425. Wildlife Habitat Analyses
Fall, 4(2-4) B OT 450 or ZOL 389 or FOR 230.
Evaluation of environmental factors affecting wildlife species; food and cover measurements. Determination of limiting factors.

426. Ecology of Migratory Birds
Fall, 4(2-4) ZOL 491 or approval of department.
Ecological, behavioral, and physiological characteristics affecting population parameters of migratory birds and applications of these relationships to the management of migratory wildlife resources.

427. Wildlife Biology and Management
Winter, 4(2-4) F W 424; ZOL 389 or BOT 450.
Ecology and management of resident wildlife on farm, forest and range lands.

450. Natural Resource Administration
Fall, 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.

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(3-0) F W 301 or ZOL 320 or ZOL 425. 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(3-3) ZOL 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 476 and F W 475. 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 391, ENT 392 recommended. Interdepartmental with the Department of Zoology.
Methods and instruments of limnological field investigation on lakes and streams.

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, 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.

901. Seminar in Fisheries and Wildlife
Fall, Winter, Spring. 1(1-0) May reenroll for a maximum of 5 credits. Approval of department.
Graduate problems and current developments of importance.

902. Advanced Topics
Fall, Winter, 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.

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.

873. Ecology and Management of Stream Fish
Winter of odd-numbered years. 3(4-0)
F W 376, ZOL 389 or BOT 450; or F W 476 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)
F W 477, or approval of department.
Historical and current contributions to concepts of community structure, energy flow and materials 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.

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

900. 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

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 man's 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.

215. World Food Issues
Spring, 3(3-0) Interdepartmental with and administered by the Department of Geography. Food resources as related to world distributions of population, soil, water, fuel and minerals. Special attention to urbanization, irrigation, and future food needs and global constraints.
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 to control 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. Refining and processing of lipids into margarine, butter, shortening and salad oils. Chemical methods for analysis of lipids.

404. Dehydrated Foods
Spring. 5(3-0) FSC 331; FSC 333 concurrently or approval of department. Concentration and dehydration of foods by roller, spray, and freeze drying and foam, puff and tunnel drying. Stability and nutritional aspects of dehydrated foods.

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.

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. 3(3-0) FSC 333 or approval of department. Processing, formulation and quality control.

448. Fruit, Vegetable and Cereal Products I
Fall. 4(3-3) FSC 331 or approval of department. Quality factors involved in canning, sugar and salt preservation and milling.

449. Fruit, Vegetable and Cereal Products II
Winter. 4(3-3) FSC 331 or approval of department. Quality factors involved in cooling, freezing and other preservation procedures.

455. Food Analysis I
Fall. 4(2-4) CEM 132 and CEM 162 or approval of department. Modern methods of analysis for fat, protein, moisture and other macroconstituents of food. Application of spectrophotometry in determinations of microconstituents; use of dye-binding, complexometric and titrimetric 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.

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

825. Food Processing Concepts, Systems and Selected New Processes
Winter. 3(3-3) FSC 331, FSC 332, or FSC 440 or approval of department. Concepts of and requirements for processing systems and continuous processes. Use of computers in food processing, microwave heating of foods; radiation preservation of foods and related processing methods.

830. Thermal Processing of Food Products
Winter. 4(3-3) FSC 331, FSC 332 or FSC 440 or approval of department. Heating and cooling characteristics of foods in containers, thermal resistance of microorganisms, and derivation of process times and temperatures for pasteurization and sterilization.

832. Microbiology of Food Processing
Winter. 3(3-3) 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.

833. Advanced Food Plant Management
Fall of odd-numbered years. 3(3-0) FSC 421 or approval of department. Advanced concepts and strategy of policies and practices in the management of food plants.

834. 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.

835. Carbohydrates in Foods
Fall of odd-numbered years. 3(3-3) FSC 333. The chemistry and food technology of mono- and disaccharides.
850. Selected Topics in Food Science
Fall, Winter, Spring, Summer. 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.

860. Special Problems in Food Science
Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 12 credits. Approval of department. Investigation of food science areas of special interest to individual graduate students.

899. Master's Thesis Research
Fall, Winter, Spring, Summer. 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, isoelectric focusing, histology, histochemistry, biological staining, 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, radiotopic tracers.

934. Research Techniques with Proteins
Fall, 3(2-3) BCH 401 or BCH 451. Physical and chemical techniques applicable to protein characterization (including electrophoretic techniques, thin-layer chromatography, gel filtration, ultrafiltration 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.

952. Advanced Lipids
Winter of even-numbered years. 3(3-0) FSC 402 or approval of department. A course relating composition, structure, and physical and chemical properties of lipids to processing requirements of fats and oils to their function in food systems.

