427. Wildlife Biology and Management

Winter. 4(2-4) 424; ZOL 389 or BOT 450.

Ecology and management of resident wildlife on farm, forest and range lands.

450. Natural Resource Administration

Fall, Spring. 4(4-0) Interdepartmental with Forestry, Parks and Recreation Resources and Resource Development Departments and Natural Resources. Administered by the Forestry Department.

Concepts and methods of administering wildland properties. The legal, economic and social environment. Benefit-cost analysis of management changes. Unit organization, personnel management and accounting. Presents a systems view of administration.

471. Ichthyology

Spring. 3(2-3) 301 or ZOL 305 or 314. Interdepartmental with Zoology Department.

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) 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) B S 212. Interdepartmental with the Zoology Department.

Ecology of lakes and streams with special reference to physical, chemical, and biological factors affecting their productivity.

477. Limnological Methods

Winter. 3(0-9) 476 concurrently; ZOL 481; ENT 301, 302 recommended. Interdepartmental with the Zoology Department.

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.

801. Seminar in Fisheries and Wildlife

Fall, Winter, Spring. 1(1-0)

Graduate problems and current developments of importance.

802. Advanced Topics

Fall, Winter, Spring, Summer. 1 to 6 credits. May re-enroll for a maximum of 15 credits. Approval of department.

Study of selected advanced topics in detail and depth.

821. Advanced Stream Ecology

Summer. 3 credits. ENT 421 or approval of instructor. Given at W. K. Kellogg Biological Station. Interdepartmental with and administered by the Entomology Department.

Stream ecosystem energy budget models with emphasis on individual projects involving both laboratory and field experiments. Particular use will be made of artificial streams and locally abundant species of aquatic insects.

830. Environmental Requirements of Fish

Winter. 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.

874. Advanced Biological Limnology

Fall. 3(4-0) 477, or approval of department.

Historical and current contributions to concepts of community structure, energy flow and materials cycling in aquatic eco-systems.

875. Chemical Limnology

Winter. 4(3-3) 476, 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.

899. Research

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

940. Quantitative Wildlife Ecology

Spring. 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 stablity.

999. Research

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

FOOD SCIENCE AND HUMAN NUTRITION*

College of Agriculture and Natural Resources
College of Human Ecology†

Food Science FSC

101. Food and Society

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.

211. Introduction to Food Science

Spring. 3(3-0)

Modern food processing, world food problems, and the basic characteristics of processed foods.

*Named changed October 17, 1970. Formerly Food Science and Human Nutrition and Foods.

†Named changed July 1, 1970. Formerly College of Home Economics.

242. Meats, Poultry and Fishery Products I

Fall. 3(2-2) Interdepartmental with the Animal Husbandry Department.

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)

Composition, use, classification and market grades, methods of storage and factors affecting keeping quality of dairy products.

331. Physical Principles of Food Processing

Fall, Winter. 4(3-2) 211; MTH 109; PHY 239 or approval of department.

Food preservation by heat, low temperature, dehydration and radiation.

332. Biological Principles of Food Processing

Winter. 4(3-3) MPH 200 or approval of department.

Biological problems related to food processing including waste disposal, sanitizing and bactericidal compounds, pesticides and residues, plant and animal growth regulators, radioactive elements, preservatives and toxicology of additives.

333. Chemical Principles of Food Processing

Spring. 4(3-3) 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.

400. Milk Processing Technology

Fall. 4(3-3) CEM 132 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

Spring. 3(3-0) 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(2-3) 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.

404. Dehydrated Foods

Spring. 3(2-3) 331; 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. Chemistry and Technology of Dairy Products Manufacturing

Winter. 3(2-3) May re-enroll for a maximum of 6 credits if a different topic is taken. 400 or approval of department.

Physical, chemical and microbiological factors in the processing of dairy products. Ice cream, sherbets, ice milks and special frozen desserts are studied in odd-numbered years; cheese, and related dairy products in even-numbered years.

421. *Food Plant Management*

Spring. 3(2-3) Seniors or approval of department.

Efficiency concepts, merchandising, personnel utilization and organization.

440. *Food Microbiology*

(MPH 371.) Spring. 5(3-6) MPH 200 or 301 or 401, or approval of department. Interdepartmental with the Microbiology and Public Health Department.

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(1-6) 333 or approval of department.

Processing, formulation and quality control.

448. *Fruit, Vegetable and Cereal Products I*

Fall. 4(3-3) 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) 331 or approval of department.

Quality factors involved in cooling, freezing and other preservation procedures.

455. *Food Analysis I*

Fall. 4(2-6) CEM 132 and 162 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 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 quality control within the food industry by case study. Use of control charts, sampling plans, flavor panel analyses.

