

FOOD SCIENCE (FOOD SCI)

FOOD SCI 120 – SCIENCE OF FOOD

3 credits.

Relationship between food, additives, processing and health. How foods are processed. Current food controversies.

Requisites: None

Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req

Level - Elementary

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Summer 2024

Learning Outcomes: 1. Describe the basic scientific concepts regarding food composition, processing, additives, regulations, and safety

Audience: Undergraduate

2. Explain how the functionality of food can influence food processing and quality

Audience: Undergraduate

3. Identify and analyze current issues and their implications for food processing additional learning objectives provided for each module

Audience: Undergraduate

FOOD SCI 140 – THE CHOCOLATE EXPERIENCE: SCIENCE, SOCIETY, AND SUSTAINABILITY

3 credits.

Learn about the history of cocoa and chocolate production, the cultivation of cocoa and processing of cocoa beans to the production of chocolate from cocoa beans. Other topics covered include nutrition and health aspects of cocoa and chocolate consumption and socioeconomic and sustainability issues in cocoa production.

Requisites: None

Course Designation: Level - Elementary

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Summer 2024

Learning Outcomes: 1. Explore the history of cocoa and chocolate, and worldwide cultivation practices.

Audience: Undergraduate

2. Describe the cocoa production process, including microbiological and biochemical aspects of cocoa fermentation.

Audience: Undergraduate

3. Outline and analyze the production of chocolate from the cleaning of cocoa beans to final chocolate products (from bean to bar).

Audience: Undergraduate

4. Examine the nutritional and health impact of chocolate consumption.

Audience: Undergraduate

5. Scrutinize and critique the socioeconomic impact of cocoa and chocolate production in fair trade, international politics, social justice, and sustainability.

Audience: Undergraduate

FOOD SCI 150 – FERMENTED FOOD AND BEVERAGES: SCIENCE, ART AND HEALTH

3 credits.

Explores the science behind fermented food and beverages, popularized by brewing, winemaking and breadmaking at home and in retail. Introduces the scientific principles that underlie food and beverage processing through fermentation. Covers how basic sciences such as chemistry, biochemistry and microbiology influence the process and desired outcomes when fermenting vegetables, milk, fruit, and grains.

Requisites: None

Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req

Level - Elementary

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Define fermentations in the context of foods and beverages

Audience: Undergraduate

2. Identify and apply basic principles of chemistry, processing and microbiology to the manufacturing of fermented foods and beverages.

Audience: Undergraduate

3. Identify and describe the human health implications resulting from the consumption of fermented foods and beverages.

Audience: Undergraduate

4. Describe the social, economic, and environmental dimensions of agricultural inputs and production of fermented food and beverages and identify potential tradeoffs and interrelationships among these dimensions at a level appropriate to the course.

Audience: Undergraduate

5. Analyze the causes of and solutions for the sustainability challenge of producing fermented foods and beverages

Audience: Undergraduate

FOOD SCI 201 – DISCOVERING FOOD SCIENCE

1 credit.

Provides a brief introduction to the different areas of study and career opportunities within the food industry.

Requisites: None

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Describe the depth and scope of food science as a profession

Audience: Undergraduate

2. Explain and discuss career options for food science graduates

Audience: Undergraduate

3. Recommend personal initiatives that will enhance career success

Audience: Undergraduate

4. Relate courses in food science curricula to job responsibilities of food scientist

Audience: Undergraduate

FOOD SCI 289 – HONORS INDEPENDENT STUDY

1-2 credits.

Research work for honors students under direct guidance of a faculty member in an area encompassing Food Science. Students are responsible for arranging the work and credits with the supervising instructor.

Requisites: Consent of instructor

Course Designation: Honors - Honors Only Courses (H)

Repeatable for Credit: Yes, unlimited number of completions

Learning Outcomes: 1. Develop critical, analytical, and independent thinking skills

Audience: Undergraduate

2. Apply the scientific method and engage in constructive problem solving

Audience: Undergraduate

3. Demonstrate application of research skills and methodologies

Audience: Undergraduate

4. Effectively communicate findings

Audience: Undergraduate

FOOD SCI 299 – INDEPENDENT STUDY

1-3 credits.

Research work for students under direct guidance of a faculty member in an area encompassing Food Science. Students are responsible for arranging the work and credits with the supervising instructor.

Requisites: Consent of instructor

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2025

Learning Outcomes: 1. Develop critical, analytical, and independent thinking skills

Audience: Undergraduate

2. Apply the scientific method and engage in constructive problem solving

Audience: Undergraduate

3. Demonstrate application of research skills and methodologies

Audience: Undergraduate

4. Effectively communicate findings

Audience: Undergraduate

FOOD SCI 301 – INTRODUCTION TO THE SCIENCE AND TECHNOLOGY OF FOOD

3 credits.

