FOOD SCIENCE (FDSC)

FDSC 1101 - Science and Technology of Foods (1 Credit)
Explores the application of science and technology to foods. Lectures elucidate the role of engineering, biotechnology, chemistry, biochemistry, nutrition, toxicology, and microbiology in supplying the world with safe and nutritious food. An overview of food science as a discipline and career choice is given. A laboratory exercise in food development is undertaken.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Identify and describe the subdisciplines of food science, and the importance of interdisciplinary interaction in the food industry and academia.
- Identify and describe basic concepts in Food Science.
- Explain how commercial ice cream is made.
- Be able to explain basic ingredient functionality in the context of ice cream formulation and production.
- Evaluate how foods and Food Science have an impact on our everyday lives.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 1102 - Leadership and Career Skills in Food Science (2 Credits)
A successful career in food science demands integrating technical knowledge with professionalism and leadership skills. This course utilizes principles in Food Science, self-assessment, industry case studies, and hands on activities to grow students' skills in leadership, team building, networking, and professional readiness.
Prerequisites: FDSC 1101.
Enrollment Information: Enrollment limited to: first-year, second semester Food science majors.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Demonstrate the ability to work independently and in teams.
- Describe social and cultural competence relative to diversity and inclusion.
- Discuss examples of ethical issues in food science.
- Employ knowledge of biology, chemistry, and physics in understanding principles of food science.
- Examine your personality type, strengths, and team building skills.
- Develop strong working relationships with your Food Science classmates.
- Grow your professionalism skills, including science communication, networking, and team-based technical problem solving.
- Communicate effectively with Cornell Food Science Members & Advocates.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 1200 - Farm to Label (3 Credits)
Farm to Label will focus on contemporaneous topics in agriculture and food science covering an eclectic array of areas including the history, technology and products that are part of the food supply. Farm to Label is a dynamic course designed to provide students with a comprehensive understanding of the sustainable agricultural practices and food production processes that underpin the modern food industry. This course delves into critical topics such as agricultural systems, environmental sustainability, food safety, quality control, and marketing strategies. Weekly topics will include: (1) Evolution of things like fire, cooking and meat-eating (2) Historical pathways will be covered on products such as salt, spices and spam (3) Technological advances such as pasteurization, high pressure processing and consumer level technology.
Distribution Requirements: (AFS-AG, SCH-AG)
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024
Learning Outcomes:

- After this course students should be able to examine the historical evolution of key food ingredients, processing techniques, and product innovations, highlighting their cultural, geographic, and chronological significance.
- After this course students should be able to identify and analyze the historical and cultural contexts that have shaped the development of specific food products, from their origins to contemporary production.
- After this course students should be able to articulate research and findings in both written and oral formats, effectively conveying historical insights and their relevance to the modern farm-to-label industry.
- After this course students should be able to analyze the key principles of sustainable agriculture and their application to the farm-to-label supply chain, including organic farming practices, biodiversity preservation, and soil health management.
- After this course students should be able to assess the environmental impacts associated with various stages of food production, from cultivation and harvesting to processing, packaging, and distribution.
- After this course students should be able to analyze complex problems in the farm-to-label supply chain, identifying key issues related to sustainability, quality control, and regulatory compliance.
- After this course students should be able to evaluate data, research, and information relevant to the farm-to-label industry, critically assessing sources and their credibility.
- After this course students should be able to demonstrate the ability to think creatively and propose innovative solutions for improving the efficiency, sustainability, and quality of farm-to-label processes.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 1500 - Food Choices and Issues (2 Credits)
The goals of this course are to help students make healthier and safer food choices and critically evaluate contemporary food issues. Topics include: food systems, federal dietary guidelines, relationships between diet and health, the obesity epidemic, vegetarian diets, and the role of food processing and biotechnology in feeding an expanding global population. Contemporary issues related to nutrition and food safety, including food ethics, genetically engineered foods, food allergens, world hunger, and the environmental impact and systainability of food systems are discussed. Students analyze the nutritional quality of their personal diets using Food Tracker and USDA's on-line diet analysis software.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Identify healthy and safe food choices.
- Examine fundamental nutrition concepts necessary for selecting healthy diets and interpreting nutrition literature.
- Discuss the impact of modern food science and technology on food choices.
- Develop a greater awareness and understanding of the factors that influence perceptions of contemporary food issues.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 2000 - Introduction to Physiochemical and Biological Aspects of Foods (3 Credits)
Crosslisted with NS 3450
Comprehensive introduction to the physical, chemical, and nutritional properties of foods and to the principles and practice of food science and technology. Topics include chemistry and functionality of commodities and ingredients, chemical, physical and biological phenomena that affect food quality, techniques of processing and preservation, microbiology and fermentation, food safety, regulation, and contemporary issues.
Prerequisites: college-level courses in general chemistry and biology; organic chemistry or concurrent registration.
Distribution Requirements: (AFS-AG, BSC-AG, OPHLS-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:
- Demonstrate the ability to define parameters that collectively determine the quality of foods, and describe the chemical, biochemical, and biological phenomena that impact quality parameters.
- Demonstrate the ability to link the functionality of food ingredients with their chemical and physical, nutritional, and biological characteristics in the context of specific foods or categories of foods.
- Identify and describe the physicochemical and biological phenomena that underlie the major methods of food preservation, and recognize foods whose quality is extended by the use of such methods.
- Demonstrate the ability to independently locate authoritative information on food regulation and composition, and on contemporary issues of national and international importance using federal web-based resources.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 2100 - Food Analysis (2 Credits)
Introduces basic analytical techniques for food analysis and other biological analysis. Emphasizes fundamental principles of analytical chemistry, basic laboratory techniques, and modern instrumental methods. Discusses gravimetric, volumetric, and spectrophotometric methods, gas chromatography, high-performance liquid chromatography, infrared spectra, and atomic absorption spectrometry.
Prerequisites: CHEM 2070 and CHEM 1570 or equivalent.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Describe the principles of food analysis methods.
- Perform basic laboratory techniques in quantitative analysis.
- Write a report, interpret and explain the results obtained in the laboratory.
- Select official methods for food analysis and perform the assays.
- Integrate and apply core competencies in Food Chemistry and Analysis to solve/explain food analysis problems.
- Apply the problem solving and systems analysis skills described above to new situations.
- Present an oral report on the nutritional label of a complex food product.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 2110 - Food Analysis Laboratory (2 Credits)
The experiments conducted in Food Analysis lab provide context for the application of principles of food analysis. Students will analyze complex food products for lipids, minerals, carbohydrates, proteins and other components, and through this process, hone their basic lab skills, including organization and time management. Experiments are designed to introduce a variety of techniques commonly used in food science and nutrition analytical labs. The techniques, process, and problems presented to students in this lab will have application for career paths in product development, research and development, quality control, food safety, and industry regulations, among others.
Prerequisites: CHEM 1570 and CHEM 2070 or equivalent.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Work safely and confidently in a food analysis lab setting.
- Properly sample product for physical and biochemical analysis.
- Work proficiently using procedures and equipment for the physical and biochemical analysis of foods.
- Maintain a clearly organized lab notebook.
- Identify sources of error in scientific analysis of food.
- Communicate results from experiments, clearly identify patterns in results, and interpret their significance and utility.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 2205 - Growing Grapes and Making Wines Laboratory (2 Credits)
Crosslisted with VIEN 2205
Field trips, vineyard and winery work provide opportunities for application of knowledge gained in Grapes to Wines lecture course. Students will produce a wine, from grape harvest determination to cold stabilization. Some winery activities between laboratory sessions plus a two-day field trip expected.
Prerequisites: VIEN 1105. Prerequisite or Corequisite: VIEN 2204.
Enrollment Information: Enrollment preference given to: Viticulture and Enology majors and minors.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Demonstrate wine analytical techniques.
- Identify different grapevine species and cultivars in the vineyard.
- Assess fruit ripening and make good decisions about harvest time.
- Explain each step in winemaking process, including typical procedures used and the scientific rationale for choosing a particular technique from alternatives at each step.
- Produce wines from grape harvest to cold stabilized products.
- Demonstrate wine flavor evaluation and appreciation techniques.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 2206 - Fermentation of Food (1 Credit)
Fermentation of food changed the course of human history. This course will help interested students learn about fermentations, generally, and concentrate on examples within major categories of fermented foods: fruit, vegetable, dairy, soybean, and grain. We will describe the cultures that developed and consume different fermented foods, and how microbes interact with their environments and with each other during food fermentations. Students in the course will develop an overview of the scientific principles and practices behind fermentation, and gain practical experience in sensory evaluation while increasing their enjoyment of foods.
Prerequisites: one college level biology or college level chemistry course.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe the importance of fermentations to human history, health, & cultures.
- Explain basic chemical and biological changes that occur during fermentation of different raw materials.
- Match particular foods with the specific microbes involved in that foods' production.
- Describe the basic microbial ecology of different food fermentations.
- Explain general procedures for production of specific foods.
- Describe the flavor attributes of fermented foods.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 2300 - Culinary Science (1-2 Credits)
Learn the science behind some favorite and new foods. Working with chefs from Cornell Dining, the underlying principles of the foods prepared in class are explained. The final exam is the preparation of a class dinner.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Plan, organize, and prepare a meal for 2 to 12 people.
- Describe composition and functionality of common ingredients used in the kitchen and product development lab.
- Explain how cooking techniques facilitate ingredient interactions and transform mixtures of ingredients into flavorful foods.
- Implement food safety principles in the kitchen.
- Discuss differences and similarities between food production in a kitchen and food processing on a large scale.
- Identify the scientific disciplines that support the field of food science and the food industry broadly.
- Describe the importance of reductive perspectives in Food Science.
- Describe the importance of systems-wide perspectives in Food Science.
- Discuss challenges and opportunities facing our evolving food systems.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 2310 - The Science and Technology of Beer (1 Credit)
Crosslisted with VIEN 2310
This course uses beer and brewing science as a starting point to explore topics in fermentation biology, food chemistry, food processing, and sensory perception. Students will learn to recognize the major sensory and chemical features that distinguish different beer styles or defects, and understand how raw materials and choices during production lead to these outcomes. Several guest lectures, including brewers and producers of raw materials, will also be included.
Prerequisites: introductory biology and chemistry, or permission of instructor.
Course Fee: Course Fee, $25. Tasting fee: will be applied to student bursar bill.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Spring 2022
Learning Outcomes:

- Differentiate between the basic physiological senses of human perception of foods and beverages. Describe how these senses are utilized to perceive the qualities of foods and beverages.
- Describe some of the fundamental principles of odor and taste perception.
- Summarize the key steps in the brewing process, and contrast these steps to other fermentations
- Explain the role of the major components of beer (water, malt, hops, yeast), and the choices that brewers have in their use and source.
- Describe the sensory properties of major beer styles and explain how they differ in production practices and chemical composition.
- Explain how different microorganisms can positively or negatively affect the quality of beer.
- Summarize the positive health impacts of moderate beer consumption and contrast these benefits with the negative health impacts of alcohol misuse/abuse. Also differentiate between the current treatment options for alcohol use disorders.
- Summarize ongoing and emerging technological challenges to the brewing industry.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 2360 - Distillation Principles and Practices (1 Credit)
Crosslisted with VIEN 2360
As an introduction to the science of distillation this course uses the study of pre-fermentation and fermentation biology, phase separation and vapor-liquid equilibrium, and sensory perception as a vehicle to explore the role of science and technology in the production and enjoyment of distilled beverages. Sensory samples and commercial samples of spirits will be used to illustrate the sensory properties and chemical components which define different types of distilled spirits, with the goal of understanding how different raw materials, processing, and aging impact these sensory properties.
Prerequisites: introductory biology and chemistry, or permission of instructor.
Course Fee: Course Fee, $50. Tasting fee: will be applied to student bursar bill.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Summarize the key physical laws involving gasses and liquids which are pertinent to distilling.
- Summarize the key steps in the distillation process and contrast these steps to other fermented beverages.
- Explain the role of the raw materials (grains, fruits, and other agricultural products, barrels, etc.) in alcoholic beverage distillation and the choices that distillers have in their use and source.
- Summarize how the type of still and distillation process options impact the sensory properties of the spirit produced.
- Describe the sensory properties of major distilled spirit styles and explain how they differ in production practices and chemical composition.
- Explain how different distillation techniques and aging requirements might impact the method of consumption of distilled spirits and cocktails (mixed, over ice, neat, etc.).
- Describe ongoing and emerging technological, economic, and social challenges to the distilled spirits industry.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 2400 - Wines and Grapes: Composition and Analysis (2 Credits)
Crosslisted with VIEN 2400
Investigates the composition of grapes and wine and the most common analytical tools used in their evaluation. Both the theoretical and practical aspects of grape and wine analyses are considered.
Prerequisites: one semester of chemistry.
Enrollment Information: Enrollment preference given to: Viticulture and Enology and Food Science majors.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Interpret commonly measured quantitative and qualitative metrics relevant to grapegrowing and winemaking and their utility in wine (grape) production (the WHY?).
- Evaluate advantages and disadvantages of different methodologies for measuring wine and grape components, including methods that you have no prior experience with (the WHAT?).
- Demonstrate proficiency with routine protocols in wine and grape analysis, in preparation for later VIEN courses, internships, research, etc... (the HOW?).

Schedule of Classes (https://classes.cornell.edu/)

FDSC 3290 - International Agribusiness Study Trip (2 Credits)
Crosslisted with AEM 3290
Last Four Terms Offered: Spring 2023, Spring 2019, Spring 2017, Spring 2015
Schedule of Classes (https://classes.cornell.edu/)

FDSC 3920 - Food Systems Microbiology (2 Credits)
The focus of the course will be on food systems and how microbiology impacts the safety and quality of food products. The course will address issues of food product development, quality, safety, and the impact of the microbiome of foods on the individuals that consume it. Topics will include: establishing a product and environmental sampling plan; the impact of raw materials and processing of food shelf-life; food systems approaches to food safety and quality including the economics of raw material selection, processing and packaging; and root cause analysis. Real-world examples will be used to develop critical thinking skills.
Prerequisites: one college-level course in microbiology, or permission of instructor.
Last Four Terms Offered: Spring 2025, Spring 2024
Learning Outcomes:

- Describe the basic principles of food systems microbiology.
- Create and use database platforms for food safety, quality management along with root cause analysis.
- Implement software platforms to create food processing scenarios and collect critical control point data.
- Identify the root causes of out-of-specification events and implement solutions.
- Communicate acquired knowledge from reading selection of the scientific literature.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 3930 - Craft Fermentations (2 Credits)
The course will cover the science and commerce of craft fermentations, focusing on smaller-scale, complex processes. Products will include vinegar, miso and alcoholic beverages. Fermented foods are growing in popularity due to their inherent organoleptic complexity and potential human health benefits. The course will focus on the science of fermentations and invite in a variety of expert practitioners from a range of different companies to offer their perspectives. A different fermented food will be covered each week using examples that highlight complex fermentations which result from a succession of microbial populations during the course of the fermentation.
Last Four Terms Offered: Fall 2024, Fall 2023
Learning Outcomes:

- Describe the basic principles of biochemistry and microbiology that apply to food fermentations.
- Articulate connections between the biochemistry and microbiology for the food fermentation processes.
- Analyze commercial practices in food fermentations.
- Communicate acquired knowledge from scientific literature.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 3940 - Applied and Food Microbiology (3 Credits)
Crosslisted with BIOMI 3940
Food Science 3940 will focus on the origin, transmission, consequences, and management of diverse microbiota throughout the food chain. Topics in this course generally include: 1) the microbiota of different food systems, 2) the physiology, metabolism, and pathogenesis of important groups of microbes, and 3) application of food microbiology to the industrial sector. You will receive a basic education in interdisciplinary subjects that require knowledge of microbiology, food safety, epidemiology, public health, biotechnology, and cell metabolism. Knowledge and expertise gained in this course will support your qualification for a future career in food science, biotechnology, or microbiology.
Prerequisites: BIOMI 2900 and BIOMI 2911.
Distribution Requirements: (AFS-AG, BSC-AG, OPHLS-AG), (BIO-AS)
Last Four Terms Offered: Fall 2024, Summer 2024, Fall 2023, Fall 2022
Learning Outcomes:

- Identify the microbiota relevant to a given food product, process, or environment.
- Describe the causes of and mechanisms behind foodborne disease, fermentation, and spoilage.
- Determine the relevant conditions or measures needed to promote safety, fermentation, or reduce spoilage.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 3950 - Food Microbiology Laboratory (3 Credits)
Work includes study of the physiological characteristics of representative food microorganisms, practice in using general and rapid methods for microbiological testing and control of food products, and practice in the application of a systematic approach to controlling the safety of foods, or addressing a food safety issue.
Prerequisites: BIOMI 2911 or equivalent.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Use different sampling and plating methods to enumerate and identify microorganisms found in food products.
- Test different commodities for legal microbial standards.
- Isolate and culture bacteria used in food fermentations.
- Conduct environmental sampling in a food plant.
- Describe modern technologies used in food microbiology.
- Formulate a hypothesis and propose a protocol to test it.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 3960 - Food Safety Assurance (2 Credits)
Food Science 3960/FDSC 5960 will focus on currently used food safety programs to control biological, chemical and physical hazards and assure the safety of foods. Topics include prerequisite programs such as Current Good Manufacturing Practices and Sanitation Standard Operating Procedures, Hazard Analysis Critical Control Point (HACCP), food safety management systems (SQF) and the application of current technologies in reducing foodborne illness. Upon successful completion of the course, the students will receive 1) General HACCP certification and 2) SQF implementation certification (through a collaboration with SQFI [Safe Quality Foods Institute]). These certificates will allow students to be highly qualified for food safety and quality jobs.
Prerequisites: BIOMI 2900 or permission of instructor.
Course Fee: Course Fee, $135. Includes $60 for GMP certification and $75 for SQF testing and materials.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Develop a HACCP plans for different food industries.
- Describe laws and regulations governing food safety principles (preventive controls for human food/HACCP).
- Identify and discuss industry food safety requirements and certifications: organic, halal, kosher, and Global Food Safety Initiatives.
- Analyze different auditing schemes, and be able to complete internal (first party) audits.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4000 - Capstone Project in Food Science (2 Credits)
This course is designed to provide students with the opportunity to apply Food Science knowledge and skills to solve specific, real life technical problems incurred by food processors. Under the guidance of faculty mentors, teams consisting of 4 - 5 students will act as consultants for local industry partners working with the New York State Food Venture Center (NYSFVC).
Enrollment Information: Enrollment limited to: juniors and seniors majoring in Food Science.
Exploratory Studies: (CU-CEL)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Apply critical thinking, problem solving, and project management skills.
- Develop professional skills and demonstrate business-level interaction.
- Apply and demonstrate proficiency with food science concepts.
- Practice effective communication to diverse groups, including industry, and academic partners.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4010 - Concepts of Food Product Development (2 Credits)
Introduction to topics and events sequence that provide the foundation for development of new food products, building upon knowledge acquired from other food science courses. The course allows students to integrate and apply basic concepts into case-based learning experiences to enhance professional skills, utilizing individual assessments and team-work assignments.
Prerequisites: FDSC 3940, FDSC 4170, and FDSC 4210 or permission of instructor.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Spring 2022
Learning Outcomes:

