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.

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 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, 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 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(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 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 food service 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 Biosystems Engineering. Administered by Biosystems 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.
Food processing including obtaining, conversion, processing, chemistry, analysis, and microbiology for plants, fruits, and vegetables. 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

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
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: (FSC 440 or concurrently) and completion of Tier I writing requirement. R: Not open to freshmen.
Major groups of microorganisms important 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 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 post-harvest 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 Fruthouse Winery and Brewing Company, East Lansing. Interdepartmental with Chemical Engineering. Administered by Chemical Engineering. P: CHE 311 or (ME 410 or currently) 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 6 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 functions of these components in food systems.
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.

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.

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.

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.