Introduction to the science and the technology of food manufacture. Covers the basic chemical, physical and microbiological properties of food and manipulation of these properties in the manufacture of food products.

Requisites: (MATH 112, 114 or 217) and (CHEM 103, 109 or 115) and (ZOOLOGY/BIOLOGY 101, 102, BOTANY/BIOLOGY 130, or ZOOLOGY/BIOLOGY/BOTANY 151) or (BSE 349 or concurrent enrollment)

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Apply core knowledge in chemistry, physics, mathematics and biology to the understanding of food systems including quantitative problem-solving skills

Audience: Undergraduate

2. Identify the chemical composition of the main components in foods and describe how the composition influences functionality and material properties

Audience: Undergraduate

3. Explain relationships of mass-balance in food processing and be able to do simple mass-balance calculations

Audience: Undergraduate

4. Apply the basic principles of microbiology in relation to food safety and food processing/preservation

Audience: Undergraduate

5. Outline key technical information/terminology related to food science

Audience: Undergraduate

6. Describe the way in which food handling and processing operations impact food composition and human health

Audience: Undergraduate

7. Discuss regulations and market forces that govern our food supply

Audience: Undergraduate

8. Outline emerging trends in food production, processing, and handling

Audience: Undergraduate

FOOD SCI/AN SCI 305 – INTRODUCTION TO MEAT SCIENCE AND TECHNOLOGY

4 credits.

Application of biological, technological, and economical principles to muscle and related tissue utilized for food.

Requisites: (ZOOLOGY/BIOLOGY/BOTANY 152 or ZOOLOGY/BIOLOGY 101 and 102) and (CHEM 103, 109, or 115) or graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Discuss the nutritional value of fresh and processed meats in addition to addressing diet/health issues and food safety of these products

Audience: Both Grad & Undergrad

2. Describe the processes associated with animal harvest and explain the differences among different livestock species

Audience: Both Grad & Undergrad

3. Demonstrate where carcass fabrication cuts are made to produce the major carcass primal cuts and the ability to separate out and identify major muscles of economic importance

Audience: Both Grad & Undergrad

4. Describe how the biochemical properties of meat proteins relate to muscle function

Audience: Both Grad & Undergrad

5. Explain of the chemical and physical properties of fresh meat and how these properties can be evaluated and analyzed

Audience: Both Grad & Undergrad

6. Collect carcass data and determine USDA quality and yield grades

Audience: Both Grad & Undergrad

7. Calculate the appropriate amounts of non-meat ingredients and explain the applicable manufacturing procedures to produce various types of processed meats including whole muscle products and finely comminuted sausages

Audience: Both Grad & Undergrad

8. Explain how an understanding of muscle microstructure ultrastructure, and changes in postmortem biochemistry can be used to predict ultimate meat quality characteristics

Audience: Graduate

FOOD SCI/AN SCI 321 – FOOD LAWS AND REGULATIONS

1 credit.

Food laws and regulations, regulatory and commercial grading standards used in the food industry.

Requisites: Junior standing

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Identify major food laws, their authoritative departments and enforcement agencies (regulatory framework)

Audience: Undergraduate

2. Identify, examine and analyze the implications of laws and regulations required for the manufacture and sale of food products

Audience: Undergraduate

3. Discuss current topics of importance to the food industry that have the potential to generate new or refine existing regulations on food laws and regulations that apply to specific segments of the food industry

Audience: Undergraduate

4. Find pertinent information on food laws and regulations that apply to specific segments of the food industry

Audience: Undergraduate

FOOD SCI/MICROBIO 324 – FOOD MICROBIOLOGY LABORATORY

2 credits.

Lab exercises dealing with food preservation, spoilage, and food poisoning. Isolation, identification and quantification of specific microbes occurring in foods, and food fermentations by bacteria and yeast.

Requisites: (MICROBIO 102 or MICROBIO 304) and FOOD SCI/MICROBIO 325 or concurrent enrollment

Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req

Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Utilize laboratory techniques to identify microorganisms in food.

Audience: Undergraduate

2. Describe the principles involving food preservation via fermentation processes.

Audience: Undergraduate

3. Demonstrate understanding of the role and significance of microbial inactivation, adaptation, and environmental factors (i.e., water activity, pH, temperature) on growth and response of microorganisms in various environments.

Audience: Undergraduate

4. Identify the conditions, including sanitation practices, under which important pathogens and spoilage microorganisms are commonly inactivated, killed, or made harmless in foods.

Audience: Undergraduate

FOOD SCI/MICROBIO 325 – FOOD MICROBIOLOGY

3 credits.

