FOOD SCIENCE FSC

Department of Food Science and Human Nutrition
College of Agriculture and Natural Resources

111 Foundational Concepts in Food Processing and Technology
Fall. 3(3-0) R: Open to students in the Institute of Agricultural Technology.
Principles of food chemistry, microbiology, and physical science.

112 Seminar in Food Processing, Technology and Safety
Fall. 1(1-0) R: Open to students in the Institute of Agricultural Technology.
Communication, organization, and time management skills for the food processing industry.

113 Basic Commodity Overview of Food Processing and Technology
Fall. 3(3-0) R: Open to students in the Institute of Agricultural Technology.
Principles of food processing continuum. Production, through processing, to distribution.

114 Food Processing and Technology Facilities Management
Spring. 3(2-2) P: FSC 125 or concurrently R: Open to students in the Institute of Agricultural Technology.
Food facility design and layout. Cleaning and sanitation systems, standards, and regulations. Total quality management principles.

125 Food Processing and Technology Unit Operations
Spring. 2(1-2) P: FSC 111 R: Open to students in the Institute of Agricultural Technology.
Operations to prepare, process, and preserve a variety of food products and their effects of food processing on quality and shelf life.

211 Principles of Food Science
Fall, Summer. 3(3-0)
Scientific principles, historical perspective, and current status of technology related to food composition, safety, toxicology, processing, preservation, and distribution.

222 Professional Development and Career Planning in Food Science
Fall. 1(1-0) P: FSC 211 or concurrently RB: Introductory course in food science R: Open to freshmen or sophomores in the Food Science Major.
Career opportunities in food science; training in oral, written, and visual communication skills for professional development.

230 Fruit and Vegetable Processing
Fall. 2(1-2) P: FSC 125 and (FSC 242 or concurrently) R: Open to students in the Institute of Agricultural Technology.
Concepts and operations of the handling, preservation, and processing of fruit and vegetable crops

231 Cereals Processing
Spring. 2(1-2) P: FSC 125 and (FSC 242 or concurrently) R: Open to students in the Institute of Agricultural Technology.
Classification and composition of major cereal crops. Milling processes and cereal product manufacturing.

232 Dairy Foods Processing
Fall. 2(1-2) P: FSC 125 and (FSC 242 or concurrently) R: Open to students in the Institute of Agricultural Technology.
Handling and processing of milk and milk products.

233 Muscle Foods Processing
Spring. 2(1-2) P: FSC 125 and (FSC 242 or concurrently) R: Open to students in the Institute of Agricultural Technology.
Manufacturing practices and principles of fresh, frozen, and cured meats.

240 Applied Microbiology in Food Processing and Technology
Spring. 2(2-0) P: FSC 111 RB: A previous course in biological science. R: Open to students in the Institute of Agricultural Technology.
Microorganisms in food processing with emphasis on ecological, physiological, and public health aspects. Principles and practices to prevent food spoilage and food-borne outbreaks.

241 Safety Principles and Regulations in Food Processing and Technology
Fall. 3(3-0) P: FSC 240 R: Open to students in the Institute of Agricultural Technology.
Hazard Analysis Critical Control Points (HACCP), risk-based preventive controls, process validation, and statistical applications in food safety.

242 Applied Chemistry in Food Processing and Technology
Fall. 2(2-0) P: FSC 111 RB: A previous course in general chemistry. R: Open to students in the Institute of Agricultural Technology.
Chemical changes in foods as a result of formulation, processing, and storage.

310 Sensory Analysis and Consumer Research
Fall. 3(2-2) P: (FSC 211 or HNF 150) and (STT 200 or STT 201 or STT 315 or STT 421 or STT 464) R: Open to undergraduate students in the Department of Food Science and Human Nutrition. SA: FSC 410
Discriminative, affective and descriptive methods used to evoke, measure, analyze, and interpret sensory reactions to food characteristics and consumer needs.

322 Advanced Professional Seminar in Food Science
Spring. 1(1-0) P: FSC 222 R: Open to sophomores or juniors in the Food Science Major. SA: FSC 422
Preparation for success in food science careers, marketing tools, business communication skills, and contemporary topics in food science.