480. *Special Problems in Food Science*

Fall, Winter, Spring, Summer. 1 to 3 credits. May re-enroll 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.

828. *Food Processing Concepts, Systems and Selected New Processes*

Winter. 3(3-0) 331, 332 or 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) 331; 332 or 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*

Fall. 3(2-3) 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 even-numbered years. 3(3-0) 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 year. 3(3-0) 333.

The chemistry and food technology of mono-, oligo-, and poly-saccharides.

850. *Selected Topics in Food Science*

Winter of odd-number years. 3(3-0) Approval of department.

Current developments in food utilization and wholesomeness including food additives, residues, toxicants, and state and federal regulations pertaining to food processing and quality assurance.

880. *Special Problems in Food Science*

Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll for a maximum of 12 credits. Approval of department.

Investigation of food science areas of special interest to individual graduate students.

899. *Research*

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

932. *Histological and Chemical Technique*

Winter. 3(1-6) Approval of department.

Research techniques in thin-layer and gas chromatography, differential thermal analysis, isoelectric focusing, histology, histochemistry, biological testing, polarography and pH stat measurements.

933. *Instrumental Methods of Analysis*

(931.) Spring. 3(2-3) 455 or 456 or approval of department.

Spectroscopy (ultraviolet, visible, infrared, flame, atomic absorption, fluorescence), manometry, ion exchange, countercurrent distribution, radioisotopic tracers.

934. *Research Techniques with Proteins*

Fall. 3(2-3) BCH 401 or 451.

Physical and chemical techniques applicable to protein characterization (including – electrophoretic techniques, thin-layer chromatography, gel filtration, ultracentrifugation and amino acid analysis).

951. *Muscle Chemistry*

Spring of odd-numbered years. 3(2-3) 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) 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. *Enzyme Reactions*

Spring of even-numbered years. 4(3-3) BCH 451, or approval of department.

Comprehensive discussion of parameters which affect enzyme activity. Properties of enzymes important in food processing.

954. *Chemistry of Plant Products*

Fall of even-numbered years. 3(3-0) 333, BCH 451, or approval of instructor.

Chemistry and biochemistry of plant pigments, tannins, toxins and proteins.

990. *Food Science Seminar*

Fall, Winter, Spring. 1(1-0) May re-enroll 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. *Research*

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Human Nutrition and Foods* HNF

100. *Elementary Food Preparation*

(F N 100.) 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. 3(3-0) 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*

(F N 102.) Fall, Winter, Spring. 3(3-0)

Fundamentals of nutrition with reference to diverse ways man provides for and attaches meaning to his food.

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*Name changed July 1, 1970. Formerly Foods and Nutrition and Institution Administration.

221. Food and the Consumer

Fall, Winter, Spring. 3(3-0) Sophomores.

Factors affecting the food supply, consumer protection, food buying and management of human and material resources in feeding the family.

222. Laboratory for Food Management

Fall, Winter, Spring. 2(0-4) 221 concurrently.

Planning, organizing, preparing and serving meals with consideration of human and material resources as well as nutrient needs.

320. Food Service Systems

Fall, Winter. 5(3-4) 221. Juniors.

Management of food service systems with varying organizational patterns and objectives. Emphasis on human and material resources and their interrelationships in quality food production and service.

340. Experimental Foods

Fall. 4(2-4) CEM 132; MPH 200 or concurrently.

Physical and chemical changes occurring in foods during storage, preservation and preparation in terms of palatability, microbial safety and nutritive value. Emphasis on carbohydrates and fats.

341. Experimental Foods

Winter. 4(2-4) 340.

Continuation of 340. Emphasis on proteins.

350. Fundamental Principles of Nutrition

(F N 350.) Winter, Spring. 4(3-2) PSL 331 or BCH 200 or concurrently.

Identification, function, metabolism and food sources of specific nutrients required by man for normal growth and development.

400H. Honors Work

(F N 400H.) Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 16 credits. Seniors, approval of department.

403. Fats and Carbohydrates in Food Systems

(F N 403.) Fall. 4(3-3) 341 or approval of department.

Chemical and physical reactions in fat and carbohydrate food systems, including sols, gels, emulsions, etc. Food evaluation techniques will be introduced.

404. Role of Proteins in Food Systems

(F N 404.) Winter. 4(3-3) 341 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

(F N 406.) 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 socio-economic status are considered.

406L. Laboratory—Cultural Aspects of Food

(F N 406.) Spring. 1(0-3) 100; 406 or concurrently.

Art and science of cookery in relation to historical, national, regional, racial and religious customs.

