875. Chemical Limnology
Winter. 4(3-0) F W 476, F W 477 or approval of department.
Application of analytical chemistry concepts and technologies to fundamental and 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.

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

999. Doctoral Dissertation
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 (N)
Fall. 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
Winter. 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.

223. Commercial Food Processing Systems
Fall. 3(3-0) Interdepartmental with and administered by Agricultural Engineering Technology.
Processes and systems used in handling, processing and distribution of food; the need for processing systems and their influence on food quality.

242. Meats, Poultry and Fishery Products
Fall. 3(2-2) Interdepartmental with the Department of Animal Husbandry.
Principles of evaluation and nutritive value. Identification of grades and cuts of beef, pork, lamb and poultry products.

300. Dairy Products
Spring. 3(2-2) CEM 132 or approval of department.
Chemical and physical properties of milk and milk products. Survey of dairy products and the technologies involved in their manufacture.

310. Food Safety and Microbiology
Fall. 4(3-3) Juniors; CEM 132 or concurrently or approval of department. Not open to students with credit in FSC 440.
Interdepartmental with the Department of Microbiology and Public Health.
Effects of food handling, preparation and service on food safety. Microorganisms in foods, sanitation, food borne disease and food service regulations.

311. Food Processing and Preservation
Winter. 4(4-0) CEM 132
Effects of processing, packaging and preservation on the quality of foods. Demonstrations of use of ingredients, evaluation of products and results of various processing methods.

331. Physical Principles of Food Processing
Fall. 4(3-2) FSC 211, MTH 109, PHY 229 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) FSC 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
Fall. 3(3-0) FSC 440 and organic chemistry or approval of department.
Physical, microbiological and chemical procedures in utilizing microbial cultures in controlled fermentations of foods and food constituents.

402. Chemistry and Technology of Lipids
Winter. 3(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. 3(3-0) FSC 331; FSC 333 concurrently or approval of department.
Concentration and dehydration of foods by roller, spray, and freeze drying and freeze, puff and tunnel drying. Stability and nutritional aspects of dehydrated foods.

405. Technology of Manufactured Dairy Products
Winter. 4(3-1) 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. 3(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(1-6) 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 determination of microconstituents; use of dye-binding, complexometric and isometric 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.

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

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

805. 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 study of food preservation, texture, additives, toxicants, food proteins, ingredient safety, nutritional stability, new processing techniques, flavors, quality control, storage stability, state and federal food regulations.

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, and isoelectric focusing, histology, histochemistry, biological testing, polargraphy and pH stat measurements.

933. Instrumental Methods of Analysis
Spring. 3(2-3) FSC 453 or FSC 456 or approval of department.
Spectroscopy (ultraviolet, visible, infrared, fluorescence), manometry, ion exchange, countercurrent distribution, radioisotopic tracers.

934. Research Techniques with Proteins
Fall. 3(2-3) BCH 401 or BCH 451.
Physical and chemical techniques applicable to protein structure by electrophoretic techniques, thin-layer chromatography, gel filtration, ultracentrifugation and amino acid analysis.

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

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 440 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.
Descriptions - FOOD SCIENCE AND HUMAN NUTRITION

of Courses

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.

990. 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 HNF

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. 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 (N)
Fall, Winter, Spring. 3(3-0)
Fundamentals of nutrition with reference to diverse ways man provides for and attains nourishment to his body.

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

205. Food Laws and Regulations
Winter. 3(4-0) 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.

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

300. Experimental Foods
Winter, Spring. 4(2-6) HNF 200, CEM 132; FSC 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.

301. Dynamics in Dietetics I
Fall. 2(0-4) Approval of department, HNF 461 concurrently.
Basic knowledge and experience in the functions and responsibilities of the professionally qualified dietitian. Local field trips required. Approved through Summer 1981.

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 Winter 1982.

303. Dynamics in Dietetics III
Spring. 2(0-4) HNF 302; HNF 470 concurrently. Approved through Winter 1982.

310. Sensory Assessment of Foods
Winter. 2(1-2) HNF 200; 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.

320. Food Service Systems
Fall, Winter, Spring. 3(3-0) HNF 222.
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.
Approved through Summer 1981.

321. Food Service Management: Material Resources
Fall, Winter, Spring. 3(2-2) 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; FSC 262A.
Three terms of natural science or approval of department.
Functions and importance of nutrients to physical growth, development and health of the child. Existing behavior of children. Feeding in child care centers.

375. Community Nutrition (475). Spring. 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, Summer. 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 ails, 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 socio-economic status are considered.

406L. Laboratory—Cultural Aspects of Food
Spring. 1(0-3) HNF 100 or HNF 200 or approval of department; HNF 406 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 PSY 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 problem situations. Application of problem-solving techniques, 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 term 1982.

461. Energy Nutrients and Proteins for Human Nutrition
Fall, 4(4-0) BCH 200; PSL 423 or PSL 241.
Metabolism of protein, fats and carbohydrates as applied to the nutritional requirements and food supplies of people.

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

463. Nutrition and Human Development
Spring, 4(3-3) 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
Winter, 4(3-0) HNF 462 or approval of department.
A study of recent developments in research in human nutrition. Approved through Fall term 1982.

470. Clinical Nutrition
Fall, 3(5-0) HNF 462; PHM 330 or approval of department.
Changes in pathological and/or biochemical functions or processes due to illness and uses of modified diets as an essential part of treatment.
816. Applied Human Nutrition  
Spring, 3(3-0) HNF 462.  
840. Topics in Nutrition  
Fall, Winter, Spring, Summer. 2 to 3 credits. HNF 462, PSE 432, BCH 401.  
Advanced studies in nutrition: assessment and surveillance, community, clinical, growth and development, behavior, infectious diseases and environment, oral health, obesity, aging, diet.  
899. Master's Thesis Research  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.  
921. Pathology of Nutritional and Metabolic Diseases  
Summer of even-numbered years, 4(3-2)  
BCH 452, HNF 462 recommended.  
Interdepartmental with the departments of Large Animal Surgery and Medicine, Animal Husbandry, and Pathology.  
Development, physiopathology and morphologic pathology of nutritional and metabolic diseases including carbohydrate, protein, fatty acid, vitamin and mineral deficiencies, their experimental induction and their medical or dental significance.

917. Comparative Nutrition—Protein Metabolism and Developmental Biology  
Winter of even-numbered years, 4(4-0)  
BCH 452, PSE 802 or concurrently.  
Interdepartmental with the Department of 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.

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