325 Food Processing: Unit Operations
Spring. 3(3-0) P: FSC 211 or ANS 201 SA: FSC 229, FSC 339
Principles, technologies, and applications in conversion of raw products into high quality foods. Unit operations: thermal processing, irradiation, freezing, membrane fractionation, enzyme technologies, dehydration, and refrigeration.

342 Food Safety and Hazard Analysis Critical Control Point Program
Fall. 3(3-0) RB: ((FSC 211 or concurrently) or (HNF 150 or concurrently)) or a prior or concurrent basic course in microbiology, chemistry or biological sciences.
Sources of microbiological, chemical and physical hazards; minimizing microbial growth and survival; good manufacturing, cleaning and sanitation practices; Hazard Analysis Critical Control Point Programs in food processing and food service.

401 Food Chemistry
Spring. 3(3-0) P: BMB 200 or CEM 352 or (BMB 401 or concurrently) R: Not open to freshmen or sophomores.
Organic and biological reactions of food constituents. Chemical changes in foods during processing and storage affecting texture, color, flavor, stability, and nutritive qualities.

402 Food Chemistry Laboratory
Spring. 1(0-3) P: (FSC 401 or concurrently) and completion of Tier I writing requirement
Chemical changes in food constituents which affect stability of food products and properties such as color, flavor and texture.

420 Quality Assurance
Fall. 2(2-0) P: (STT 200 or STT 201 or STT 231 or STT 315 or STT 351) and ((FSC 211 or concurrently) or (ANS 201 or concurrently) or (HRT 204 or concurrently)) R: Open to juniors or seniors or graduate students in the Department of Food Science and Human Nutrition.
Theory and application of quality assurance programs for food processing industries.

421 Food Laws and Regulations
Spring of odd years, Summer of even years. 3(3-0) P: HNF 150 or FSC 211 or ABM 100
Adoption, interpretation, and enforcement of laws and regulations governing food processing and foodservice systems. Impact of regulation on food production, availability, marketing, and safety.

423 Functional Foods and Human Health-
Spring of even years. 3(3-0) P: {HNF 150 or (HNF 311 or concurrently)} and (MMG 205 or MMG 301 or FSC 342) and ((BMB 200 or concurrently) or (BMB 401 or concurrently))
Concept, nature and classification of functional foods. Spectrum of biological activity. Positive and negative impacts on health, and regulatory aspects.

429 Fundamentals of Food Engineering-
Spring. 3(3-0) Interdepartmental with Biosystems Engineering. Administered by Biosystems Engineering. P: (FSC 325) and (MTH 124 or MTH 132 or LB 118 or MTH 152H) and (PHY 231 or PHY 183 or PHY 193H or LB 273) RB: FSC 211 R: Not open to students in the College of Engineering. SA: BE 329
Definition and measurement of food properties, thermodynamics, fluid mechanics, heat transfer, and mass transfer.

430 Food Processing: Fruits and Vegetables
Fall. 3(2-3) P: (FSC 211) and (FSC 325 or BE 350) R: Not open to freshmen or sophomores. SA: FSC 330
Fruit and vegetable composition and quality indices. Harvest technology, post-harvest physiology, and preparatory systems. Principles and applications of thermal processing, freezing, and specialized techniques.

431 Food Processing: Cereals
Spring. 3(2-3) P: (FSC 211) and (FSC 325 or BE 350) R: Not open to freshmen or sophomores. SA: FSC 331
Classification and composition of cereals. Milling processes. Cereal product manufacture.

432 Food Processing: Dairy Foods
Fall. 3(2-3) P: (FSC 211) and (FSC 325 or BE 350) R: Not open to freshmen or sophomores. SA: FSC 332
Principles for production and processing of safe and wholesome dairy foods. Practical experience in safety and quality assurance systems and in the processing of fluid milk, cultured products, cheese, and frozen desserts.

433 Food Processing: Muscle Foods
Spring. 3(2-3) Interdepartmental with Animal Science. Administered by Food Science. P: (FSC 211) and (FSC 325 or BE 350) R: Not open to freshmen or sophomores. SA: FSC 333
Manufacturing practices and principles of fresh, frozen, and cured meats and fish. Processed products from muscle foods. Product formulation and quality control.