953. Food Enzymology
Spring of even-numbered years. 3(3-0) FSC 333, BCH 401 or approval of department. Production, utilization and application of food enzymes in food industries. Effects of food enzymes on quality and nutrients of foods and food products.

953L. Laboratory-Food Enzymology
Spring of even-numbered years. 2(0-4) FSC 953 or concurrently or approval of department. Research methods in the isolation, purification, and characterization of food enzymes and the use of food enzymes in food industries.

954. Chemistry of Plant Products
Fall of even-numbered years. 3(3-0) FSC 333, BCH 451, or approval of instructor. Chemistry and biochemistry of plant pigments, tannins, toxins and proteins.

956. Food Science Seminar
Fall, Winter, Spring. 1(1-0) May reenroll for a maximum of 3 credits toward M.S. and 6 credits toward the Ph.D. Approval of department. Preparation and presentation of reports on a specialized aspect of research findings in food science.

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

Human Nutrition and Foods

100. Elementary Food Preparation
Fall, Winter, Spring. 4(2-4) Composition and properties of food related to quality characteristics; methods of preparation, evaluation of quality and use of selected foods.

101. Food and Society
Fall, Winter, Spring. Interdepartmental with and administered by Food Science. Analysis of the scientific, social and environmental aspects of food in determining the quality of man's life. Introduction into the principles of food preservation and safety.

102. Nutrition for Man (H)
Fall, Winter, Spring. 3(3-0) Fundamentals of nutrition with reference to diverse ways man provides for and attaches meaning to his food.

200. Physical and Chemical Properties of Foods
Fall, Winter, Spring. 4(2-4) CEM 131 or concurrently, or CEM 141. Interrelationship between basic physical and chemical principles and food preparation: composition, methods of preparation, evaluation, quality standards and comparative analysis.

205. Food Laws and Regulations
Spring, 3(3-0) Interdepartmental with and administered by Food Science. Food laws and regulations that govern food processing and food service systems; procedures involved in adopting and enforcing food laws and regulations.

221. Food and the Consumer
Fall, Winter, Spring, 3(3-0) Sophomores or approval of department. Factors affecting the food supply, consumer protection, food buying and management of human and material resources in feeding the family.

222. Food and the Consumer Laboratory
Fall, Winter, Spring. 2(0-4) HNF 221 or concurrently. Decision making in Foods and Nutrition with emphasis on food choices in the marketplace. Management of human and nonhuman resources in food consumerism activities.

250. Professional Literature I
Fall, Winter, Spring. 2(2-0) HNF 102 or HNF 100 and HNF 200 or FSC 101, Sophomores; departmental major. Identification of factors and development of analytical skills involved in evaluating and communicating scientific information.

300. Experimental Foods
Winter, Spring. 4(2-4) HNF 200, CEM 132, HNF 310 or concurrently. Experimental approach to the study of foods, relating chemical and physical properties to reactions and processes occurring in food in response to various treatments.

302. Dynamics in Dietetics II
Winter. 2(0-4) Approval of department, HNF 301, HNF 320 or concurrently and HNF 462 concurrently. Principles and practices in the duties of professionally qualified dietitians with focus on providing food service for groups and nutritional care for patients and/or clients. Local field trips required. Approved through Fall 1982.

303. Dynamics in Dietetics III
Spring. 2(0-4) HNF 302, HNF 470 concurrently. Principles and practice of instructional design and instruction applied to problems in dietetics. Local field trips required. Approved through Fall 1981.

310. Sensory Assessment of Foods
Winter. 2(1-2) HNF 250, HNF 300 or concurrently. Sensory perception, chemistry of food flavors, and methods used in organoleptic evaluation of foods.

312. Nutrient Composition of Foods
Winter, Summer. 1(0-2) HNF 102 or FSC 101. Sources of nutrient composition information and their use in menu planning. Choosing foods to meet nutrient needs of various groups.

315. Consumer Aspects of Food Consumption
Fall. 3(3-0) HNF 102 or FSC 101, EC 200. Economic issues of concern to consumers in the food marketplace, human resource allocation to consumer food consumption activities, federal food programs affecting consumers' nutritional status.

319. Food Service Systems: General Survey
Fall, Winter, Spring. 3(3-0) HNF 222 or concurrently, or approval of department. Factors which influence the design of food service systems. Comparison of systems as related to organizational objectives and responsibilities, operational resources (material, human) and consumer acceptance factors.

