

## FOOD SCIENCE FSC

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

#### 211 Principles of Food Science

Fall, Spring. 3(3-0)

Scientific principles, historical perspective, and current status of technology related to food composition, safety, toxicology, processing, preservation, and distribution.

#### 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. Field trip required.

#### 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 (HNF 311 or concurrently)) or a prior or concurrent basic course in microbiology, chemistry or biological sciences. SA: FSC 442

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

Fall. 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

Fall. 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.

#### 410 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) RB: HNF 300 or FSC 401 R: Open to undergraduate students in the College of Agriculture and Natural Resources or in the Department of Food Science and Human Nutrition. SA: HNF 410

Discriminative, affective and descriptive methods used to evoke, measure, analyze, and interpret sensory reactions to food characteristics and consumer needs.

#### 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 210 or concurrently) or (HRT 204 or concurrently)) R: Open only to juniors or seniors or graduate students in the Department of Food Science and Human Nutrition or in the Food Processing and Technology Specialization.

Theory and application of quality assurance programs for food processing industries.

#### 421 Food Laws and Regulations

Spring. 3(3-0) P: HNF 150 or HNF 311 or FSC 211 or FIM 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.

#### 429 Fundamentals of Food Engineering

Spring. 3(3-0) Interdepartmental with Biosystems Engineering. Administered by Biosystems Engineering. P: FSC 325 and MTH 126 and PHY 231 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 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 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

Spring. 3(2-3) P: FSC 211 or ANS 210 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

Fall. 3(2-3) Interdepartmental with Animal Science. Administered by Food Science. P: FSC 211 or ANS 201 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

Spring. 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. SA: MPH 440

Major groups of microorganisms of importance to the food industry. Ecological, physiological, and public health aspects.

#### 441 Food Microbiology Laboratory

Spring. 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 206 or 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.

#### 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 401 and FSC 410) and (FSC 440 or concurrently) 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.

#### 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) Fall: Lansing. 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 wine-making and spoilage. Cellar practices, problems, and operations.

## Food Science—FSC

- 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 BE 350 or BE 429 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 freshmen or 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, EEP 493, ESA 493, FSC 493, FIM 493, FW 493, HRT 493, PKG 493, PLP 493, and PRR 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. 3(3-0) RB: (FSC 810) or food science, law, food safety, international development or related disciplines.  
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 Asia**  
Summer. 3(3-0) RB: Food science, law, food safety, international development or related disciplines.  
Current issues that have shaped the regulation of food in Asia, regional characteristics and culture, basic food laws, agency responsibilities, product registration requirements, basic standards, food labeling, food safety, food additives, food import systems. Special emphasis will be given to the food regulations of Japan, China, Korea and Southeast Asia (ASEAN).
- 816 Codex Alimentarius - The Food Code**  
Spring. 3(3-0) RB: (FSC 810) or food science, law, food safety, international development or related disciplines.  
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 Animal Health, World Trade and Food Safety (OIE): Challenges and Opportunities**  
Fall. 3(3-0) RB: (FSC 810) or animal science, veterinary medicine, food science, law, food safety, international development, agriculture, or related disciplines.  
Examines the history, objectives, rules and operations of the World Organization for Animal Health (OIE), regarding global animal health, animal welfare, world trade, and food safety.
- 818 Global Risk Regulation: Focus on Food Safety**  
Spring. 3(3-0) RB: Food science, law, food safety, animal science, veterinary medicine, international development, health, environment, or related disciplines.  
Focuses on societies' efforts to assess and manage food, health, safety and environmental risks, including selection of the risks deserving regulatory attention, scientific advice and decision-making situations of scientific uncertainty, the role of non-scientific values, calculating costs and benefits of regulation, and distributional and equity effects.
- 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.
- 831 Advanced Cereal Science**  
Spring of odd years. 3(3-0) RB: (BMB 401 and FSC 401) or approval of department.  
Physico-chemical properties of major constituents in cereal grains. Relationship of constituent structures to functionality in the processing of cereal grains into food products, with emphasis on wheat.
- 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.
- 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 and Animal Science Seminar**  
Fall, Spring. 1(1-0) A student may earn a maximum of 4 credits in all enrollments for this course. Interdepartmental with Animal Science. Administered by Food Science. R: Open to graduate students in the Department of Animal Science or in the Department of Food Science and Human Nutrition.  
Critical review of literature. Organization and communication of scientific data in food science and animal 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 masters 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 masters 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 99 credits in all enrollments for this course. R: Open only to doctoral students in the Food Science major.

Doctoral dissertation research.