440 Food Microbiology
Fall. 3(3-0) Interdepartmental with Microbiology and Molecular Genetics. Administered by Food Science. P: (MMG 201 or MMG 301) and completion of Tier I writing requirement. R: Not open to freshmen.
Major groups of microorganisms of importance to the food industry. Ecological, physiological, and public health aspects.

441 Food Microbiology Laboratory
Fall. 2(0-4) Interdepartmental with Microbiology and Molecular Genetics. Administered by Food Science. P: (FSC 440 or concurrently) and completion of Tier I writing requirement RB: MMG 302 SA: MPH 441
Methods for studying major groups of microorganisms important to the food industry. Isolation, enumeration, characterization, identification, and use of microorganisms.

442 Hazard Analysis Critical Control Point Training and Certification
Fall. 1(1-0) P: (FSC 325) and (MMG 301 or concurrently) RB: FSC 440 R: Open to juniors or seniors.
Design and implementation of Hazard Analysis Critical Control Point (HACCP) programs for the food industry. Offered second half of semester.

455 Food and Nutrition Laboratory
Fall. 3(2-3) P: ((BMB 200 or concurrently) or (BMB 401 or concurrently) or (BMB 461 or concurrently)) and completion of Tier I writing requirement
Principles and application of analytical techniques. Analysis for fats, proteins, carbohydrates, minerals, vitamins, and additives. Techniques include spectroscopy, fluorimetry, chromatography, electrophoresis, and proximate composition.

470 Integrated Approaches to Food Product Development
Spring. 3(2-3) P: FSC 310 and FSC 401 and FSC 440 RB: FSC 325 R: Open to seniors or graduate students.
Food product development including obtaining, screening, and selecting ideas. Integration of food processing, chemistry, analysis, and microbiology for the design, production, and evaluation of a food product.

475 International Studies in Food Science
Fall, Spring, Summer. 2 to 6 credits.
Fall: Abroad. Spring: Abroad. Summer: Abroad. A student may earn a maximum of 12 credits in all enrollments for this course. P: HNF 150 or FSC 211 R: Approval of department; application required.
Education abroad experience. Contemporary problems affecting food science and human nutrition in world, national and local communities.

477 Food Engineering: Fluids
Fall. 3(2-2) Interdepartmental with Biosystems Engineering. Administered by Biosystems Engineering. P: BE 350 and BE 351 and BE 360 SA: FE 465
Unit operations, process engineering, equipment, and industrial practices of the food industry. Manufactured dairy products: thermal processing, pipeline design, heat exchange, evaporation, dehydration, aseptic processing, membrane separation, cleaning, and sanitation.

481 Fermented Beverages
Fall. 3(2-2) R: Open to juniors. Approval of department.
Origin and history of alcoholic beverages produced by fermentation; types of products and methods of production; relationships among agricultural practices, processing and sensory attributes; responsible consumption of alcoholic beverages.

482 Science and Technology of Wine Production
Fall. 3(2-3) Interdepartmental with Chemistry and Chemical Engineering. Administered by Chemistry. P: CEM 143 or CEM 251 or CEM 351 RB: Must be at least 21 years of age. R: Open to seniors or graduate students in the Department of Biosystems and Agricultural Engineering or in the Department of Chemical Engineering and Materials Science or in the Department of Chemistry or in the Department of Food Science and Human Nutrition or in the Department of Horticulture or in the Department of Microbiology and Molecular Genetics or in the Lyman Briggs Chemistry Coordinate Major. Approval of department.
Origin and history of wine and wine production. Determination and timing of harvest, methods of postharvest handling, storage, and processing of grapes into juice and wine. Physical and chemical changes in wine and processes. Analysis of must and its adjustment, fermentation, fining, and aging. Physiology of yeasts and bacteria involved in winemaking and spoilage. Cellar practices, problems, and operations.

483 Brewing and Distilled Beverage Technology
Spring. 3(2-3) Spring: Uncle John's Fruithouse Winery and Brewing Company, East Lansing. Interdepartmental with Chemical Engineering. Administered by Chemical Engineering. P: CHE 311 or (ME 410 or concurrently) or BE 350 or (BE 429 or concurrently) or (FSC 325 or concurrently) RB: Major in Chemical Engineering, Biosystems Engineering or Food Science. Must be at least 21 years of age. R: Approval of department.
Raw materials for fermentation and basics of alcohol fermentation, beer and cider production; basics of distillation; brandy and eau de vie production; whiskey production; vodka, gin and flavored spirits production; flavor chemistry

490 Special Problems in Food Science
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Not open to sophomores. Approval of department; application required.
Individual study of selected topics in food science. Supervised independent study.