407. Patterns of Food Selection

Fall. Summer of even-numbered years. 3(3-0) 350.

Sociological and psychological factors influencing food choices. Evaluation of dietary habits in relation to nutritional needs of individuals.

409. Presentations in Foods and Nutrition

(F N 409.) Winter. 4(2-4) 340; 350 or 461.

Principles and techniques of presenting foods and nutrition information as applied to teaching or promotional work.

453. Readings in Nutrition

(F N 453.) Winter. Summer of odd-numbered years. 3(3-0) 462 or approval of department.

A study of recent developments in research in human nutrition.

454. Readings in Foods

(F N 454.) Fall. Summer of even-numbered years. 3(3-0) 340.

Selected topics in foods research. Emphasis on experimental data and basic scientific principles related to food quality.

461. Energy Nutrients and Proteins for Human Nutrition

(F N 461.) Fall. 4(4-0) BCH 200; PSL 332 or 241.

Metabolism of protein, fats and carbohydrates, as applied to nutritional requirements and food supplies of people.

462. Vitamins and Minerals for Human Nutrition

(F N 462.) Winter. 3(3-0) 461.

Metabolism of vitamins and minerals as applied to the nutritional requirements and food supplies of people.

463. Nutrition and Human Development

(F N 463.) Spring. 3(3-0) 462.

The role of nutrients in physiological systems and biochemical processes as related to the perspective of human growth and development.

469. Physical and Physiological Growth of Children

Winter, Spring. 4(3-2) 102. Three terms of Natural Science. Interdepartmental with and administered by the Family and Child Sciences Department.

Physical and physiological growth patterns. Experimental evidence for nutritional requirements. Applications to feeding practices, and physical activity of children.

470. Clinical Nutrition

Fall. 4(4-0) 462.

Changes in physiological and/or biochemical functions or processes due to illness and uses of modified diets as an essential part of treatment.

475. Community Nutrition

Spring. 4(3-3) 462 or approval of department.

Identification of nutritional needs of population groups and available resources in communities.

495. Independent Study

(I A 400.) Fall, Winter, Spring. 2 to 6 credits. May re-enroll for a maximum of 6 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, Summer. 4 to 12 credits. May re-enroll 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

(F N 800.) Fall, Winter, Spring. 1(1-0) 403 or 463.

802. Seminar in Food Service Management

(I A 800.) Winter, Summer. 1 to 3 credits. May re-enroll for a maximum of 8 credits. Approval of department.

803. Problems in Food Service Management

(I A 803.) Fall, Winter, Spring, Summer. Variable credit. Approval of department.

805. Experimental Foods III

(F N 805.) Spring. 4(1-9) 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

(F N 813A.) Fall, Winter, Spring, Summer. Variable credit. 461.

813B. Special Studies in Experimental Foods

(F N 813B.) Fall, Winter, Spring. Summer of odd-numbered years. Variable credit. 404; BCH 200 or 451 and 804.

813C. Special Studies in Food Service Management

(I A 813.) Fall, Winter, Spring, Summer. Variable credit. Approval of department.

Special studies in facility management, manpower coordination and tools and methods of operational control.

816. Applied Human Nutrition

(F N 816.) Spring. 3(3-0) 462.

825. Techniques in Nutrition Research

(F N 825.) Winter of odd-numbered years. 1 to 3 credits. CEM 333; approval of department. Interdepartmental with and administered by the Animal Husbandry Department.

Use of specialized instruments and techniques. Laboratory safety. Management of laboratory animals. Development of abilities in areas of particular interest to individual students.

899. Research

(F N 899.) Fall, Winter, Spring, Summer. Variable credit. Approval of department.

926. Comparative Nutrition — Lipids and Carbohydrates

Winter of odd-numbered years. 4(4-0) BCH 452. Interdepartmental with the Animal Husbandry Department.

Regulatory aspects of carbohydrate and lipid metabolism as influenced by nutrition in mammals. Emphasis on normal and abnormal physiological 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 502 or concurrently. Interdepartmental with Animal Husbandry Department.

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 of even-numbered years. 3 credits. BCH 452, PSL 502. Interdepartmental with and administered by the Animal Husbandry Department.

Forms and location in body, metabolic roles, deficiency and toxicity signs, interrelationships, requirements and biological availability of sources.

929. *Comparative Nutrition — Vitamins*

Winter of odd-numbered years. 3(3-0) BCH 452 and a previous course on principles of nutrition. Interdepartmental with and administered by the Animal Husbandry Department.

Chemical and physical properties, standards of activity, occurrence, metabolic roles, antivitamins, deficiency and toxicity signs, requirements and factors affecting requirements.