321. Food Service Management: Material Resources
Fall, Winter, Spring. 3(3-2) HNF 319 or approval of department. Principles, processes and operational control strategies in materials management in food service systems. Menu planning, procurement, on-premise storage and issue, production, consumer distribution, safety, sanitation, and material cost analysis.

Winter. 3(3-0) HNF 102, FCS 262A, three terms of natural science or approval of department. Functions and importance of nutrients to physical growth, development and health of the child. Eating behavior of children. Feeding in child care centers.
375. Community Nutrition (475) Fall. 3(3-0) HNF 102 or approval of department. Identification of nutritional needs of population groups and available resources in communities.

400H. Honors Work
Fall, Winter, Spring. Variable credit. May reenroll for a maximum of 16 credits. Seniors, approval of department.

403. Fats and Carbohydrates in Food Systems
Fall. 4(3-3) HNF 300 or approval of department. Chemical and physical reactions in fat and carbohydrate food systems, including oils, gels, emulsions, etc. Food evaluation techniques will be introduced.

404. Role of Proteins in Food Systems
Winter. 4(3-3) HNF 300 or approval of department. Physical and chemical reactions with protein foods, meats, eggs, cheese, seeds. Emphasis on time-temperature data in relation to quality.

406. Cultural Aspects of Food
Spring, Summer of odd-numbered years. 3(3-0) Juniors. A cross-cultural investigation of food and its consumption. Factors such as history, religion, food sources and socioeconomic status are considered.

406L. Laboratory-Cultural Aspects of Food
Spring. 10(0-3) HNF 100 or HNF 200 or approval of department, HNF 408 concurrently. Art and science of cookery in relation to historical, national, regional, racial and religious customs.

407. Interactions of Culture and Nutrition
Fall. 3(3-0) Juniors, HNF 102 or ANP 171 or approval of instructor. Interdepartmental with the Department of Anthropology. World and U.S. food behavior focusing on conflicts between behavior and nutritional needs at various stages of life cycle. Anthropological, psychological and social influences affecting food behavior are analyzed.

411. Principles of Human Nutrition
Winter, Summer. 4(3-2) BCH 200. Identification, function and food sources of nutrients required by man. Metabolism as affected by deficiency or excess of specific nutrients.

420. Food Service Management: Human Resources
Fall, Winter. Summer of odd-numbered years. 3(2-2) HNF 321 and PST 356 or approval of department. Principles, processes and operational control strategies in personnel management in food service systems. Hiring, training, and dismissal procedures, labor-management relations, task analysis and distribution, productivity assessment, and labor cost analysis.

421. Food Service Management: Problem Analysis and Decision Making
Winter, Spring, Summer of even-numbered years. 3(1-4) HNF 420 or approval of department. Analysis of selected food service problems situations. Application of problem-solving techniques to identification of cause and effect factors, analysis of situational components and development of remedial alternatives for administrative action.

454. Readings in Foods
Fall. Summer of even-numbered years. 3(3-0) HNF 300 or approval of department. Selected topics in foods research. Emphasis on experimental data and basic scientific principles related to food quality. Approved through summer 1982.

461. Energy Nutrients and Proteins for Human Nutrition
Fall. 4(4-0) BCH 200, PSI 432 or PSI 341. 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(3-4) HNF 461. Metabolism of vitamins and minerals as applied to the nutritional requirements and food supplies of people.

463. Nutrition and Human Development
Spring. 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.

465. Readings in Nutrition
(455) Winter. Summer of odd-numbered years. 3(3-0) HNF 462 or approval of department. A study of recent developments in research in human nutrition. Approved through Fall 1982.

470. Clinical Nutrition
Fall. 3(3-0) HNF 463, 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
Fall. 10(0-3) HNF 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
Winter. 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.

478. Dietetics: Theory-Practice Interrelationships I
Winter. 3(2-3) HNF 321, HNF 470, ED 414 or P E 340. Introduction and practice of competencies required of the professional dietician. Skills in communication, interviewing, problem solving and planning for nutritional care will be developed using simulated and real life situations.

479. Dietetics: Theory-Practice Interrelationships II
Spring. 3(2-3) HNF 478. Continued of HNF 478. Skills in nutritional and employee counseling, resource management and professional behavior will be developed using simulated and real life situations.

480. Practice of Dietetics
Fall, Winter, Spring, Summer. 12(2-30) May reenroll for a maximum of 24 credits. HNF 303, HNF 470. Application and integration of nutritional and managerial concepts related to the practice of dietetics.

490. Professional Literature I: Foods
Fall. 2(2-0) HNF 290, HNF 300 or HNF 403 or approval of department. Selected topics in foods 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(2-0) 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
Winter. 2(2-0) HNF 290, HNF 470 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 pathophysiological correlations, nutritional assessment, diet planning, nutrition counseling.

