

901. Internship

(H E 901.) Fall, Winter, Spring, Summer. 3 to 5 credits. May re-enroll for a maximum of 9 credits. Approval of department.

Supervised advanced graduate practicums, observation, internships, and externships in the various areas of emphasis.

902. Independent Study in Family Ecology

(H E 902.) Fall, Winter, Spring, Summer. 1 to 5 credits. May re-enroll for a maximum of 9 credits. Approval of department.

Study on an individual basis.

903. Seminars in Family Ecology

(H E 903.) Spring, Summer. 2 or 3 credits. May re-enroll for a maximum of 9 credits. Approval of department.

Seminars in selected topics.

932. History and Philosophy of Home Management

(FCS 932.) Fall, Summer of even-numbered years. 3(2-0)

History and development of home management as a field of study. Values and decision-making as analyzed by various disciplines and as used in home management.

933. Apprentice Experience in Home Management Residence

(FCS 933.) Fall, Winter, Spring. 3(1-6) 437 and approval of department.

Experience in presenting home management as a resident course. Each student works with one home management group. Limited to a few well-qualified students.

999. Research

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

**FISHERIES AND
WILDLIFE**

F W

**College of Agriculture and
Natural Resources**

200. Resource Ecology and Man

For course description, see Interdisciplinary Courses.

202. Soils and Man's Environment

Winter. 3(3-0) Interdepartmental with Resource Development Department, Natural Resources, and Soil Science and administered by Soil Sciences.

Use of soil-water resources in a technological society as it relates to environmental quality. Nature of pollution problems and their possible solutions. Food production and world population.

301. Fish and Wildlife of North America

Winter. 5(3-4) N S 192 or B S 212.

Comparative study of fish and wildlife groups in North America, their significant life history stages, morphology, migrations, habitats and populations. Common species are identified in the laboratory.

305. Management of Fish and Wildlife Resources

Winter. 3(3-0) IDC 200 or other ecology course.

Effects of regulations, refuges, stocking, species introductions, habitat manipulation, artificial

feeding, genetic improvement, land use, ecological research and control of predators, diseases and competitors in the production of fish and game.

374. Biological Oceanography

(474.) Winter. 3(3-0) N S 193 or B S 212.

Biology of marine animals, with emphasis on physical, chemical and biological factors affecting their abundance and distribution.

402. Conservation Education

Fall, Winter, Spring. 4(3-2) Elementary education Juniors.

Nature, distribution, abundance and interrelationships of natural resources. Biological and physical components of field, range, forest, and aquatic associations. Includes techniques of teaching about the environment.

403. Conservation Education

Spring. 4(3-2) Elementary education juniors.

A continuation of 402. Special emphasis afforded lakes, streams, and wetlands.

404. Fisheries and Wildlife Problems

Fall, Winter, Spring, Summer. 1 to 5 credits. May re-enroll for a maximum of 12 credits. B S 212; 6 credits of fisheries and wildlife; approval of department.

To give undergraduate majors an opportunity to study special topics in fisheries and wildlife.

424. Wildlife Population Analyses

Spring. 4(3-2) 305 or approval of department.

Population mensuration; reproductive and survival rates; sex and age determination; handling and marking methods.

425. Wildlife Habitat Analyses

Spring. 4(2-4) BOT 450 or ZOL 389 or FOR 220.

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 461 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) 424; ZOL 389 or BOT 450.

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

450. Natural Resource Administration

Fall, Winter. 4(4-0) Interdepartmental with the Forestry, Park and Recreation Resources, and Resource Development Department and administered by the Forestry Department.

Concepts and methods of economics and administration and application of techniques to management of wildlands.

471. Ichthyology

Spring. 3(2-3) ZOL 305 or 315. Interdepartmental with the 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 dis-

tribution and natural history, and application of this knowledge to problems of obtaining maximum return from fishery resources.

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. Advanced Conservation Education

Fall of odd-numbered years. 4(3-2) Approval of department.

Designed for secondary teachers. Areas of outdoor education, school camping, recreation, biology teaching and camp counseling. This course will offer both content and methods applicable to people working in specified types of jobs.

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.

899. Research

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

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

211. Introduction to Food Science

Spring. 3(3-0)

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

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 I

Spring. 3(2-2)

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

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

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

331. Food Processing I: Physical Principles
Fall. 4(3-3) 211; MTH 109; PHY 239 or approval of department.

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

332. Food Processing II: Biological Principles
Winter. 4(3-3) 211; MPH 200 or approval of department.

Sanitation and control of microbiological problems involved in processing and storage of foods.

333. Food Processing III: Chemical Principles
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. Dairy Products II
(304.) 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. Processing of Lipids
Winter. 3(2-3) 333 or CEM 241 or approval of department.

Refining, hydrogenation, and interesterification of fats and oils. Processing of margarine, butter, shortenings and salad oils. Control of rancidity and other quality factors.

404. Dehydrated Foods
Spring. 3(2-3) 331; 333 concurrent-ly 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. Dairy Products III
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. 4(2-6) 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.

850. Selected Topics in Food Science
Fall of even-numbered years. Winter and Spring of odd-numbered years. 3(3-0) May re-enroll for a maximum of 9 credits if a different topic is taken. Approval of department.

Fall: advanced food plant management.
Winter: utilization, additives and new processing methods.
Spring: flavor and color evaluation and advanced statistical quality control.

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.

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.

