water yields.

410. Forest Tree Improvement
Fall, 3(2-2)
Distribution of genetic variation in natural tree populations. Introduction, selection, progeny testing, species hybridization, and polyploidy to obtain superior tree populations.

411. Tree Physiology
Winter, 3(3-0) BOT 301.
The fundamental principles of plant physiology with particular reference to the growth and development of woody plants, and consideration of the influence of genetic and environmental factors on physiological processes in trees.

424. Forest Soils
Spring, 3(3-3) CSS 210; Juniors or approval of department. Forestry majors: FOR 305, FOR 402, FOR 423, FOR 425 concurrently. Interdepartmental with the Department of Crop and Soil Sciences.
Interrelationships of forest site and the growth of trees. Properties, classification, inventory, productivity and management of forest soils. Effects of silvicultural and forest management practices on the soil.

425. Forest Soils Laboratory
Spring, 3(2-3) CSS 210; FOR 305, FOR 402, FOR 424, FOR 429 concurrently. Interdepartmental with the Department of Crop and Soil Sciences.
Exercises and field trips relating to properties, classification, inventory, productivity and management of forest soils. Extended field trips required.

429. Timber Harvesting
Spring, 3(3-3) FOR 309, FOR 305, FOR 402, FOR 424, FOR 425 concurrently.
Felling, bucking and transport of trees to mill site. Capabilities and limitations of mechanical devices, vehicles, and logging systems related to timber size and terrain. Extended field trips required.

430. Industrial Timber Utilization Processes
Winter, 3(2-2) FOR 429.
Mechanics and technologies of industrial wood conversion processes, including grading logs and lumber, manufacture of furniture, plywood, particleboard, fiberboard, and paper. Field trips required.

431. Finishing, Preservation and Drying of Wood
Winter, 3(3-0) FOR 399.
Properties, selection, application of decorative and protective coatings, wood preservatives and fire retardants. Air and kiln drying of lumber.

435. Late and Resources
Fall, 3(3-0) RD 417 or BSA 440. Interdepartmental with and administered by the Department of Resource Development.
Legal theories, cases, statutes and constitutional considerations are applied to natural resource utilization. Private and public property interests in natural resources are illustrated through case studies of use conflicts.

446. Range Management
Winter of even-numbered years, 4(4-0) FOR 220 or FOR 304 or approval of department.
The science of range management, with emphasis on range regions, range vegetation management, livestock management practices, range improvements and multiple use values of rangelands.