Principles of food preservation, epidemiology of foodborne illness, agents of foodborne illness, food fermentations and biotechnology.

Requisites: MICROBIO 101, 303, or M M & I 301 or graduate/professional standing

Course Designation: Breadth – Biological Sci. Counts toward the Natural Sci req

Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Identify and summarize the impacts of intrinsic and extrinsic factors on microorganisms.

Audience: Undergraduate

2. Calculate and apply thermal processing parameters to reductions in microbial numbers.

Audience: Undergraduate

3. Apply Hazard Analysis Critical Control Point (HACCP) concepts and principles to food production processes.

Audience: Undergraduate

4. Demonstrate knowledge of foodborne microbial pathogens.

Audience: Undergraduate

5. Describe methods and principles of sampling and testing food for microorganisms.

Audience: Undergraduate

6. Compare and contrast the principles, practices, and pathways of food fermentations.

Audience: Undergraduate

7. Analyze and use microbiological data sets.

Audience: Undergraduate

8. Evaluate the benefits and hazards of modern food production, organic foods, and genetically-engineered foods.

Audience: Undergraduate

FOOD SCI 330 – DAIRY PRODUCTS EVALUATION

1 credit.

Introduction to sensory analysis of dairy and dairy-alternative products. Individual skill building to evaluate products such as vanilla ice cream, cheddar cheese, cottage cheese, yogurt, milk, and butter by providing mentored sensory training.

Requisites: None

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Recall key vocabulary terms and facts relevant to introductory sensory science, dairy product evaluation, and the US dairy industry

Audience: Undergraduate

2. Evaluate, compare and rank products depending on multiple quality characteristics

Audience: Undergraduate

3. Compare similar nondairy products

Audience: Undergraduate

4. Communicate results of product analysis and evaluation in a professional setting

Audience: Undergraduate

FOOD SCI 375 – SPECIAL TOPICS

1-3 credits.

Subjects of current interest to undergraduates.

Requisites: None

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Fall 2024

Learning Outcomes: 1. Explain concepts relating to a special topic outlined in the title

Audience: Undergraduate

FOOD SCI 378 – PRECISION FERMENTATION FOR SUSTAINABLE FOODS AND PRODUCTS

2 credits.

Introduction to principles of precision fermentation, genetic tools used to manipulate the organisms involved in precision fermentation, food and non-food applications of precision fermentation. Topics such as: sustainable manufacturing of alternative proteins, food colorants, artificial sweeteners, amino acids, vitamins, flavoring and blending agents in alternative protein formulations, fatty acids, non-food chemicals of industrial importance, and sustainable feedstocks. Comparison of precision fermentation to traditional fermentations including whiskey, rum and bourbon.

Requisites: None**Repeatable for Credit:** No**Last Taught:** Spring 2025**Learning Outcomes:** 1. Describe the concept of precision fermentation.
Audience: Undergraduate

2. List and explain examples of precision fermentation.

Audience: Undergraduate

3. Outline and analyze the tools used to manipulate the microorganisms used in precision fermentation.

Audience: Undergraduate

4. Describe the processes deployed to produce foods and non-food products derived by precision fermentation.

Audience: Undergraduate

5. Outline the sustainability aspects of precision fermentation and the feedstocks used.

Audience: Undergraduate

6. Compare and contrast traditional and precision fermentations.

Audience: Undergraduate

FOOD SCI 399 – COORDINATIVE INTERNSHIP/COOPERATIVE EDUCATION

1-8 credits.

An internship under guidance of a faculty or instructional academic staff member in the Food Science department and a internship site supervisor. Students are responsible for arranging the work and credits with the faculty or instructional academic staff member and the internship site supervisor.

Requisites: Consent of instructor**Course Designation:** Level - Advanced

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Workplace - Workplace Experience Course

Repeatable for Credit: Yes, unlimited number of completions**Last Taught:** Spring 2025**Learning Outcomes:** 1. Apply concepts learned in coursework to authentic professional situations

Audience: Undergraduate

2. Demonstrate professional skills appropriate for the industry

Audience: Undergraduate

3. Identify and reflect on how concepts learned in coursework apply to specific work settings and situations

Audience: Undergraduate

FOOD SCI 400 – STUDY ABROAD IN FOOD SCIENCE

1-6 credits.

Provides an area equivalency for courses taken on Madison Study Abroad Programs that do not equate to existing UW courses.

Requisites: None**Repeatable for Credit:** Yes, unlimited number of completions**FOOD SCI 410 – FOOD CHEMISTRY**

3 credits.

Nature and chemical behavior of food constituents including proteins, lipids, carbohydrates, water, and enzymes.