490D. Professional Literature II: Food Service Management
Spring, Summer. 2(2-0) HNF 290, HNF 420 or concurrently 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, manpower needs, operational accountability and public responsibility.

490E. Professional Literature II: Foods and Nutrition Information
Spring. Summer of odd-numbered years. 2(2-0) HNF 290, HNF 411 or HNF 462 or approval of department. Selected topics in foods 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 foods, nutrition and food service management under staff guidance.

498. Field Study
Fall, Winter, Spring. 4 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.
800. Seminar in Foods and Nutrition
   Fall, Winter, Spring. 1-3 credits. HNF 405 or HNF 463.

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

803. Problems in Food Service Management
   Fall, Winter, Summer. Variable credit. Approval of department.

805. Experimental Foods III
   Spring. 3 or 4 credits. 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.

813A. Special Studies in Nutrition
   Fall, Winter, Spring. Summer. Variable credit. HNF 461.

813B. Special Studies in Experimental Foods
   Fall, Winter, Spring. Summer. Variable credit. HNF 404, BCH 200 or BCH 451 and BCH 804.

813C. Special Studies in Food Service Management
   Fall, Winter, Spring. Summer. Variable credit. Approval of department. Special studies in facility management, manpower coordination, and methods of operational control.

816. Applied Human Nutrition
   Spring. 3(3-0) HNF 462.

840. Topics in Nutrition
   Fall, Winter, Spring. Summer. 2 to 3 credits. HNF 462, PSL 432, BCH 401.

841. Nutrition and Obesity
   Fall, Winter, Spring. Summer. Variable credit. HNF 462. 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.

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

921. Pathology of Nutritional and Metabolic Diseases
   Spring. 3(3-0) HNF 404 or AN 420. ANS 325. BCH 452. HNF 462 recommended. Interdepartmental with and administered by the Department of Large Animal Surgery and Medicine.

926. Comparative Nutrition--Lipids and Carbohydrates
   Winter. 3(3-0) BCH 452 and a previous course on principles of nutrition. Interdepartmental with Animal Husbandry.

927. Comparative Nutrition--Protein Metabolism and Developmental Biology
   Winter. 3(3-0) BCH 452, PSL 802 or concurrently. Interdepartmental with Animal Husbandry. Protein quality assessment, protein status, protein calorie malnutrition, amino acid metabolism, protein turnover, digestion and absorption, hormonal control of protein metabolism, developmental aspects of protein metabolism and growth.

928. Comparative Nutrition--Minerals
   Spring. 3(3-0) BCH 452, PSL 802. Interdepartmental with and administered by Animal Husbandry. Forms and location in body, metabolic roles, deficiency and toxicity signs, interactions, requirements and biological availability of sources.

929. Comparative Nutrition--Vitamins
   Spring. 3(3-0) BCH 452 and a previous course on principles of nutrition. Interdepartmental with and administered by Animal Husbandry.

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

FOOD SYSTEMS ECONOMICS AND MANAGEMENT

See Agricultural Economics.

FOREIGN LANGUAGES

See German and Russian, Linguistics and Oriental and African Languages, and Romance and Classical Languages.

FORESTRY

College of Agriculture and Natural Resources

In 305, 306, 410 and 430, field trips are scheduled for several consecutive days away from the campus for integrated field experience, primarily in the second half of spring term of the junior year, so that these courses must be taken concurrently. This precludes enrollment in other courses during that term. The approximate cost of these field trips is $210.

IDC. Introduction to Resource Ecology
   For course description, see Interdisciplinary Courses.

202. Introduction to Forestry
   Fall. 3 or 4 credits. Forstry in its broadest sense, including: historic development, forest growth, protection and management, products, national and world economy and policy. Emphasis on multiple use concepts. One-day field trip required.

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

220. Plants and Their Environment
   Winter. 3 or 4 credits. Interdepartmental with Agriculture and Natural Resources.

301. Quantitative Methods for Natural Resources
   Winter. 3(3-0) MTH 109 or MTH 111.

304. Forest Ecology
   Fall. 3(3-3) FOR 204; BOT 205; CSS 210 or concurrently.

305. Silviculture
   Spring. 3(3-0) FOR 204, FOR 304, FOR 424, FOR 425 and FOR 429 concurrently.

306. Forest Fire Protection and Use
   Winter. 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.

309. Wood Technology
   Fall. 4(3-1)

310. Wood Structure and Properties
   Spring. 3(2-2) Not open to Forestry majors.

402. Forest Inventory
   Spring. 4 or 4 credits. 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.

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