

424. Wildlife Population Analyses
Fall. 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. (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. Migratory Wildlife Resources
Fall. 4(2-4) 424 or approval of department.
Biology and management of doves, waterfowl and marsh birds.

427. Resident Wildlife Resources
Winter. 4(2-4) 424 or approval of department.
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 Departments 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 and administered by 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.
Special reference to distribution 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. 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 FSC

College of Agriculture and Natural Resources

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) For non-agricultural students.
Composition, use, classification and market grades, methods of storage and factors affecting keeping quality of dairy products.

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.

348. Meat, Poultry and Fishery Products II
Winter of odd-numbered years. 3(1-6) 242.
Selection and utilization of meat, poultry and fishery products for institutional use.

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 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. 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 MPH 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.

931. Research Techniques and Instrumentation
Fall, Winter, Spring. 3(1-6) May re-enroll for a maximum of 9 credits if a different topic is taken. 455 or 456 or approval of department.
Fall: electrophoresis, thin-layer chromatography and gel filtration microscopy, ultra centrifugation, and infra-red spectrometry.
Winter: chemical, microbiological and histological methods.
Spring: manometric and radioisotope techniques, spectrophotometry, electro and column chromatography.

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.

FOODS AND NUTRITION F N

College of Home Economics

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.

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

200. Food Preparation
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
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
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.

350. Fundamental Principles of Nutrition
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
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 16 credits. Seniors, approval of department.

403. Experimental Foods I
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
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
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
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
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.

452. Patterns of Food Selection
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.