Requisites: FOOD SCI 301, CHEM 343, and (BIOCHEM 501 or concurrent enrollment)**Course Designation:** Breadth - Biological Sci. Counts toward the Natural Sci req

Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No**Last Taught:** Fall 2024**Learning Outcomes:** 1. Clarify the physical and chemical principles of water, proteins, carbohydrates, and lipids in foods

Audience: Undergraduate

2. Use the principles of food chemistry to describe and alter the behavior of foods

Audience: Undergraduate

3. Hypothesize how chemical reactivity affects food properties

Audience: Undergraduate

FOOD SCI 412 – FOOD ANALYSIS

4 credits.

Application of quantitative techniques to the determination of composition and quality of food products.

Requisites: (STAT 301 or 371) and FOOD SCI 410

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Choose appropriate analytical techniques to determine the composition of foods

Audience: Undergraduate

2. Clarify the underlying principles of food analytical methods

Audience: Undergraduate

3. Integrate basic statistical methods into experimental data analysis

Audience: Undergraduate

4. Assemble effective written and oral communications regarding composition of food

Audience: Undergraduate

FOOD SCI 432 – PRINCIPLES OF FOOD PRESERVATION

3 credits.

Fundamentals of food preservation methods: post-harvest, thermal processing, refrigeration and freezing, control of water activity, chemical preservation, nonthermal methods and control of food packaging.

Requisites: MICROBIO/FOOD SCI 325, FOOD SCI 410, and 440

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Clarify the mechanisms of food spoilage and how to inhibit them

Audience: Undergraduate

2. Predict how food quality is affected throughout product lifecycle

Audience: Undergraduate

3. Differentiate preservation methods appropriate for foods, including "natural" foods

Audience: Undergraduate

4. Critique relevant scientific literature to explain food preservation principles

Audience: Undergraduate

5. Assemble effective written and oral communications regarding food preservation

Audience: Undergraduate

FOOD SCI 437 – FOOD SERVICE OPERATIONS

4 credits.

Fundamentals, principles, and practices of the United States Food Systems, Food Service, and Food Service Management. Introduction to the food service industry as applied in diverse settings, including but not limited to schools, hospitals and restaurants.

Requisites: FOOD SCI 301 and declared in Nutritional Sciences BS or BS-Nutrition and Dietetics

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Assess the impact of a public policy position on the nutrition and dietetics profession

Audience: Undergraduate

2. Explain the process involved in delivering quality food and nutrition services

Audience: Undergraduate

3. Apply management theories to the development of programs or services

Audience: Undergraduate

4. Evaluate a budget/financial management plan and interpret financial data

Audience: Undergraduate

5. Apply principles of human resource management to different situations

Audience: Undergraduate

6. Apply safety and sanitation principles related to food, personnel and consumers

Audience: Undergraduate

FOOD SCI 440 – PRINCIPLES OF FOOD ENGINEERING

3 credits.

Application of engineering principles in the analysis of food process operations: properties of gases and vapors, psychrometrics, material and energy balances, fluid flow, heat transfer, microwave heating, mass transfer, packaging film permeability, dehydration.

Requisites: FOOD SCI 301, (MATH 217 or 221), and (PHYSICS 201 or 207)

Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req

Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Apply the conservation equations (mass, energy, momentum) to food processes including those with reactions and unsteady state operation

Audience: Undergraduate

2. Apply the transport equations (mass, energy, and momentum, including food rheology) to food processes

Audience: Undergraduate

3. Apply concepts of thermodynamics to food systems: 1st law, 2nd law, gas laws, and psychrometrics

Audience: Undergraduate

4. Explain the theoretical basis for rheology and use rheological approaches to solve problems in food processing and product quality evaluation

Audience: Undergraduate

FOOD SCI/AN SCI/DY SCI/SOIL SCI 472 – ANIMAL AGRICULTURE AND GLOBAL SUSTAINABLE DEVELOPMENT

1 credit.

Examines issues related to global agriculture and healthy sustainable development. Using a regional approach and focusing on crops and livestock case studies, students will learn the interdependence between US agriculture and agriculture in emerging economies. Some topics covered include population and food, immigration, the environment; crop and livestock agriculture; global trade; sustainability; food security, the role of women in agriculture, and the role of dairy products in a healthy diet.

Requisites: None

Repeatable for Credit: No

Last Taught: Spring 2024

Learning Outcomes: 1. Apply sustainability principles and/or framework to addressing the challenge of feeding an increasing world population sustainably.

Audience: Undergraduate

2. Define and characterize sustainability, sustainable agriculture and Sustainable Development

Audience: Undergraduate

3. Analyze the contributions of animal agriculture to the Sustainable Development Goals both in developing and developed countries.

Audience: Undergraduate

4. Explain the social, economic, and/or environmental dimensions of the sustainability challenges of diverse animal agricultural systems both in developing and developed countries.