950. Advanced Topics in Food Science
Fall, Spring. Winter of even-numbered years. 3(2-3) May re-enroll for a maximum of 15 credits if a different topic is taken. 333, BCH 401 or approval of department.

Fall of odd-numbered years: Advanced Chemical Concepts of Carbohydrates and Proteins.

Winter of even-numbered years: Lipids.

Spring of even-numbered years: Enzymatic Reactions.

Fall of even-numbered years: Chemistry of Plant Products.

Spring of odd-numbered years: Muscle Chemistry.

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.

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.

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

- 200. Food Preparation**
(F N 200.) Fall, Spring. 5(2-6)
CEM 132.
Scientific principles of food preparation with special emphasis on the physical and chemical changes involved.
- 200A. Lectures in Foods**
(F N 200A.) Fall, Spring. 1(2-0)
100; CEM 132.
Lecture part of 200. Completion of this course, 100 and CEM 132 constitutes substitution for 200.
- 220. Meal Management**
(F N 220.) Fall, Winter, Spring.
5(3-4) Sophomores.
Analysis of factors that influence family meals; family food behavior, resources, and family goals and values. Emphasis on the use of the money resource. Survey of patterns for meal service. Study of food laws.
- 322. Quality Food Production**
(I A 322.) Fall, Winter, Spring.
4(2-4) 220.
Experience in quantity food production; personnel problems; cost control.
- 325. Institution Management**
(I A 325.) Winter. 3(3-0) Juniors.
Principles of effective management with emphasis on techniques of supervision for controlling costs in quantity food service operations.
- 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. Experimental Foods I**
(F N 403.) Fall. 4(2-6) 200 or FSC 211.
Colloidal properties of foods with special reference to protein in food preparation. Objective and subjective evaluation of effect of ingredient proportion, manipulation, temperatures, etc. on quality characteristics. Simple statistical treatment and interpretation of data.
- 404. Experimental Foods II**
(F N 404.) Winter. 4(2-6) 200 or FSC 211.
Continuation of 403 with focus on chemical and physical properties of fats and carbohydrates as they affect food preparation and preservation.
- 406. Cultural Aspects of Food**
(F N 406.) Spring. 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 or 200; 406 or concurrently.
Art and science of cookery in relation to historical, national, regional, racial and religious customs.
- 409. Demonstrations in Foods and Nutrition**
(F N 409.) Winter. 4(1-6) 403; 350 or 461; COM 101 or ATL 113; or approval of department.
Principles and techniques of demonstration as applied to teaching or promotional work.
- 426. Institution Marketing**
(I A 426.) Fall. 3(2-2) S S 233 or EC 200.
Standards of quality, distribution and storage of food supplies to serve as a basis for purchase of such commodities for institution food service.
- 428. Advanced Food Management**
(I A 428.) Spring. 4(4-0) 322, 325.
Experience in food administration. University food services are used for training centers.
- 452. Patterns of Food Selection**
(F N 452.) Fall. Summer of even-numbered years. 3(3-0) 350 or equivalent credit in nutrition and chemistry; teaching or extension experience.
Factors influencing food choices. Evaluation of dietary habits in relation to nutritional needs of individuals.
- 453. Readings in Nutrition**
(F N 453.) Winter. Summer of odd-numbered years. 3(3-0) 452 or approval of department.
A study of recent developments in research in human nutrition.
- 454. Recent Advances in Foods**
(F N 454.) Spring. 3(3-0) 403.
Critical analysis of recent developments in preparation, prefabrication and preservation of foods.
- 461. Human Nutrition I**
(F N 461.) Fall. 4(2-2) BCH 200; PSL 332 or 241.
Metabolism of protein, fats and carbohydrates, as applied to nutritional requirements and food supplies of people.
- 462. Human Nutrition II**
(F N 462.) Winter. 4(2-2) 461
Metabolism of vitamins and minerals as applied to the nutritional requirements and food supplies of people.
- 463. Human Nutrition III**
(F N 463.) Spring. 4(3-2) 462.
Critical analysis of methods used in assessing human nutrition status; evaluation of nutritional problems of current interest.
- 464. Diet Therapy**
(F N 464.) Spring. 4(2-2) 462 or concurrently.
Dietary modifications necessary in pathological conditions, including dietary treatment of diabetes, gout, nephritis, and gastro-intestinal disorders.
- 495. Independent Study**
(I A 400.) Fall, Winter, Spring.
Variable credit. May re-enroll for a maximum of 6 credits. Seniors; approval of department.
Individual study of specific problems in food service management of hospitals, restaurants, college housing units, and the federal school lunch program 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.
- 927. Comparative Nutrition I**
(F N 927.) Winter. 2 or 4 credits.
BCH 452, PSL 502 or concurrently. Interdepartmental with the Animal Husbandry Department.
Mammalian nutrition based on biochemical and physiological phenomena. Proteins are studied in the first half of the term; carbohydrates, fats and macro-minerals in the last half.
- 928. Comparative Nutrition II**
(F N 928.) Spring. 2 or 4 credits.
BCH 452, PSL 502. Interdepartmental with and administered by the Animal Husbandry Department.
Mammalian nutrition based on biochemical and physiological phenomena. Micro-minerals are studied in the first half of the term; vitamins in the last half.
- 999. Research**
(F N 999.) Fall, Winter, Spring, Summer. Variable credit. Approval of department.

FOREIGN LANGUAGES

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