999. *Research*

(F N 999.) 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 Languages.

FORESTRY FOR

College of Agriculture and Natural Resources

200. *Resource Ecology and Man*

For course description, see **Interdisciplinary Courses.**

202. *Introduction to Forestry*

Fall. 3(3-0)

Forestry 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. 5(3-4) BOT 205 or approval of department.

Nomenclature, classification, and identification of important trees, shrubs, and herbaceous plants of forest and field.

220. *Plants and Their Environment*

Winter. 3(3-0) Interdepartmental with Natural Resources.

Fundamental ecological relationships between various climatic, edaphic and biotic environmental factors of the ecosystem and plant response, including structure, function and evaluation of species.

301. *Quantitative Methods for Natural Resources*

Fall. 4(3-3) MTH 109 or 111.

Collection and analysis of information pertaining to natural resources. Survey design, field procedures, equipment, and analytical techniques.

302. *Forest Inventory*

Winter. 3(2-3) 301.

Field and office techniques of forest inventory, with primary emphasis on timber resources.

305. *Silviculture*

Fall. 4(3-3) 204.

Interrelationships of trees of the forest community and the environment; natural and artificial forest reproduction methods; intermediate cuttings; field studies of silvicultural conditions.

306. *Forest Fire Protection and Use*

Spring. 3(3-0) Juniors or approval of department.

Causes and effects of forest fires. Combustion, fire behavior, and fire weather. Prevention and control planning and techniques. Use of fire in forest land management. One-day field trip required.

309. *Wood Technology*

Fall. 4(3-3)

Structure of wood. Mechanical and physical properties of wood. Wood anatomy and relation to growth.

319. *Forestry Today*

(419.) Spring. 3(3-0) Not open to majors.

For the non-forestry student, emphasizing multiple use of forests, scope and practice of forestry, environmental roles of forests, influences, products, non-timber uses of forests and current forest policy.

409. *Forest Hydrology*

Winter. 3(3-0) SLS 210.

Hydrologic cycle, with emphasis on soil, water and ground water regimes; instrumentation and measurement of the various components. Effects of forest management on watersheds 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*

Fall. 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. 4(3-3) 220; SLS 210. Interdepartmental with Soil Science.

Interrelationships of forest site and the growth of forests. Classification and productivity of forest soils. Effects of silvicultural and forest management practices on the soil. Two-day field trip required.

430. *Manufacture of Lumber and Composite Wood Products*

Winter. 3(3-0) 309.

Log and lumber grades, sawmill equipment and practices. Wood working machinery. Gluing of wood. Manufacture of pulp, plywood and other board products.

431. *Finishing, Preservation and Drying of Wood*

Spring. 3(3-0) 309.

Properties, selection, application of decorative and protective coatings, wood preservatives and fire retardants. Air and kiln drying of lumber.

432. *Methods in Wood Science*

Spring. 3(2-2) 309.

Application of standard laboratory testing procedures to the evaluation of basic properties of solid wood and wood products. Laboratory exercises in wood microtechnique and wood finishings.

446. *Range Management*

Winter. 4(3-3) 220 or approval of department.

Development of range industry; grazing regions and reconnaissance; planning multiple-use management on forest range and watershed.

449. *Field Studies in Forestry*

Fall. 3 credits. 302, 305.

Multiple use forest resource management in various forest regions. Two-week field trip required, prior to the fall term of the senior year.

450. *Natural Resource Administration*

Fall, Spring. 4(4-0) Interdepartmental with Fisheries and Wildlife, Parks and Recreation Resources and Resource Development Departments and Natural Resources.

Concepts and methods of administering wildlife properties. The legal, economic and social environment. Benefit-cost analysis of management changes. Unit organization, personnel management and accounting. Presents a systems view of administration.

454. *World Forestry*

Winter. 3(3-0)

Forest resources, forestry practices, and the forest economy throughout the world.

455. *Forestry Economics*

Winter. 4(3-2) 450 or approval of department.

Basic economic and political principles and techniques that govern the production and consumption of forest land products, including basic forest valuation procedures.

457. *Forest Management and Utilization Planning*

Spring. 5(4-2) 455.

Integrative planning for forest management, including multiple-use aspects and timber harvesting systems.

460. *Arboriculture*

Spring. 3(2-3) Approval of department.

Principles and techniques of species selection, establishment, and cultural practices used in the care and maintenance of shade and ornamental trees. Two-day field trip required.

465. *Forest and Wood Science Problems*

Fall, Winter, Spring, Summer. 1 to 5 credits. Seniors with a 2.80 average, or approval of department.

Special problems course for students qualified for advanced study in some phase of forestry or wood science.