Audience: Undergraduate

5. Evaluate the role of livestock in communities where poverty, hunger and marginalization are embedded as a way of life.

Audience: Undergraduate

6. Critically evaluate the causes of –and ways to break– the chains of hunger and poverty among the poorest of the poor.

Audience: Undergraduate

FOOD SCI/AN SCI/DY SCI/SOIL SCI 473 – INTERNATIONAL FIELD STUDY IN ANIMAL AGRICULTURE AND SUSTAINABLE DEVELOPMENT

2 credits.

Examines issues related to global agriculture and healthy sustainable development. Using a regional approach and focusing on crops and livestock case studies, students will learn the interdependence between US agriculture and agriculture in emerging economies. Some topics covered include population and food, immigration, the environment; crop and livestock agriculture; global trade; sustainability; and the role of women in agriculture and the role of dairy products in a healthy diet.

Requisites: DY SCI/AN SCI/FOOD SCI/SOIL SCI 472

Repeatable for Credit: No

Learning Outcomes: 1. Improve communication and interpersonal skills associated with participating in team-based intercultural experiences

Audience: Undergraduate

2. Be better prepared for professional success in an interconnected world by navigating unfamiliar cultural norms and societal differences

Audience: Undergraduate

3. Reflect on US-centric personal and cultural values while building an appreciation and respect for the Latin America culture.

Audience: Undergraduate

4. Explain the social, economic, and/or environmental dimensions of the sustainability challenge of alleviating poverty and malnutrition in Mexico

Audience: Undergraduate

5. Apply sustainability principles and/or framework to addressing the challenge of fostering prosperity in marginalized indigenous communities

Audience: Undergraduate

6. Analyze both from their own disciplinary lens and from an interdisciplinary lens the contributions of dairy farming to the Sustainable Development Goals

Audience: Undergraduate

7. Evaluate the sustainability of subsistence, market-oriented, and industrial-scale farming systems

Audience: Undergraduate

FOOD SCI 511 – CHEMISTRY AND TECHNOLOGY OF DAIRY PRODUCTS

3 credits.

Chemistry of milk components (i.e. protein, lipids, carbohydrate, salts, enzymes) with an emphasis on chemical and physical changes that occur during the manufacture of a range of milk products (i.e. ice cream, butter, cheese). Dairy technology and microbiological quality.

Requisites: FOOD SCI 410

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Describe the composition of milk and identify the approximate content, individual types present and main features of the main components

Audience: Undergraduate

2. Integrate their knowledge of food chemistry, physical properties and microbiology to understand the processing of dairy products

Audience: Undergraduate

3. Use knowledge of the chemistry of dairy components (proteins, fats, lactose, salts) to evaluate the impact of processing conditions (e.g. heat, pH) on milk and dairy products

Audience: Undergraduate

4. Describe the contribution of dairy foods to the diet including milk constituents with possible physiological roles

Audience: Undergraduate

5. Explain how dairy products (such as fluid milk, yogurt, butter, powder, cheese) are made and the key functions of the processing steps involved

Audience: Undergraduate

FOOD SCI 514 – INTEGRATED FOOD FUNCTIONALITY

4 credits.

Molecular basis of food functional properties; impact of ingredients and processing on functional properties (texture, flavor, nutrition and structure); design of new or reformulating foods to meet specific quality expectations.

Requisites: FOOD SCI 602

Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req

Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Explain the chemical and physical basis for interactions taking place between food components and how these influence the properties of food structures

Audience: Undergraduate

2. Relate the quality of foods to the chemical composition, processing and potential for changes or reactions to occur during storage (includes physical, chemical, biochemical, and microbial reactions/changes)

Audience: Undergraduate

3. Select food ingredients that give specific functional benefits for use in product development, product reformulation, or problem-solving situations

Audience: Undergraduate

4. Apply sensory and rheological methods of evaluation in analysis of foods (e.g., Quality Control), product development, or reformulation of existing products

Audience: Undergraduate

5. Design and perform a shelf-life test (including normal storage conditions and accelerated tests) and be able to apply statistical approaches to determine acceptable shelf-life of products made with different ingredients/processing conditions/storage situations

Audience: Undergraduate

6. Assemble effective written and oral communications regarding food structure and functionality

Audience: Undergraduate

FOOD SCI/AN SCI 515 – COMMERCIAL MEAT PROCESSING

2 credits.

Principles and procedures in the commercial manufacture of processed meat products; sausage manufacturing, curing, smoking, freezing and packaging.

