FOOD SCIENCE

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

221 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.

222 Professional Development and Career Planning in Food Science
Fall: 1(1-0) P: FSC 211 or concurrently RB: Open to students in the Food Science Major. Career opportunities in food science; training in oral, written, and visual communication skills for professional development. Offered second half of semester.

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, dehydrolysis, and refrigeration. Field trip required.

342 Food Safety and Hazard Analysis Critical Control Point Program
Fall: 3(0-3) RB: (IFSC 211 or concurrently) or (HNF 150 or concurrently) or (HNF 260 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(0-3) 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 values.

402 Food Chemistry Laboratory
Fall: 1(0-3) P: (IFSC 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 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: 3(3-0) P: HNF 150 or HNF 260 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.

422 Advanced Professional Seminar in Food Science
Fall: 1(1-0) P: FSC 222 RB: Advanced course work in food science R: Open to students in the Food Science Major. Preparation for success in food science careers, marketing tools, business communication skills, and contemporary topics in food science. Offered first half of semester.

429 Fundamentals of Food Engineering
Spring: 3(3-0) Interdepartmental with Bio-systems Engineering. Administered by Bio-systems Engineering. P: FSC 325 and MTH 124 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
Spring: 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

432 Food Processing: Dairy Foods
Spring: 3(2-3) P: FSC 211 or ANS 201 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 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. 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 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
Spring: 1(1-0) P: (MMG 301 or concurrently) or (FSC 440 or concurrently) RB: Advanced course work in food science 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 spectrophotometry, fluorometry, chromatography, electrophoresis, and proximate composition.

470 Integrated Approaches to Food Product Development
Fall: 3(2-3) P: (FSC 401 and FSC 410) and (FSC 440 or concurrently) SA: FSC 431 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) P: 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 Chemis-
try and Chemical Engineering. Administered by
Chemistry, P: CEM 143 or CEM 251 or CEM
143 or CEM 251 or CEM 143 or CEM 251.
R: Open to at least 21 years of age. R: Open to
seniors or graduate stu-
dents in the Department of Biosystems and
Agricultural Engineering or in the Depart-
ment 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 Microbi-
ology 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.

483 Brewing and Distilled Beverage Technology
Spring. 3(3-2) Spring: Uncle John’s
Fruithouse Winery and Brewing Company,
East Lansing. Interdepartmental with Chem-
ical Engineering. Administered by Chemical
Engineering. P: CHE 311 or BE 350 or BE
429 RB: Major in Chemical Engineering, Bi-
osystems Engineering or Food Science.
Must be at least 21 years of age. R: App-
proval of department.
Raw materials for fermentation and basics of alcohol
fermentation, beer and cider production; basics of
distillation; brandy and eau de vie production; whis-
key production; vodka, gin and flavored spirits pro-
duction; flavor chemistry

490 Special Problems in Food Science
Fall, Spring, Summer. 1 to 3 credits. A stu-
dent may earn a maximum of 6 credits in all
enrollments. R: Open to sophomores. Approval of
department; applic-
pication 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 stu-
dent may earn a maximum of 6 credits in all
enrollments for this course. A student may earn a
maximum of 6 credits in all enroll-
ments 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 de-
partment; 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 de-
partment.
Toxicology related to food safety. Metabolism of
toxicants as influenced by food constituents, muta-
genesis, and chemical carcinogenesis. Risk as-
essment.

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

811 U.S. Food Laws and Regulations
Fall, Spring. 3(3-0) RB: (FSC 810) or food
science, law, food safety, international de-
velopment, veterinary medicine, or related
disciplines. SA: ANR 811 Not open to stu-
dents 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, importa-
tion, 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 de-
velopment or related disciplines. SA: ANR 812
Introduction to the European Union (EU), the role
of case law, official controls, the European Food Safety
Authority, food labeling, food additives, food fortifica-
tion, 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 impor-
tation. Trade issues, international organizations, and
commercial agreements.

814 Food Laws and Regulations in Canada
Spring. 3(3-0) RB: (FSC 810) or food sci-
ence, law, food safety, international develop-
ment or related disciplines.
Canadian regulatory framework. Labeling and ad-
vertising rules under the Canadian Food and Drug
Act and other statutes. Food additives, food sup-
plements 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 en-
facement. Food importation.

815 Food Laws and Regulations in Asia
Summer. 3(3-0) RB: Food science, law,
food safety, international development or re-
lated 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
Fall, Spring. 3(3-0) RB: (FSC 810) or food
science, law, food safety, international de-
velopment 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 Tech-
nical 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 sci-
ence, veterinary medicine, food science, law,
food safety, international development, agriculture,
or related disciplines.
Examines the history, objectives, rules and opera-
tions of the World Organization for Animal Health
(OIE), regarding global animal health, animal wel-
fare, world trade, and food safety.

818 Global Risk Regulation: Focus on Food
Safety
Summer. 3(3-0) RB: Food science, law,
food safety, animal science, veterinary medi-
cine, international development, health, en-
vironment, or related disciplines.
Focuses on societies’ efforts to assess and manage
food, health, safety and environmental risks, includ-
ing selection of the risks deserving regulatory atten-
tion, 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: Biochemis-
try and Microbiology.
Influence of diet on the immune system and rela-
tionship 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. 1 to 3 credits. A stu-
dent may earn a maximum of 8 credits in all
enrollments for this course. R: Open only to
graduate students in Food Science. Ap-
proval of department; application required.
Individual investigation of an area of food science.

891 Selected Topics in Food Science
Fall, Spring. 1 to 4 credits. A stu-
dent may earn a maximum of 6 credits in all
enrollments for this course. R: Open only to
graduate students in 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 36 credits in all enrollments for this course. R: Open to doctoral students in the Food Science major. Doctoral dissertation research.