493 Professional Internship in Food Science
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. A student may earn a maximum of 6 credits in all enrollments for any or all of these courses: ABM 493, AEE 493, ANR 493, ANS 493, CMP 493, CSS 493, CSUS 493, EEP 493, FSC 493, FIM 493, FW 493, HRT 493, PKG 493, and PLP 493. R: Open to juniors or seniors in the Food Science major. Approval of department; application required.
Supervised professional experiences in agencies and businesses related to food science.

803 Advanced Food Chemistry
Spring of even years. 3(3-0) RB: (FSC 401) or Prior coursework in biochemistry. SA: FSC 801, FSC 802
Carbohydrates, proteins, and lipids. Purification, structural characterization, chemical reactions, and functional properties of these components in food systems.

807 Advanced Food Toxicology
Fall of even years. 3(3-0) R: Approval of department.
Toxicology related to food safety. Metabolism of toxicants as influenced by food constituents, mutagenesis, and chemical carcinogenesis. Risk assessment.

810 International Food Laws and Regulations
Fall, Spring. 3(3-0) RB: Food science, law, food safety. international development or related disciplines. SA: ANR 810
Survey of food laws of various countries and regions.

811 U.S. Food Laws and Regulations
Fall, Spring. 3(3-0) RB: (FSC 810) or food science, law, food safety, international development, veterinary medicine, or related disciplines. SA: ANR 811 Not open to students with credit in FSC 421.
Surveys the laws and regulations governing the manufacture, distribution and sale of food products in the United States, the regulation of foods and food additives, genetic modification of food, food safety and HACCP, civil and criminal liability for defective products, inspections, labeling, importation, exportation, and current issues of concern.

812 Food Laws and Regulations in the European Union
Fall, Spring. 3(3-0) RB: (FSC 810) or food science, law, food safety. international development or related disciplines.
Introduction to the European Union (EU), the role of case law, official controls, the European Food Safety Authority, food labeling, food additives, food fortification, genetically modified foods, organic foods, imports, food safety, inspections, enforcement and compliance, and the role of science in EU food law.

813 Food Laws and Regulations in Latin America
Fall of odd years. 3(3-0) RB: (FSC 810) or food law background. Not open to students with credit in LAW 810G.
Current issues that have shaped Latin American food regulation. Overview of regional characteristics. Basic food laws, agency responsibilities, product registration requirements, basic standards, food labeling, food safety, food additives, and food importation. Trade issues, international organizations, and commercial agreements.

814 Food Laws and Regulations in Canada
Spring. 3(3-0) RB: (FSC 810) or food science, law, food safety, international development or related disciplines.
Canadian regulatory framework. Labeling and advertising rules under the Canadian Food and Drug Act and other statutes. Food additives, food supplements and food fortification. Regulation of novel foods and genetically modified foods, organic foods and food irradiation. Inspection and related food safety programs. Food recalls. Compliance and enforcement. Food importation.

815 Food Laws and Regulations in China
Summer. 3(3-0) RB: Food science, law, food safety, international development or related disciplines. Not open to students with credit in LAW 810J.
Current issues that have shaped the regulation of food in China, regional characteristics and culture, food laws, agency responsibilities, product registration requirements, basic standards, food labeling, food safety, food additives, and food import systems.

816 Codex Alimentarius - The Food Code
Spring. 3(3-0) RB: (FSC 810) or food science, law, food safety, international development or related disciplines. Not open to students with credit in LAW 810F.
How Codex Alimentarius formulates and harmonizes food standards for hygiene, contaminants, food additives, veterinary drugs, and pesticide residues, including its role in the World Trade Organization (WTO) Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) Agreements.

817 Global Animal Health, Food Safety, and International Trade
Fall. 3(3-0) RB: (FSC 810) or animal science, veterinary medicine, food science, law, food safety, international development, agriculture, or related disciplines. Not open to students with credit in LAW 810E.
Overview of the World Organization for Animal Health (OIE), global animal health patterns, and their relationship with international food law, world trade agreements, food safety, and their importance in international food and agricultural trade.