Requisites: AN SCI/FOOD SCI 305, FOOD SCI 410, or graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Summarize the various chemical and physical properties of meat and non-meat ingredients used to manufacture processed meats

Audience: Both Grad & Undergrad

2. Formulate various processed meats in compliance with governmental regulations

Audience: Both Grad & Undergrad

3. Identify basic meat processing principles

Audience: Both Grad & Undergrad

4. Demonstrate the ability to determine if a thermal processing procedure will produce a safe product

Audience: Graduate

5. Recognize how various types of meat processing equipment operate

Audience: Both Grad & Undergrad

6. Summarize proper cleaning and sanitation procedures

Audience: Both Grad & Undergrad

FOOD SCI 532 – INTEGRATED FOOD MANUFACTURING

4 credits.

Procedures used to process and preserve foods on a commercial basis, with emphasis on concentration, dehydration and fractionation process, plant sanitation/GMP, statistical process control, and environmental impacts.

Requisites: FOOD SCI 432 or (BSE 461 or concurrent enrollment)

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Explain the unit operations of food processing technologies (concentration, dehydration, extrusion, etc.) and various ancillary food equipment (pumps, heat exchangers, etc.), including performing engineering calculations as appropriate

Audience: Undergraduate

2. Apply the key elements of food quality assurance, including analyzing and, writing and implementing Hazard Analysis and Critical Control Points plans in a food processing situation (includes prerequisite programs like Good Manufacturing Practice and Sanitation Standard Operating Procedure)

Audience: Undergraduate

3. Set up and maintain a process control chart, design an effective sampling plan for a food processing/distribution environment, and effectively evaluate whether a process is in control

Audience: Undergraduate

4. Identify weaknesses (and solutions) in existing Sanitation Standard Operating Procedure plans and design defensible new plans for cleaning and sanitation protocols in food processing operation, analyze existing plans and design new plans for cleaning and sanitation protocols in food processing operations

Audience: Undergraduate

5. Explain the effects of processing operations on shelf stability and be able to calculate shelf life of foods based on kinetics of microbial, chemical and physical changes during storage

Audience: Undergraduate

6. Explain the main steps in water and waste treatment as important to food processing operations

Audience: Undergraduate

7. Apply basic concepts of reaction engineering and reaction kinetics to food processing systems

Audience: Undergraduate

FOOD SCI 535 – CONFECTIONERY SCIENCE AND TECHNOLOGY

3 credits.

Through a combination of on-line lectures, classroom activities, evaluation of commercial samples and discovery-based labs, the science and technology of confections from hard candy to chocolate will be covered.

Requisites: FOOD SCI 410 and FOOD SCI 432

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Describe processing methods for confectionery production

Audience: Undergraduate

2. Describe the typical ingredients used in confections

Audience: Undergraduate

3. Explain how ingredients and processing conditions interact to create quality confections with adequate shelf stability

Audience: Undergraduate

4. Apply scientific principles to confectionery production and storage

Audience: Undergraduate

5. Explain effects of processing and storage conditions on shelf life of confections

Audience: Undergraduate

6. Analyze, diagnose, and propose solutions for problems in production and shelf life of confections based on the appropriate scientific principles

Audience: Undergraduate

7. Communicate scientific results clearly and concisely

Audience: Undergraduate

FOOD SCI 550 – FERMENTED FOODS AND BEVERAGES

2 credits.

Chemistry, microbiology, and technology of foods and beverages in which fermentations are important (e.g. cheese, bread, pickles, beer). Fermentation techniques in developing new foods and food additives. Instrumentation and mechanization of food fermentations.

Requisites: FOOD SCI 150**Course Designation:** Breadth - Biological Sci. Counts toward the Natural Sci req

Level - Intermediate

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No**Last Taught:** Spring 2025**Learning Outcomes:** 1. Identify important biochemical pathways in the production of fermented foods and beverages

Audience: Undergraduate

2. Identify factors contributing to sensory qualities of fermented foods and beverages

Audience: Undergraduate

3. Evaluate the importance of chemical constituents for fermentation substrates and ingredients in fermentation

Audience: Undergraduate

4. Explain how starting ingredients are processed and how processing impacts fermentation and the final product

Audience: Undergraduate

5. Describe the production process of fermented vegetables, cheese, beer and wine

Audience: Undergraduate

6. Demonstrate knowledge about microbial species, biochemical pathways, and fermentation factors in the production of fermented foods and beverages by reviewing current research

Audience: Undergraduate

7. Discuss and explain how a wide variety of fermented foods and beverages are produced from a few basic ingredients

Audience: Undergraduate

FOOD SCI 551 – FOOD FERMENTATION LABORATORY

1 credit.

Offers the opportunity to learn to produce fermented beverages and dairy products in laboratory and scalable production facilities. Designed to introduce the chemical and physical basis for development of specific characteristics associated with individual styles of products as well as analytical methods to qualify those characteristics. Enrollment limited to students 21 years of age or older

Requisites: FOOD SCI 550 or concurrent enrollment**Repeatable for Credit:** No**Last Taught:** Spring 2025**Learning Outcomes:** 1. Utilize laboratory tools to evaluate chemical constituents of fermented foods and beverages

Audience: Undergraduate

2. Apply knowledge of yeast and bacteria fermentations to the production of foods and beverages

Audience: Undergraduate

3. Communicate research results and knowledge of fermented foods to a scientific audience

Audience: Undergraduate

FOOD SCI 602 – SENIOR PROJECT

2 credits.

Part one of senior capstone requirement. Working as teams, students conduct research around a problem pertinent to the food industry. Weekly discussions plus laboratory. Data collection and analysis and report writing are critical components of this course.

Requisites: FOOD SCI 412 and 432**Repeatable for Credit:** No**Last Taught:** Fall 2024**Learning Outcomes:** 1. Define a hypothesis or project objective(s); identify appropriate testing and analysis methodology, generate or collect original data, critically analyze results, provide a thorough explanation of results and a clear and concise research paper

Audience: Undergraduate

2. Communicate project work in written format

Audience: Undergraduate

3. Provide effective feedback of project progress

Audience: Undergraduate

4. Conduct independent projects with guidance

Audience: Undergraduate

FOOD SCI 603 – SENIOR SEMINAR

1 credit.

Part two of senior capstone requirement. Students will present data gathered and analyzed as part of the senior project.

Requisites: FOOD SCI 602

Course Designation: Gen Ed - Communication Part B

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Communicate project work in oral and written format

Audience: Undergraduate

2. Communicate project results effectively

Audience: Undergraduate

3. Provide effective assessment of project results

Audience: Undergraduate

FOOD SCI 611 – CHEMISTRY AND TECHNOLOGY OF DAIRY PRODUCTS

3 credits.

Chemistry of milk components (i.e. protein, lipids, carbohydrate, salts, enzymes) with an emphasis on chemical and physical changes that occur during the manufacture of a range of milk products (i.e. ice cream, butter, cheese). Dairy technology and microbiological quality.

Requisites: FOOD SCI 410 or graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Describe the composition of milk and identify the approx. content, individual types present and main features of the main components

Audience: Both Grad & Undergrad

2. Integrate knowledge of food chemistry, physical properties, and microbiology to describe the processing of dairy products

Audience: Both Grad & Undergrad

3. Use knowledge of the chemistry of dairy components (proteins, fats, lactose, salts) to evaluate the impact of processing conditions (e.g. heat, pH) on milk and dairy products

Audience: Both Grad & Undergrad

4. Describe the contribution of dairy foods to the diet including milk constituents with possible physiological roles

Audience: Both Grad & Undergrad

5. Explain how dairy products (such as fluid milk, yogurt, butter, powder, cheese) are made and the key functions of the processing steps involved

Audience: Both Grad & Undergrad

6. Discuss hot topics related to dairy foods

Audience: Graduate

7. Evaluate the scientific status of dairy's role or contribution to nutrition, sustainability, and functionality with reference to current scientific literature on these topics

Audience: Graduate

FOOD SCI 681 – SENIOR HONORS THESIS

2-4 credits.

Individual study for majors completing theses for Honors degrees as arranged with a faculty member.

Requisites: Consent of instructor

Course Designation: Honors - Honors Only Courses (H)

Repeatable for Credit: No

Last Taught: Fall 2013

Learning Outcomes: 1. Review and analyze scientific literature

Audience: Undergraduate

2. Identify and use appropriate research methodologies to address a research question

Audience: Undergraduate

3. Begin structuring and writing a thesis based on original research

Audience: Undergraduate

FOOD SCI 682 – SENIOR HONORS THESIS

2-4 credits.

Second semester of individual study for majors completing theses for Honors degrees as arranged with a faculty member.

Requisites: Consent of instructor

Course Designation: Honors - Honors Only Courses (H)

Repeatable for Credit: No

Last Taught: Spring 2014

Learning Outcomes: 1. Review and analyze scientific literature

Audience: Undergraduate

2. Identify and use appropriate research methodologies to address a research question

Audience: Undergraduate

3. Write a thesis based on original research

Audience: Undergraduate

FOOD SCI 699 – SPECIAL PROBLEMS

1-3 credits.

Individual advanced work in an area of Food Science under the direct guidance of a faculty member.