820 Regulatory Leadership in Food Law
Fall. 3(3-0) RB: (FSC 811) or prior coursework in food law Not open to students with credit in LAW 810U.
Food law regulatory affairs. Skill development for leadership in food regulatory issues including working with government agencies in adverse or high-stakes situations, achieving the central purpose of regulation, and control of risks to the public. Practical application of regulatory affairs tools and strategies. Nature of assessing and communicating risk. Quality controls and management. Dealing and prevention of crises.

821 Wine, Beer, and Spirits Laws and Regulations
Spring of even years. 3(3-0) RB: (FSC 811) or prior coursework in food safety, food laws, or food science Not open to students with credit in LAW 810Y.
Laws, regulations, and policies that govern alcoholic beverages in the United States.

823 Diet and Immune Function
Spring of odd years. 3(3-0) RB: Biochemistry and Microbiology.
Influence of diet on the immune system and relationship to infectious and non-infectious diseases, adverse reactions such as food allergy, and alcohol and substance abuse. Methods to evaluate immune function.

842 Foodborne Diseases
Spring of odd years. 3(3-0) RB: FSC 440 or FSC 840
Epidemiology, isolation, characterization, clinical manifestations, pathogenicity, incidence and control of bacterial, parasitic and viral foodborne pathogens and associated toxins.

843 Exposure Science and Epidemiology
Fall of even years. 3(3-0) RB: Statistics, basic biological and chemical science
Human exposure to contaminants in food, water, products, and the environment - and how those exposures can effect human health. Applied concepts in exposure science and environmental epidemiology.

844 Risk Assessment of Foodborne Chemicals and Toxins
Spring of even years. 3(3-0) RB: Calculus, basic biological and chemical sciences, toxicology
Human health risk assessment, including hazard identification, dose-response and exposure assessment, and risk characterization. Application to food safety and environmental risks.

851 Food Import Law and the Foreign Supplier Verification Program (FSVP) Rule
Summer of odd years. 3(3-0) RB: (FSC 811) or prior coursework in food safety, food law, or food science Not open to students with credit in LAW 810V.
Survey of the FDA and USDA law regarding the importing food into the United States, including the Foreign Supplier Verification Program (FSVP) rule and the Food Safety Modernization Act.

852 The Law of the Preventive Controls for Human and Animal Food
Spring. 3(3-0) RB: (FSC 811) or prior coursework or professional experience in food safety, food law, or food science Not open to students with credit in LAW 810W.
Legal perspective of FDA's Preventive Controls for Human Food Rule of the Food Safety Modernization Act.

853 The Law of the Produce Safety Rule
Fall. 3(3-0) RB: (FSC 811) or prior coursework in food safety, food law, or food science Not open to students with credit in LAW 810X.
Legal perspective of FDA's Produce Safety Rule of the Food Safety Modernization Act.

854 Global Regulation of Food Contact Substances and Packaging
Spring of odd years. 3(3-0) RB: Prior coursework or equivalent professional experience in food safety, food law, or food science
Regulation of food contact substances (FCSs) and materials (FCMs); FCS/FCM scientific and health issues related to regulation; Codex Alimentarius; regulations in the U.S. and around the globe; future regulatory developments in plastics and packaging.

890 Special Problems in Food Science
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open only to graduate students in Food Science. Approval of department; application required.
Individual investigation of an area of food science.

891 Selected Topics in Food Science
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to graduate students in the Food Science major or Human Nutrition major.
Topics of current interest and importance in basic and applied areas of food science.

892 Food Science Seminar
Spring. 1(1-0) A student may earn a maximum of 4 credits in all enrollments for this course. R: Open to graduate students in the Department of Food Science and Human Nutrition.
Critical review of literature. Organization and communication of scientific data in food science.

898 Master's Research
Fall, Spring, Summer. 1 to 5 credits. A student may earn a maximum of 5 credits in all enrollments for this course. R: Open only to master's students in Food Science. Approval of department.
Directed research in support of Plan B master's degree requirements.

899 Master's Thesis Research
Fall, Spring, Summer. 1 to 10 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to master's students in the Food Science major.
Master's thesis research.

999 Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open to doctoral students in the Food Science major.
Doctoral dissertation research.