Requisites: Consent of instructor

Course Designation: Level - Advanced

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2025

Learning Outcomes: 1. Develop critical, analytical, and independent thinking skills

Audience: Undergraduate

2. Apply the scientific method and engage in constructive problem solving

Audience: Undergraduate

3. Demonstrate application of research skills and methodologies

Audience: Undergraduate

4. Effectively communicate findings

Audience: Undergraduate

FOOD SCI/AN SCI 710 – CHEMISTRY OF THE FOOD LIPIDS

2 credits.

Chemical constitution, structures, reactions, stereochemistry of fats, phospholipids, related compounds; methods of isolation, characterization; synthesis; relation of structure to physical properties.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2021

Learning Outcomes: 1. Write a clear and concise research paper
Audience: Graduate

2. Improve oral communication by presenting major points of the research paper
Audience: Graduate

3. Utilize software to illustrate a protein containing a bound lipid at atomic resolution.
Audience: Graduate

4. Explain lipid functions in relation to varying environmental conditions and electron transfer reactions
Audience: Graduate

5. Develop a detailed understanding of lipid analysis, lipid synthesis as well as digestion and transport of dietary lipids in different vertebrates.
Audience: Graduate

6. Derive the likely volatiles to be generated during storage of any unsaturated fatty acid using the beta-scission of a linoleic acid hydroperoxide as a template
Audience: Graduate

7. Determine if a given reaction is thermodynamically favorable based on standard one-electron reduction potentials and concentrations of reactants (oxidized/reduced couples)
Audience: Graduate

FOOD SCI/AN SCI 711 – FOOD BIOCHEMISTRY

3 credits.

Explores methods for interrogating structure-function relationships, molecular profiles, and microstructure of foods. Provides hands-on experience using computational approaches to model protein-small molecule interactions, analysis of small molecules using high-resolution MS, and protein composition and morphology with fluorescence spectroscopy and microscopy. Knowledge of food chemistry or organic chemistry (such as FOOD SCI 410, CHEM 341, 343, or 345) required.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Critically evaluate recent literature in the field of food chemistry
Audience: Graduate

2. Illustrate the interactions between food molecules (lipids, protein, carbohydrates, bioactive) at atomic resolution using software.
Audience: Graduate

3. Analyze and differentiate the molecular composition of a food or ingredient using HPLC-MS/MS data; fluorescence spectroscopy; and microscopy
Audience: Graduate

4. Propose and analyze how reactions and physical changes affect food microstructure and composition
Audience: Graduate

FOOD SCI 725 – ADVANCED FOOD MICROBIOLOGY

3 credits.

Principles and problems covering fundamental concepts in Food Microbiology; application of concepts in fermentation, pathogenesis, and gut health; development and control of a sustainable and safe food and fiber system.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2024

Learning Outcomes: 1. Analyze common mechanisms of foodborne microbial pathogenesis and immune responses to foodborne infections
Audience: Graduate

2. Critically evaluate treatment, control, and detection strategies for foodborne pathogens
Audience: Graduate

3. Evaluate primary research articles, identify problems related to the experimental approach, (interpretation of) data and/or discussion, and develop solutions to the identified problems
Audience: Graduate

4. Describe emerging trends, drivers and impacts of sustainable food systems
Audience: Graduate

5. Explain the process of fermentation and probiotic mechanism of action
Audience: Graduate

FOOD SCI 799 – PRACTICUM IN FOOD SCIENCE TEACHING

1-3 credits.

Teaching experience for PhD candidates.

Requisites: Consent of instructor

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2019

Learning Outcomes: 1. Explain current manufacturing practices through experiential learning
Audience: Graduate

FOOD SCI 875 – SPECIAL TOPICS

1-3 credits.

New graduate and courses of current interest.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2023

Learning Outcomes: 1. Explain concepts relating to a special advanced topic outlined in the title
Audience: Graduate

FOOD SCI 900 – SEMINAR ADVANCED

1 credit.

Research literature and current departmental research.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2025

Learning Outcomes: 1. Identify and summarize key aspects of scientific rigor and reproducibility, including determination of sample size, statistical significance, measures of outliers, and experimental replicates
Audience: Graduate

2. Describe the features of high-quality presentations and best practices in scientific data/information interpretation
Audience: Graduate

3. Apply and demonstrate best practices in the effective presentation of complex data/information to diverse scientific audience
Audience: Graduate

FOOD SCI 990 – RESEARCH

1-12 credits.

Full lab and literature review of a problem in food science. Leads to preparation of thesis and publication.

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2025

Learning Outcomes: 1. Devise an engaging overview of a research area
Audience: Graduate

2. Explain background, methods, results, and a discussion of experimental data
Audience: Graduate

3. Design charts/tables that effectively communicate data
Audience: Graduate

4. Assess peers on the effectiveness of a scientific presentation
Audience: Graduate

5. Generate goals to improve presentation skills
Audience: Graduate