- Evaluate the complexities/intricacies governing the development of new and improved food products.
- Apply food science and marketing principles to the food product development process
- Identify and apply appropriate food regulations and safety measures to ensure the safety of new products.
- Demonstrate awareness of the variety of product testing protocols available to evaluate food product quality and consumer acceptance.
- Identify challenges associated with various sourcing ingredients, manufacturing venues, distribution channels and diverse consumer preferences and needs.
- Effectively utilize synergistic team-work to solve problems, enhance critical thinking, include diverse viewpoints, and strengthen communication skills.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4040 - Chemistry and Functional Properties of Food Ingredients (2 Credits)
This is a course with an emphasis on understanding the interactions of food ingredients and their role and functionality in the food product. This course is designed to enable students to utilize a step by step problem solving approach to tackle challenges found in the food industry. Examples of these challenges will be presented as case studies obtained from literature and food industry.
Prerequisites: FDSC 4170.
Last Four Terms Offered: Spring 2025, Spring 2023, Spring 2022, Spring 2021
Learning Outcomes:

- Identify properties of various food ingredients based on their chemical composition and associated function.
- Describe techniques that can be utilized to measure food ingredients properties and monitor quality of raw ingredients and final products.
- Explain chemical interactions that occur between ingredients in a food matrix during food processing and storage.
- Recommend suitable food ingredients for a food product based on required processing systems and storage condition.
- Solve food ingredient-related problems and identify healthier ingredients choices.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4050 - Dairy Chemistry (1 Credit)
This course will discuss the general composition of milk, with a special focus on the chemistry and functionality of the high value components of milk (lipids and proteins).
Prerequisites: general chemistry (CHEM 1560, CHEM 2070, and/or CHEM 2080), organic chemistry (CHEM 1570, CHEM 3570, and/or CHEM 3580), and Food Chemistry I (FDSC 4170).
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Students will be able explain the biochemical pathways of milk fat, protein, and lactose are synthesis in the context of the structure and organization of the bovine mammary cell.
- Students will be able to explain how stage of lactation and dairy cow diet changes the chemical structure of milk fat and melting properties of milk fat and texture of dairy products.
- Students will learn the differences in chemical structure of the 5 major proteins in milk and be able to explain how differences structure impact how the proteins interact when subjected to thermal stress, mechanical stress, and pH change.
- Graduate students will be able to explain the relationship between chemical structure and infrared light absorbance of milk to measure the concentration of fat, protein, lactose and fatty acid composition.
- Graduate students will be able to explain the chemical and physical changes that happen to milk fat, protein, and lactose during thermal processing and integrate how those changes impact flavor, appearance and texture of dairy products.
- Graduate students will be able to explain the chemical changes that occur during aging of Cheddar, provolone, and camembert cheeses and express how those changes create the flavor and textural differences among these cheeses.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4100 - Sensory Evaluation of Food (2-3 Credits)
Topics include the sensory evaluation methods used to test the flavor, appearance, and texture of foods by quantitative description and simple difference testing; consumer testing for product acceptability; sensory tests in quality control; strategic product research; and product development. Presents the psychological principles in sensory testing and statistical methods for sensory data analysis. The lab provides firsthand experience in organizing and conducting sensory tests and an introduction to online data collection and analysis.
Prerequisites: statistics course.
Distribution Requirements: (AFS-AG, DLG-AG)
Last Four Terms Offered: Spring 2025, Fall 2024, Fall 2023, Fall 2022
Learning Outcomes:

- Familiarize students with the test methods involved in discrimination, descriptive analysis and consumer sensory testing of food products.
- Examine the types of statistical analyses used to summarize sensory data and to draw conclusions and make recommendations about product characteristics.
- Recognize principles of physiology, psychology and measurement upon which methods of sensory testing are based.
- Delineate how a sensory evaluation provides important information in the product development process.
- Enable students to select the right testing strategy for a given situation.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4110 - Flavor Perception (2 Credits)
The successful preparation of food for personal joy, or culinary and manufacturing profitability is driven by consumer perceptions of flavor, value, nutrition, ecological implications, in that order. Therefore, understanding flavor perception is essential for the creation of successful foods.
Prerequisites: at least one semester each of general chemistry and biology (including material on psychology and physiology). Additional coursework in biochemistry, sensory perception, and psychology is desirable.
Last Four Terms Offered: Spring 2024, Spring 2023, Spring 2022, Spring 2021
Learning Outcomes:

- Define the common terms used in the study of flavor perception and be able to use these terms to illustrate the process of a flavor experience.
- Be able to explain a flavor experience in terms of measurable perceptions and components and be able to discuss the role emotions play in flavor perception.
- Be able to explain how data collected on an individual's flavor perception relates to group behavior (liking, purchasing, and eating).

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4170 - Food Chemistry (3 Credits)
Covers the chemistry of foods and food ingredients. Discusses the chemical and physical properties of water, proteins, lipids, carbohydrates, and other food components and additives in the context of their interactions and functional roles in foods.
Prerequisites: CHEM 1570, BIOMG 3300, or BIOMG 3310.
Distribution Requirements: (PSC-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Summer 2024, Spring 2024, Spring 2023
Learning Outcomes:
- Describe the principal groups of food molecules and recognize their chemical structures.
- Explain the chemistry underlying the properties and reactions of various food components.
- Articulate the general principles that govern the behavior of food materials.
- Describe the chemical reactions that occur during processing and explain how they affect food properties.
- Interpret and communicate complex food chemistry concepts to a lay audience.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4190 - Food Chemistry Laboratory (2 Credits)
Deals with the chemical properties of food components and changes they undergo in processing and storage. Stresses relationships between the chemical composition of foods and functional, nutritional, and sensory properties. Introduces lab techniques commonly used in food research. Requires a lab research project that involves writing a research proposal for the project, conducting laboratory research to test hypotheses described in the proposal, analyzing the data, and writing a paper following the format used by the Journal of Food Science.
Prerequisites: BIOMG 3300 or BIOMG 3310 or CHEM 1570 or equivalent.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Describe the chemical/biochemical reactions amongst various food components and how they influence food quality.
- Conduct and record laboratory experiments following a specific protocol with minimal supervision.
- Summarize the chemical principles underlying each laboratory exercise.
- Interpret, communicate, and critically evaluate the results in a scientific manner bot written and orally.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4210 - Food Engineering Principles (4 Credits)
Introduces the engineering principles underlying food processes and equipment with an emphasis on their utility in manufacturing operations. Focus is on applications of engineering concepts and transport phenomena to unit operations and process development. Topics include the fundamental principles of thermodynamics, mass and energy balance, fluid mechanics, heat and mass transport, refrigeration, and psychrometrics.
Prerequisites: FDSC 2000 and introductory physics.
Last Four Terms Offered: Fall 2024, Spring 2024, Fall 2023, Fall 2022
Learning Outcomes:
- Describe the principles of food engineering (mass and heat transfer, fluid flow, thermodynamics).
- Apply steady-state mass and energy balances to simple food processes and formulations.
- Apply the principles of fluid statics and fluid dynamics to real systems.
- Underline the principles and practices of psychrometrics.
- Demonstrate competency in the use of phase diagrams, steam tables, and thermal properties (enthalpy, heat capacity, conductivity).
- Graduate students: Analyze food manufacturing operations and their utility in product development.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4220 - Foods, Dietary Supplements, and Health (3 Credits)
Covers functional foods and nutraceuticals, bioactive compounds, antioxidants and dietary supplements, micronutrient fortification, botanicals, and herbs in disease prevention and health promotion. Emphasizes the mechanisms of action and scientific evidence of efficacy. Biomarkers, safety and efficacy testing, and regulations for functional foods and nutraceuticals are discussed.
Prerequisites: basic biochemistry course or permission of instructor.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Apply the scientific principles necessary to evaluate the benefits and risk of foods and dietary supplements.
- Evaluate and interpret the latest information in literature on the rapidly growing field of foods and dietary supplements.
- Integrate and apply core competencies in Food Chemistry, Biochemistry and Nutrition to solve/explain practical product development in foods and dietary supplements.
- Explain the roles of nutrients and bioactive compounds in foods and dietary supplements that impact human health.
- Confidently apply the problem solving and systems analysis skills described above to new situations.
- Give critical evaluations on the nutritional claims of foods and dietary supplements.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4230 - Unit Operations and Food Packaging (2 Credits)
This lecture course surveys unit operations, engineering/manufacturing principles, and materials common in the commercial processing and packaging of foods and beverages. The objective of this course is for students to understand common unit operations and packaging materials used to manufacture foods with consistency, quality, and safety.
Prerequisites: FDSC 4210.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe key unit operations in food processing.
- Be able to determine thermal processing parameters (D and z values) and understand their application in processing of foods and relationship to food safety.
- Identify the advantages, limitations, & food applications of different types of food packaging.
- Construct a process flow diagram with equipment details for a food product.
- Name principles of food manufacturing equipment design, based on an understanding of the basic elements of machine design and fabrication methods relevant to food applications.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4240 - Food Processing Laboratory (2 Credits)
This is a senior-level laboratory course focused on demonstrating engineering principles, unit operations, and technologies commonly used during processing and packaging of foods.
Prerequisites: FDSC 4210.
Enrollment Information: Open to: all Food Science majors.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022
Learning Outcomes:

- Build and explain process flow diagrams used in food processing.
- Identify processing equipment used to manufacture or package food products and describe how they work.
- Apply mass and heat balances to food product manufacturing.
- Conduct specific tests for assessing the quality of food products.
- Collect, process, analyze, and report data.
- Perform lab and pilot scale basic unit operations.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4250 - Food Processing: Conventional and Emerging Technologies (2 Credits)
This course is focused on discussing principles and practices fundamental to the processing and storage of foods, using both conventional and emerging food processing technologies. Material covered includes: i) emerging food processing technologies, ii) processing principles for animal products and plant based foods, iii) cleaning and disinfection ion food processing; and iv) byproduct & waste handling and processing. The various concepts will be demonstrated with case studies from commercial processing.
Prerequisites: FDSC 4210 or permission of instructor.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Spring 2023
Learning Outcomes:

- Discuss the principles behind conventional and emerging technologies.
- Build and explain process flow diagrams and identify the processing equipment used to manufacture of a variety of animal and plant based food products.
- Describe the unit operations and processing steps used in the processing of animal and plant based food products and waste streams foin food processing, their principles and underlying mechanisms of action.
- Identify and discuss the critical parameters that affect the processing and quality of a variety of food products.
- Communicate effectively on critical current issues related to food processing, including controversial issues.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4260 - We Are What We Eat: Linking Food With Intestinal Functionality and Microbiome (3 Credits)
Learn how you can impact your overall health by balancing your gut health; how your intestinal functionality, and microbiome are affected by your diet, and how to improve normal gut function. Learn how various chronic conditions and dietary deficiencies (as iron and zinc) may improve the gut digestive and absorptive surface (Brush Border Membrane) functionality and health promoting microbiome. In this course you will discuss the literature and learn that the microbiome and intestinal functionality play an important role in maintaining normal gut function, digesting certain nutrients, early life development, behavior and disorders like irritable bowel syndrome, mineral/vitamin deficiencies, obesity and diabetes.
Prerequisites: general microbiology (e.g. BIOMI 2900). Recommended prerequisites: FDSC 1500 and FDSC 2000.
Enrollment Information: Enrollment limited to: juniors and seniors.
Distribution Requirements: (AFS-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Engage and participate in class discussions using terms and techniques in the food science, nutrition, and microbiome fields.
- Identify strengths, limits, and confounding factors in studies addressing diet, intestine (BBM) functionality, and microbiome associations.
- Assess the relevance of correlations between food ingredients, dietary patterns, gut microbes, and physiological status.
- Design a food product for a specific target population.
- Collaborate with your peers and articulate your ideas to support your decisions in regards to scientific questions and issues.
- Present research and technical information clearly and in a convincing manner.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4280 - Toxic Substances in Food Systems (2 Credits)
This course covers basic concepts in toxicology and discusses toxicological effects of substances (pesticides, herbicides, by-products of food processing, etc.) that can make their way into our food systems through environmental contamination, agricultural practices and food processing. Focus will be on substances that are harmful to human/animal health. This will be a 1.5 hr course, with the first half of lecture-based instruction on basic concepts of toxicology, impacts, regulations, and examples with different classifications of toxins/toxicants, their toxicological effects, mechanisms, and mitigation/prevention methods. In the second hour, a student will be asked to prepare and present a classic/recent toxicology case or issues followed by a moderated discussion on the same topic.
Prerequisites: BIOG 1140/BIOG 1440/BIOG 1500, and BIOMG 3300/BIOMG 3310 (or equivalent).
Last Four Terms Offered: Spring 2022
Learning Outcomes:

- Demonstrate a basic understanding of principles and key terminology used in toxicology.
- Be able to list classic/recent examples of toxic substances reported in food systems and explain the effects and basic toxicological mechanisms.
- Be able to explain the importance of 'dose' in toxicity assessments and obtain a general grasp of how risk assessments are done.
- Demonstrate understanding of the regulatory aspects of chemical food contamination/residues, and how regulations differ internationally, and the challenges they pose.
- Be able to explain how risk perception can be affected by a variety of factors, and become a better evidence-based scientific communicator with the public in mind.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4310 - The Science and Technology of Beer Laboratory (2 Credits)
Crosslisted with VIEN 4310
An introduction to the practical application of brewing. Students will make several different styles of beer in a laboratory setting to understand how raw materials and processing technologies influence the production of recognizable beer styles. Emphasis will be placed on sanitation, raw material selection, yeast selection, and the manipulation of process variables to control product outcomes. Students will also learn the alternatives in current practice for finishing, carbonation, and packaging.
Prerequisites: VIEN 2204 and VIEN 2205/FDSC 2205.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Spring 2022
Learning Outcomes:

- Summarize the key steps in the brewing process, and contrast these steps to other fermentations.
- Describe and differentiate beer processing, fermentation, and aging parameters used in different styles of traditional beer production.
- Explain the role of the raw materials (grains, fruits, and other agricultural products, barrels, etc.) and the choices that distillers have in their use and source.
- Explain the role of the major components of beer (water, malt, hops, yeast), and the choices that brewers have in their use and source.
- Explain how different microorganisms can positively or negatively affect the quality of beer.
- Describe ongoing and emerging technological challenges to the brewing industry.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4340 - Cider Production Laboratory (1.5 Credits)
Crosslisted with VIEN 4340
Cider is a fermented beverage made from apples. Students in this course are immersed in cider production and analysis practices through activities in the teaching winery and by visiting commercial cideries. Readings and discussions support the hands-on learning focus in this laboratory course. Significant winery time between weekly class sessions is required.
Prerequisites: VIEN 2205 or VIEN 5205 or permission of instructor.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Demonstrate effective analytical techniques, sanitation practices and safe use of cider making equipment.
- Explain the expected results from different cider production methods and relate to their cider making project.
- Produce ciders from whole apples to finished products.
- Design and complete a sensory difference test.
- Demonstrate written and verbal communication and critical evaluation of literature skills as they complete reports during production and final presentations of cider projects.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4360 - Distillation Principles and Practices Laboratory (2 Credits)
Crosslisted with VIEN 4360
As an introduction to the science of distillation this course uses the study of pre-fermentation and fermentation biology, phase separation and vapor-liquid equilibrium, and sensory perception as a vehicle to explore the role of science and technology in the production and enjoyment of distilled beverages. Sensory samples and commercial samples of spirits will be used to illustrate the sensory properties and chemical components which define different types of distilled spirits, with the goal of understanding how different raw materials, processing, and aging impact these sensory properties.
Prerequisites: VIEN 2204 and VIEN 2205.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Summarize the hazards involved in distilled beverage production and how these hazards may be minimized or eliminated.
- Describe and differentiate still processing and aging parameters used in different types of traditional distilled spirit production.
- Explain the role of the raw materials (grains, fruits, and other agricultural products, barrels, etc.) and the choices that distillers have in their use and source.
- Describe how the choice of raw materials, still type, production practices, and aging impact the chemical composition of final products.
- Explain how different distillation techniques and aging requirements might impact the method of consumption of distilled beverages (mixed, over ice, neat, etc.).
- Describe the products of batch distillation over the course of a distillation run, and use sensory analysis to differentiate between distilled spirits produced at the beginning, middle, and end of a batch run.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4400 - Wine and Grape Flavor Chemistry (3 Credits)
Crosslisted with VIEN 4400
Uses a (bio)-chemical perspective to investigate viticulture and enological factors that impact flavor and other quality attributes (mouthfeel, color, stability) of wine and wine grapes.
Prerequisites: at least one semester of general chemistry and one semester of organic chemistry. Recommended prerequisite: prior course work in or knowledge of viticulture and enology.
Enrollment Information: Enrollment preference given to: Viticulture and Enology majors.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Identify and describe (orally and in writing) the key compounds that influence wine organoleptic properties.
- Identify and describe how viticultural and enological practices affect those key compounds.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4500 - Advanced Winemaking Theory and Practice I (2 Credits)
Crosslisted with VIEN 4500
Provides an in-depth study of the chemical, physical, technological, microbiological and regulatory fundamentals of winemaking. Concentration is on grape and must handling, juice adjustments and treatments, diverse production methods and wine styles, and regulatory compliance. Equipment used in grape processing and wine production is studied. Course builds on previous winemaking course material regarding grape processing and alcoholic and malolactic fermentation.
Prerequisites: VIEN 2204, VIEN 2205, VIEN 2400, and BIOMI 2900, or permission of instructor.
Enrollment Information: Enrollment preference given to: Viticulture and Enology majors.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe and differentiate traditional red, white, sparkling, and dessert winemaking methods and styles and understand the regulations which control them.
- Describe and distinguish the technological and equipment options for wine and grape processing.
- Describe the impact of winemaking methods on water and energy usage and on waste generation.
- Explain and describe the administrative and regulatory challenges related to winemaking.
- Describe, recognize, and list common causes and control measures for microbiological, chemical, and physical wine spoilages.
- Evaluate sanitation in the winemaking environment and relate it to impacts on wine quality.
- Identify and select appropriate chemical and microbial controls and limits to monitor and control the winemaking process.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4510 - Advanced Winemaking Theory and Practice I Laboratory (2 Credits)
Crosslisted with VIEN 4510
Students will produce, monitor, and evaluate diverse wine styles from several grape varieties using different vinification techniques. The laboratory includes introductory lectures, grape handling and vinification using various equipment and production methods, and emphasizes good production practices including sanitation. Students must develop their own winemaking plan for several different grape varieties, and participate in self-guided wine production activities, thus previous experience in wine production is highly recommended.
Prerequisites: Prerequisite or corequisite: FDSC 4500/VIEN 4500.
Enrollment Information: Enrollment preference given to: Viticulture and Enology majors.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe and differentiate traditional red, white, sparkling, and dessert winemaking methods and styles and understand the regulations which control them.
- Describe and distinguish the technological and equipment options for wine and grape processing.
- Describe the impact of winemaking methods on water and energy usage and on waste generation.
- Explain and describe the administrative and regulatory challenges related to winemaking.
- Describe, recognize, and list common causes and control measures for microbiological, chemical, and physical wine spoilages.
- Evaluate sanitation in the winemaking environment and relate it to impacts on wine quality.
- Identify and select appropriate chemical and microbial controls and limits to monitor and control the winemaking process.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4700 - Advanced Winemaking Theory and Practice II (2 Credits)
Crosslisted with VIEN 4700
Winemaking Theory and Practice II specifically addresses the non-fermentation aspects of wine production. This area includes fining, stabilization, adjustments, clarification, filtration, bottling, general sanitation, government regulations, oxidation, aging, contributions of oak, and production equipment and materials. Course builds on previous winemaking course material regarding wine production options for different wine styles, including chemical and sensory analysis and chemical and microbial stability.
Prerequisites: VIEN 2204, VIEN 2205, VIEN 2400, and BIOMI 2900, or permission of instructor.
Enrollment Information: Enrollment preference given to: Viticulture and Enology majors.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Develop knowledge of the chemical, microbiological, and physical nature of post fermentation wines.
- Identify and describe wine processing techniques used from post-fermentation through bottling.
- Develop and test personal sensory skills in describing the aromas and flavors of wine.
- Choose, make, and apply sensory descriptive standards to different wine styles or varietals.
- Identify and differentiate wine equipment and materials, including storage and packaging options.
- Appreciate the administrative and regulatory challenges related to winemaking.
- Access and navigate winemaking regulations, both domestic and international.
- Submit a wine label which satisfies TTB Certificate of Label Approval ("COLA") and local labeling regulations.
- Investigate new wine production technologies relevant to student's interests and transfer knowledge to peers.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4710 - Advanced Winemaking Theory and Practice II Laboratory (2 Credits)
Crosslisted with VIEN 4710
In the laboratory of part II of the Winemaking Theory and Practice, students continue working with wines produced in the preceding fall term, focusing on aging options, stabilization, fining, and packaging. The laboratory also provides advanced training in wine chemical and sensory analysis. Students must develop their own winemaking finishing plan for several different young wines, and participate in self-guided wine production activities, thus previous experience in wine production is highly recommended.
Prerequisites: Prerequisite or corequisite: VIEN 4700/FDSC 4700.
Enrollment Information: Enrollment preference given to: Viticulture and Enology majors.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Develop knowledge of the chemical, microbiological, and physical nature of post fermentation wines.
- Identify and describe wine processing techniques used from post-fermentation through bottling.
- Develop and test personal sensory skills in describing the aromas and flavors of wine.
- Choose, make, and apply sensory descriptive standards to different wine styles or varietals.
- Identify and differentiate wine equipment and materials, including storage and packaging options.
- Appreciate the administrative and regulatory challenges related to winemaking.
- Access and navigate winemaking regulations, both domestic and international.
- Submit a wine label which satisfies TTB Certificate of Label Approval (COLA) and local regulations.
- Determine suitable packaging materials and package finished wine products.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4880 - Global Food, Energy, and Water Nexus — Engage the US, China, and India for Sustainable Future (3-4 Credits)
Crosslisted with ANSC 4880, AEM 4880, CHEME 4880, GDEV 4880
This course is offered by six Departments at Cornell, in collaboration with five Universities in China and India. Video conferencing will be used to connect classrooms in the three countries in real time. Important issues related to the food, energy, and water nexus and its implications for nutrition security, one health, environmental sustainability,climate change, and economic development in the US, China, India, and other countries will be described. Challenges associated with these issues will be evaluated and strategies to address them will be proposed. Engagement of these countries with each other and the rest of the world will be explored. The course serves as a platform for students from Cornell, China, and India to learn from and interact with each other in the same class, and to share their thinking, creativity, and perspectives on these issues.
Enrollment Information: Enrollment limited to: juniors or seniors only.
Distribution Requirements: (AFS-AG, D-AG, SCH-AG)
Exploratory Studies: (CU-ITL, CU-SBY); (SAAREA)

Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:
- Identify and compare the major food, nutrition and health, energy, water, and economic challenges facing the US, China, and India.
- Describe barriers to food and nutrition security for all people in each of the three countries and globally and propose solutions for overcoming these barriers.
- Identify and quantify the requirements of energy and water for producing, processing, transporting, and/or preparing food.
- Evaluate various predictions of regional and global impacts of climate change on agricultural production and human health in the 21st century.
- Collaborate as members of interdisciplinary teams composed of students from the US, China, and India to analyze and solve problems that affect food, water, and energy security.
- Effectively and respectfully debate, with people of opposing views, issues related to food, water, and energy nexus.
- Prepare and deliver focused, clear, impactful, and culturally sensitive presentations to an international audience of peers .

Schedule of Classes (https://classes.cornell.edu/)

FDSC 4940 - Special Topics in Food Science (0.5-4 Credits)
The department teaches trial courses under this number. Offerings vary by semester and are advertised by the department before the semester starts. Courses offered under the number will be approved by the department curriculum committee, and the same course is not offered more than twice under this number.
Exploratory Studies: (CU-UG)

Last Four Terms Offered: Spring 2023, Fall 2022, Fall 2020, Spring 2020
Schedule of Classes (https://classes.cornell.edu/)

FDSC 4960 - Undergraduate Internship in Food Science (1-3 Credits)
On-the-job learning experience under the supervision of professionals in a cooperating organization. A learning contract is written between the faculty supervisor and students, stating the conditions of the work assignment, supervision, and reporting. All 4960 internship courses must adhere to the CALS guidelines at cals.cornell.edu/academics/student-research/internship.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

FDSC 4970 - Individual Study in Food Science (0.5-3 Credits)
May include individual tutorial study, a special topic selected by a professor or a group of students, or selected lectures of a course already offered. Since topics vary, the course may be repeated for credit.
Exploratory Studies: (CU-UG)

Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

FDSC 4980 - Undergraduate Teaching Experience (1-3 Credits)
Students assist in teaching a course appropriate to their previous training and experience. Students meet with a discussion or laboratory section and regularly discuss objectives with the course instructor.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

FDSC 4990 - Undergraduate Research in Food Science (1-4 Credits)
Students conduct original research directed by a food science faculty member.
Exploratory Studies: (CU-UG)

Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

FDSC 5010 - Concepts of Food Product Development (2 Credits)
Introduction to topics and events sequence that provide the foundation for development of new food products, building upon knowledge acquired from other food science courses. The course allows students to integrate and apply basic concepts into case-based learning experiences to enhance professional skills, utilizing individual assessments and team-work assignments.
Prerequisites: FDSC 3940, FDSC 4170, and FDSC 4210 or permission of instructor.
Enrollment Information: Enrollment limited to: graduate students.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Spring 2022
Learning Outcomes:
- Evaluate the complexities/intricacies governing the development of new and improved food products.
- Apply food science and marketing principles to the food product development process
- Identify and apply appropriate food regulations and safety measures to ensure the safety of new products.
- Demonstrate awareness of the variety of product testing protocols available to evaluate food product quality and consumer acceptance.
- Identify challenges associated with various sourcing ingredients, manufacturing venues, distribution channels and diverse consumer preferences and needs.
- Effectively utilize synergistic team-work to solve problems, enhance critical thinking, include diverse viewpoints, and strengthen communication skills.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5050 - Dairy Chemistry (1 Credit)
This course will discuss the general composition of milk, with a special focus on the chemistry and functionality of the high value components of milk (lipids and proteins).
Prerequisites: general chemistry (CHEM 1560, CHEM 2070, and/or CHEM 2080), organic chemistry (CHEM 1570, CHEM 3570, and/or CHEM 3580), and Food Chemistry I (FDSC 4170).
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Students will be able explain the biochemical pathways of milk fat, protein, and lactose are synthesis in the context of the structure and organization of the bovine mammary cell.
- Students will be able to explain how stage of lactation and dairy cow diet changes the chemical structure of milk fat and melting properties of milk fat and texture of dairy products.
- Students will learn the differences in chemical structure of the 5 major proteins in milk and be able to explain how differences structure impact how the proteins interact when subjected to thermal stress, mechanical stress, and pH change.
- Graduate students will be able to explain the relationship between chemical structure and infrared light absorbance of milk to measure the concentration of fat, protein, lactose and fatty acid composition.
- Graduate students will be able to explain the chemical and physical changes that happen to milk fat, protein, and lactose during thermal processing and integrate how those changes impact flavor, appearance and texture of dairy products.
- Graduate students will be able to explain the chemical changes that occur during aging of Cheddar, provolone, and camembert cheeses and express how those changes create the flavor and textural differences among these cheeses.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5100 - Sensory Evaluation of Food (2-3 Credits)
Topics include the sensory evaluation methods used to test the flavor, appearance, and texture of foods by quantitative description and simple difference testing; consumer testing for product acceptability; sensory tests in quality control; strategic product research; and product development. Presents the psychological principles in sensory testing and statistical methods for sensory data analysis. The lab provides firsthand experience in organizing and conducting sensory tests and an introduction to online data collection and analysis.
Prerequisites: statistics course.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Familiarize students with the test methods involved in discrimination, descriptive analysis and consumer sensory testing of food products.
- Examine the types of statistical analyses used to summarize sensory data and to draw conclusions and make recommendations about product characteristics.
- Recognize principles of physiology, psychology and measurement upon which methods of sensory testing are based.
- Delineate how a sensory evaluation provides important information in the product development process.
- Enable students to select the right testing strategy for a given situation.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5205 - Growing Grapes and Making Wines Graduate Laboratory (2 Credits)
Crosslisted with VIEN 5205
Field trips, vineyard and winery work provide opportunities for application of knowledge gained in Grapes to Wines lecture course. Students will produce a wine, from grape harvest determination to cold stabilization. Some winery activities between laboratory sessions plus a two-day field trip expected.
Corequisites: VIEN 5204.
Enrollment Information: Primarily for: graduate students.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Demonstrate wine analytical techniques.
- Identify different grapevine species and cultivers in the vineyard.
- Assess fruit ripening and make good decisions about harvest time.
- Explain each step in winemaking process, including typical procedures used and the scientific rationale for choosing a particular technique from alternatives at each step.
- Produce wines from grape harvest to cold stabilized products 6- demonstrate wine flavor evaluation and appreciation techniques.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5206 - Fermentation of Food (1 Credit)
Fermentation of food changed the course of human history. This course will help interested students learn about fermentations, generally, and concentrate on examples within major categories of fermented foods: fruit, vegetable, dairy, soybean, and grain. We will describe the cultures that developed and consume different fermented foods, and how microbes interact with their environments and with each other during food fermentations. Students in the course will develop an overview of the scientific principles and practices behind fermentation, and gain practical experience in sensory evaluation while increasing their enjoyment of foods.
Prerequisites: one college-level biology or college-level chemistry course.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe the importance of fermentations to human history, health, & cultures.
- Explain basic chemical and biological changes that occur during fermentation of different raw materials.
- Match particular foods with the specific microbes involved in that foods' production.
- Describe the basic microbial ecology of different food fermentations.
- Explain general procedures for production of specific foods.
- Describe the flavor attributes of fermented foods.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5210 - Food Engineering Principles (4 Credits)
Introduces the engineering principles underlying food processes and equipment with an emphasis on their utility in manufacturing operations. Focus is on applications of engineering concepts and transport phenomena to unit operations and process development. Topics include the fundamental principles of thermodynamics, mass and energy balance, fluid mechanics, heat and mass transport, refrigeration, and psychrometrics.
Prerequisites: FDSC 2000 and introductory physics.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe the principles of food engineering (mass and heat transfer, fluid flow, thermodynamics).
- Apply steady-state mass and energy balances to simple food processes and formulations.
- Apply the principles of fluid statics and fluid dynamics to real systems.
- Underline the principles and practices of psychrometrics.
- Demonstrate competency in the use of phase diagrams, steam tables, and thermal properties (enthalpy, heat capacity, conductivity).
- Graduate students: Analyze food manufacturing operations and their utility in product development.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5230 - Unit Operations and Food Packaging (2 Credits)
This lecture course surveys unit operations, engineering/manufacturing principles, and materials common in the commercial processing and packaging of foods and beverages. The objective of this course is for students to understand common unit operations and packaging materials used to manufacture foods with consistency, quality, and safety.
Prerequisites: FDSC 4210.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe key unit operations in food processing.
- Be able to determine thermal processing parameters (D and z values) and understand their application in processing of foods and relationship to food safety.
- Identify the advantages, limitations, & food applications of different types of food packaging.
- Construct a process flow diagram with equipment details for a food product.
- Name principles of food manufacturing equipment design, based on an understanding of the basic elements of machine design and fabrication methods relevant to food applications.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5310 - The Science and Technology of Beer (1 Credit)
Crosslisted with VIEN 5310
This course uses beer and brewing science as a starting point to explore topics in fermentation biology, food chemistry, food processing, and sensory perception. Students will learn to recognize the major sensory and chemical features that distinguish different beer styles or defects, and understand how raw materials and choices during production lead to these outcomes. Several guest lectures, including brewers and producers of raw materials, will also be included.
Prerequisites: introductory biology and chemistry, or permission of instructor.
Course Fee: Course Fee, $25. Tasting fee: will be applied to student bursar bill.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Spring 2022
Learning Outcomes:

- Differentiate between the basic physiological senses of human perception of foods and beverages. Describe how these senses are utilized to perceive the qualities of foods and beverages.
- Describe some of the fundamental principles of odor and taste perception.
- Summarize the key steps in the brewing process, and contrast these steps to other fermentations.
- Explain the role of the major components of beer (water, malt, hops, yeast), and the choices that brewers have in their use and source.
- Describe the sensory properties of major beer styles and explain how they differ in production practices and chemical composition.
- Explain how different microorganisms can positively or negatively affect the quality of beer.
- Summarize the positive health impacts of moderate beer consumption and contrast these benefits with the negative health impacts of alcohol misuse/abuse. Also differentiate between the current treatment options for alcohol use disorders.
- Summarize ongoing and emerging technological challenges to the brewing industry.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5360 - Distillation Principles and Practices (1 Credit)
Crosslisted with VIEN 5360
As an introduction to the science of distillation this course uses the study of pre-fermentation and fermentation biology, phase separation and vapor-liquid equilibrium, and sensory perception as a vehicle to explore the role of science and technology in the production and enjoyment of distilled beverages. Sensory samples and commercial samples of spirits will be used to illustrate the sensory properties and chemical components which define different types of distilled spirits, with the goal of understanding how different raw materials, processing, and aging impact these sensory properties.
Prerequisites: introductory biology and chemistry, or permission of instructor.
Course Fee: Course Fee, $50. Tasting fee: will be applied to student bursar bill.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Summarize the key physical laws involving gasses and liquids which are pertinent to distilling.
- Summarize the key steps in the distillation process and contrast these steps to other fermented beverages.
- Explain the role of the raw materials (grains, fruits, and other agricultural products, barrels, etc.) in alcoholic beverage distillation and the choices that distillers have in their use and source.
- Summarize how the type of still and distillation process options impact the sensory properties of the spirit produced.
- Describe the sensory properties of major distilled spirit styles and explain how they differ in production practices and chemical composition.
- Explain how different distillation techniques and aging requirements might impact the method of consumption of distilled spirits and cocktails (mixed, over ice, neat, etc.).
- Describe ongoing and emerging technological, economic, and social challenges to the distilled spirits industry.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5400 - Wine and Grapes: Composition and Analysis (2 Credits)
Crosslisted with VIEN 5400
VIEN 5400 is a 2-credit course (1 credit lecture, 1 credit lab) with an emphasis on understanding the practice and theory behind analytical techniques routinely used in the wine and grape industries, and the statistical tools used to evaluate the effectiveness of both analyst and assay. The course is designed to provide practical skills complementary to other courses. VIEN 5400 is restricted to graduate students; undergraduates should enroll in VIEN 2400.
Prerequisites: two semesters of chemistry, and one semester of statistics, or permission of instructor.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Interpret commonly measured quantitative and qualitative metrics relevant to grapegrowing and winemaking and their utility in wine (grape) production (the WHY?).
- Evaluate advantages and disadvantages of different methodologies for measuring wine and grape components, including methods that you have no prior experience with (the WHAT?).
- Demonstrate proficiency with routine protocols in wine and grape analysis, in preparation for later VIEN courses, internships, research, etc. (the HOW?).
- Critique the analytical proficiency of themselves or their classmates using concepts from statistics and general chemistry.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5500 - Advanced Winemaking Theory and Practice I (2 Credits)
Crosslisted with VIEN 5500
Provides an in-depth study of the chemical, physical, technological, microbiological and regulatory fundamentals of winemaking. Concentration is on grape and must handling, juice adjustments and treatments, diverse production methods and wine styles, and regulatory compliance. Equipment used in grape processing and wine production is studied. Course builds on previous winemaking course material regarding grape processing and alcoholic and malolactic fermentation.
Prerequisites: VIEN 2204, VIEN 2205, VIEN 2400, and BIOMI 2900, or permission of instructor.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe and differentiate traditional red, white, sparkling, and dessert winemaking methods and styles and understand the regulations which control them.
- Describe and distinguish the technological and equipment options for wine and grape processing.
- Describe the impact of winemaking methods on water and energy usage and on waste generation.
- Explain and describe the administrative and regulatory challenges related to winemaking.
- Describe, recognize, and list common causes and control measures for microbiological, chemical, and physical wine spoilages.
- Evaluate sanitation in the winemaking environment and relate it to impacts on wine quality.
- Identify and select appropriate chemical and microbial controls and limits to monitor and control the winemaking process.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5510 - Advanced Winemaking Theory and Practice I Laboratory (2 Credits)
Crosslisted with VIEN 5510
Students will produce, monitor, and evaluate diverse wine styles from several grape varieties using different vinification techniques. The laboratory includes introductory lectures, grape handling and vinification using various equipment and production methods, and emphasizes good production practices including sanitation.
Prerequisites: Prerequisite or corequisite: FDSC 5500/VIEN 5500.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Describe and differentiate traditional red, white, sparkling, and dessert winemaking methods and styles and understand the regulations which control them.
- Describe and distinguish the technological and equipment options for wine and grape processing.
- Describe the impact of winemaking methods on water and energy usage and on waste generation.
- Explain and describe the administrative and regulatory challenges related to winemaking.
- Describe, recognize, and list common causes and control measures for microbiological, chemical, and physical wine spoilages.
- Evaluate sanitation in the winemaking environment and relate it to impacts on wine quality.
- Identify and select appropriate chemical and microbial controls and limits to monitor and control the winemaking process.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5920 - Food Systems Microbiology (2 Credits)
The focus of the course will be on food systems and how microbiology impacts the safety and quality of food products. The course will address issues of food product development, quality, safety, and the impact of the microbiome of foods on the individuals that consume it. Topics will include: establishing a product and environmental sampling plan; the impact of raw materials and processing of food shelf-life; food systems approaches to food safety and quality including the economics of raw material selection, processing and packaging; and root cause analysis. Real-world examples will be used to develop critical thinking skills.
Prerequisites: one college-level course in microbiology, or permission of instructor.
Last Four Terms Offered: Spring 2025, Spring 2024
Learning Outcomes:

- Describe the basic principles of food systems microbiology.
- Create and use database platforms for food safety, quality management along with root cause analysis.
- Implement software platforms to create food processing scenarios and collect critical control point data.
- Identify the root causes of out-of-specification events and implement solutions.
- Communicate acquired knowledge from reading selection of the scientific literature.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5930 - Craft Fermentations (2 Credits)
The course will cover the science and commerce of craft fermentations, focusing on smaller-scale, complex processes. Products will include vinegar, miso and alcoholic beverages. Fermented foods are growing in popularity due to their inherent organoleptic complexity and potential human health benefits. The course will focus on the science of fermentations and invite in a variety of expert practitioners from a range of different companies to offer their perspectives. A different fermented food will be covered each week using examples that highlight complex fermentations which result from a succession of microbial populations during the course of the fermentation.
Last Four Terms Offered: Fall 2024, Fall 2023
Learning Outcomes:

- Describe the basic principles of biochemistry and microbiology that apply to food fermentations.
- Articulate connections between the biochemistry and microbiology for the food fermentation processes.
- Analyze commercial practices in food fermentations.
- Communicate acquired knowledge from scientific literature.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5940 - Applied and Food Microbiology (3 Credits)
Crosslisted with BIOMI 5940
The course will focus on the origin, transmission, consequences, and management of diverse microbiota throughout the food chain. Topics in this course generally include: 1) the microbiota of different food systems, 2) the physiology, metabolism, and pathogenesis of important groups of microbes, and 3) application of food microbiology to the industrial sector. You will receive a basic education in interdisciplinary subjects that require knowledge of microbiology, food safety, epidemiology, public health, biotechnology, and cell metabolism. Knowledge and expertise gained in this course will support your qualification for a future career in food science, biotechnology, or microbiology.
Prerequisites: BIOMI 2900 and BIOMI 2911.
Learning Outcomes:

- Identify the microbiota relevant to a given food product, process, or environment.
- Describe the causes of and mechanisms behind foodborne disease, fermentation, and spoilage.
- Determine the relevant conditions or measures needed to promote safety, fermentation, or reduce spoilage.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 5960 - Food Safety Assurance (2 Credits)
Food Science 3960/5960 will focus on currently used food safety programs to control biological, chemical and physical hazards and assure the safety of foods. Topics include prerequisite programs such as Current Good Manufacturing Practices and Sanitation Standard Operating Procedures, Hazard Analysis Critical Control Point (HACCP), food safety management systems (SQF) and the application of current technologies in reducing foodborne illness. Upon successful completion of the course, the students will receive 1) General HACCP certification and 2) SQF implementation certification (through a collaboration with SQFI [Safe Quality Foods Institute]).
Prerequisites: BIOMI 2900 or permission of instructor.
Course Fee: Course Fee, $135. Includes $60 for GMP certification and $75 for SQF testing and materials.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Develop a HACCP plans for different food industries.
- Describe laws and regulations governing food safety principles (preventive controls for human food/HACCP).
- Identify and discuss industry food safety requirements and certifications: organic, halal, kosher, and Global Food Safety Initiatives.
- Analyze different auditing schemes, and be able to complete internal (first party) audits.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6000 - Seminar in Food Science (1 Credit)
Weekly seminar series on contemporary topics and issues in the field of food science and technology. Representatives from academia, industry, and government provide presentations on a wide variety of topics. Graduate students in the field of food science and technology may use the forum to present their required thesis research seminar.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

FDSC 6010 - Food Science and Technology Graduate Boot Camp (1 Credit)
Students are first introduced to the principles and applications in food chemistry, food microbiology, food processing and engineering, sensory science, and international food science. Then students review and discuss the research literature in these fields.
Enrollment Information: Enrollment limited to: graduate students.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Identify scholarly research related to a field of food science.
- Analyze, evaluate, and discuss a food ethics case study.
- Recognize and explain the core competencies of food science.
- Demonstrate the fundamentals of effectively writing academic and professional papers.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6040 - Chemistry and Functional Properties of Food Ingredients (2 Credits)
This is a course with an emphasis on understanding the interactions of food ingredients and their role and functionality in the food product. This course is designed to enable students to utilize a step-by-step problem-solving approach to tackle challenges found in the food industry. Examples of these challenges will be presented as case studies obtained from literature and food industry. Additionally, graduate students in this course will: perform a case study on a given product; investigate the role of each ingredient and determine their interactions; suggest solutions to solve the problem; and present their results on case studies in class.
Prerequisites: FDSC 4170.
Last Four Terms Offered: Spring 2025, Spring 2023, Spring 2022, Fall 2010
Learning Outcomes:

- Identify properties of various food ingredients based on their chemical composition and associated function.
- Describe techniques that can be utilized to measure food ingredients properties and monitor quality of raw ingredients and final products.
- Explain chemical interactions that occur between ingredients in a food matrix during food processing and storage.
- Recommend suitable food ingredients for a food product based on required processing systems and storage condition.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6110 - Flavor Perception (2 Credits)
The successful preparation of food for personal joy, or culinary and manufacturing profitability is driven by consumer perceptions of flavor, value, nutrition, ecological implications, in that order. Therefore, understanding flavor perception is essential for the creation of successful foods.
Prerequisites: at least one semester each of general chemistry and biology (including material on psychology and physiology). Additional coursework in biochemistry, sensory perception, and psychology is desirable.
Last Four Terms Offered: Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Define the common terms used in the study of flavor perception and be able to use these terms to illustrate the process of a flavor experience.
- Be able to explain a flavor experience in terms of measurable perceptions and components and be able to discuss the role emotions play in flavor perception.
- Be able to explain how data collected on an individual's flavor perception relates to group behavior (liking, purchasing, and eating).

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6170 - Food Chemistry (3 Credits)
Covers the chemistry of foods and food ingredients. Discusses the chemical and physical properties of water, proteins, lipids, carbohydrates, and other food components and additives in the context of their interactions and functional roles in foods.
Prerequisites: CHEM 1570, BIOMG 3300, or BIOMG 3310.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe the principal groups of food molecules and recognize their chemical structures.
- Explain the chemistry underlying the properties and reactions of various food components.
- Articulate the general principles that govern the behavior of food materials.
- Describe chemical reactions that occur during processing and explain how they affect food properties.
- Interpret and communicate complex food chemistry concepts to a lay audience.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6220 - Foods, Dietary Supplements, and Health (3 Credits)
Covers functional foods and nutraceuticals, bioactive compounds, antioxidants and dietary supplements, micronutrient fortification, and botanicals and herbs in disease prevention and health promotion. Emphasizes the mechanisms of action and scientific evidence of efficacy. Biomarkers, safety and efficacy testing, and regulations for functional foods and nutraceuticals are discussed.
Prerequisites: basic biochemistry course or permission of instructor.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Apply the scientific principles necessary to evaluate the benefits and risk of foods and dietary supplements.
- Evaluate and interpret the latest information in literature on the rapidly growing field of foods and dietary supplements.
- Integrate and apply core competencies in Food Chemistry, Biochemistry and Nutrition to solve/explain practical product development in foods and dietary supplements.
- Explain the roles of nutrients and bioactive compounds in foods and dietary supplements that impact human health.
- Confidently apply the problem solving and systems analysis skills described above to new situations.
- Give critical evaluations on the nutritional claims of foods and dietary supplements.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6250 - Food Processing: Conventional and Emerging Technologies (2 Credits)
This course is focused on discussing principles and practices fundamental to the processing and storage of foods, using both conventional and emerging food processing technologies. Material covered includes: i) emerging food processing technologies, ii) processing principles for animal products and plant based foods, iii) cleaning and disinfection ion food processing; and iv) byproduct & waste handling and processing. The various concepts will be demonstrated with case studies from commercial processing.
Prerequisites: FDSC 4210 or permission of instructor.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Discuss the principles behind conventional and emerging technologies.
- Build and explain process flow diagrams and identify the processing equipment used to manufacture of a variety of animal and plant based food products.
- Describe the unit operations and processing steps used in the processing of animal and plant based food products and waste streams foin food processing, their principles and underlying mechanisms of action.
- Identify and discuss the critical parameters that affect the processing and quality of a variety of food products.
- Communicate effectively on critical current issues related to food processing, including controversial issues.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6260 - We Are What We Eat: Linking Food With Intestinal Functionality and Microbiome (3 Credits)
Learn how you can impact your overall health by balancing your gut health; how your intestinal functionality, and microbiome are affected by your diet, and how to improve normal gut function. Learn how various chronic conditions and dietary deficiencies (as iron and zinc) may improve the gut digestive and absorptive surface (Brush Border Membrane) functionality and health promoting microbiome. In this course you will discuss the literature and learn that the microbiome and intestinal functionality play an important role in maintaining normal gut function, digesting certain nutrients, early life development, behavior and disorders like irritable bowel syndrome, mineral/vitamin deficiencies, obesity and diabetes.
Prerequisites: general microbiology (e.g. BIOMI 2900). Recommended prerequisites: FDSC 1500 and FDSC 2000.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Engage and participate in class discussions using terms and techniques in the food science, nutrition, and microbiome fields.
- Identify strengths, limits, and confounding factors in studies addressing diet, intestine (BBM) functionality, and microbiome associations.
- Assess the relevance of correlations between food ingredients, dietary patterns, gut microbes, and physiological status.
- Design a food product for a specific target population.
- Collaborate with your peers and articulate your ideas to support your decisions in regards to scientific questions and issues.
- Present research and technical information clearly and in a convincing manner.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6280 - Toxic Substances in Food Systems (2 Credits)
This course covers basic concepts in toxicology and discusses toxicological effects of substances (pesticides, herbicides, by-products of food processing, etc.) that can make their way into our food systems through environmental contamination, agricultural practices and food processing. Focus will be on substances that are harmful to human/animal health. This will be a 1.5 hr course, with the first half of lecture-based instruction on basic concepts of toxicology, impacts, regulations, and examples with different classifications of toxins/toxicants, their toxicological effects, mechanisms, and mitigation/prevention methods. In the second hour, a student will be asked to prepare and present a classic/recent toxicology case or issues followed by a moderated discussion on the same topic.
Prerequisites: BIOG 1140/BIOG 1440/BIOG 1500, and BIOMG 3300/BIOMG 3310 (or equivalent).
Last Four Terms Offered: Spring 2022
Learning Outcomes:

- Demonstrate a basic understanding of principles and key terminology used in toxicology.
- Be able to list classic/recent examples of toxic substances reported in food systems and explain the effects and basic toxicological mechanisms.
- Be able to explain the importance of 'dose' in toxicity assessments and obtain a general grasp of how risk assessments are done.
- Demonstrate understanding of the regulatory aspects of chemical food contamination/residues, and how regulations differ internationally, and the challenges they pose.
- Be able to explain how risk perception can be affected by a variety of factors, and become a better evidence-based scientific communicator with the public in mind.
- Critically evaluate, provide constructive criticism, and articulate informed opinions based on solid scientific evidence (peer-reviewed literature) in dealing with cases of toxicology.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6310 - The Science and Technology of Beer Laboratory (2 Credits)
Crosslisted with VIEN 6310
An introduction to the practical application of brewing. Students will make several different styles of beer in a laboratory setting to understand how raw materials and processing technologies influence the production of recognizable beer styles. Emphasis will be placed on sanitation, raw material selection, yeast selection, and the manipulation of process variables to control product outcomes. Students will also learn the alternatives in current practice for finishing, carbonation, and packaging.
Prerequisites: VIEN 2204 and VIEN 2205/FDSC 2205.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Spring 2022
Learning Outcomes:

- Summarize the key steps in the brewing process, and contrast these steps to other fermentations.
- Describe and differentiate beer processing, fermentation, and aging parameters used in different styles of traditional beer production.
- Explain the role of the raw materials (grains, fruits, and other agricultural products, barrels, etc.) and the choices that distillers have in their use and source.
- Explain the role of the major components of beer (water, malt, hops, yeast), and the choices that brewers have in their use and source.
- Explain how different microorganisms can positively or negatively affect the quality of beer.
- Describe ongoing and emerging technological challenges to the brewing industry.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6340 - Cider Production Laboratory (1.5 Credits)
Crosslisted with VIEN 6340
Cider is a fermented beverage made from apples. Students in this course are immersed in cider production and analysis practices through activities in the teaching winery and by visiting commercial cideries. Readings and discussions support the hands-on learning focus in this laboratory course. Significant winery time between weekly class sessions is required.
Prerequisites: VIEN 2205 or VIEN 5205.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Demonstrate effective analytical techniques, sanitation practices and safe use of cider making equipment.
- Explain the expected results from different cider production methods and relate to their cider making project.
- Produce ciders from whole apples to finished products.
- Design and complete a sensory difference test.
- Demonstrate written and verbal communication and critical evaluation of literature skills as they complete reports during production and final presentations of cider projects.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6360 - Distillation Principles and Practices Laboratory (2 Credits)
Crosslisted with VIEN 6360
As an introduction to the science of distillation this course uses the study of pre-fermentation and fermentation biology, phase separation and vapor-liquid equilibrium, and sensory perception as a vehicle to explore the role of science and technology in the production and enjoyment of distilled beverages. Sensory samples and commercial samples of spirits will be used to illustrate the sensory properties and chemical components which define different types of distilled spirits, with the goal of understanding how different raw materials, processing, and aging impact these sensory properties.
Prerequisites: VIEN 2204 and VIEN 2205.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Summarize the hazards involved in distilled beverage production and how these hazards may be minimized or eliminated.
- Describe and differentiate still processing and aging parameters used in different types of traditional distilled spirit production.
- Explain the role of the raw materials (grains, fruits, and other agricultural products, barrels, etc.) and the choices that distillers have in their use and source.
- Describe how the choice of raw materials, still type, production practices, and aging impact the chemical composition of final products.
- Explain how different distillation techniques and aging requirements might impact the method of consumption of distilled beverages (mixed, over ice, neat, etc.).
- Describe the products of batch distillation over the course of a distillation run, and use sensory analysis to differentiate between distilled spirits produced at the beginning, middle, and end of a batch run.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6400 - Wine and Grape Flavor Chemistry (3 Credits)
Crosslisted with VIEN 6400
Uses a (bio)-chemical perspective to investigate viticulture and enological factors that impact flavor and other quality attributes (mouthfeel, color, stability) of wine and wine grapes.
Prerequisites: at least one semester of general chemistry and one semester of organic chemistry required. Recommended prerequisite: prior coursework in or knowledge of viticulture and enology.
Enrollment Information: Enrollment preference given to: Viticulture and Enology students.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Identify and describe (orally and in writing) the key compounds that influence wine organoleptic properties.
- Identify and describe how viticultural and enological practices affect those key compounds.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6650 - Food and Bioprocessing Systems (2 Credits)
This course focuses on a fundamental and quantitative analyses of current and emerging techniques used in the processing of foods and related biological materials. Topics include thermal processes, extrusion, supercritical fluids processing, membrane separation, high-pressure processing, pulsed electric field processing, ultraviolet and pulsed light treatment. The course is largely based on a critical review of the recent scientific literature.
Prerequisites: FDSC 4230.
Last Four Terms Offered: Spring 2022, Spring 2019, Spring 2017, Spring 2015
Learning Outcomes:

- Gain depth in knowledge about current and emerging food processing methods, with a focus on the engineering aspects of these technologies.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6700 - Advanced Winemaking Theory and Practice II (2 Credits)
Crosslisted with VIEN 6700
Winemaking Theory and Practice II specifically addresses the non-fermentation aspects of wine production. This area includes fining, stabilization, adjustments, clarification, filtration, bottling, general sanitation, government regulations, oxidation, aging, contributions of oak, and production equipment and materials. Course builds on previous winemaking course material regarding wine production options for different wine styles, including chemical and sensory analysis and chemical and microbial stability.
Prerequisites: VIEN 2204, VIEN 2205, VIEN 2400, and BIOMI 2900, or permission of instructor.
Enrollment Information: Enrollment preference given to: Viticulture and Enology majors.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Develop knowledge of the chemical, microbiological, and physical nature of post fermentation wines.
- Identify and describe wine processing techniques used from post-fermentation through bottling.
- Develop and test personal sensory skills in describing the aromas and flavors of wine.
- Choose, make, and apply sensory descriptive standards to different wine styles or varietals.
- Identify and differentiate wine equipment and materials, including storage and packaging options.
- Appreciate the administrative and regulatory challenges related to winemaking.
- Access and navigate winemaking regulations, both domestic and international.
- Submit a wine label which satisfies TTB Certificate of Label Approval ("COLA") and local labeling regulations.
- Investigate new wine production technologies relevant to student's interests and transfer knowledge to peers.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6710 - Advanced Winemaking Theory and Practice II Laboratory (2 Credits)
Crosslisted with VIEN 6710
In the laboratory of part II of the Winemaking Theory and Practice, students continue working with wines produced in the preceding fall term, focusing on aging options, stabilization, fining, and packaging. The laboratory also provides advanced training in wine chemical and sensory analysis. Students must develop their own winemaking finishing plan for several different young wines, and participate in self-guided wine production activities, thus previous experience in wine production is highly recommended.
Prerequisites: Prerequisite or corequisite: VIEN 4700/FDSC 4700.
Enrollment Information: Enrollment preference given to: Viticulture and Enology majors.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Develop knowledge of the chemical, microbiological, and physical nature of post fermentation wines.
- Identify and describe wine processing techniques used from post-fermentation through bottling.
- Develop and test personal sensory skills in describing the aromas and flavors of wine.
- Choose, make, and apply sensory descriptive standards to different wine styles or varietals.
- Identify and differentiate wine equipment and materials, including storage and packaging options.
- Appreciate the administrative and regulatory challenges related to winemaking.
- Access and navigate winemaking regulations, both domestic and international.
- Submit a wine label which satisfies TTB Certificate of Label Approval (COLA) and local regulations.
- Determine suitable packaging materials and package finished wine products.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6880 - Global Food, Energy, and Water Nexus — Engage the US, China, and India for Sustainable Future (3-4 Credits)
Crosslisted with ANSC 6880, AEM 6880, CHEME 6780, CEE 5820, GDEV 6880
This course is offered by six Departments at Cornell, in collaboration with five Universities in China and one India. Video conferencing will be used to connect classrooms in the three countries in real time. Important issues related to the food, energy, and water nexus and its implications for nutrition security, one health, environmental sustainability, climate change, and economic development in the US and these two countries will be described. Challenges associated with these issues will be evaluated and strategies to address them will be proposed. Engagement of these countries with each other and the rest of the world will be explored. The course serves as a platform for students from Cornell, China, and India to learn from and interact with each other in the same class, and to share their thinking, creativity, and perspectives on these issues.
Enrollment Information: Enrollment limited to: graduate student status, or permission of the instructors.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Identify and compare the major food, nutrition and health, energy, water, and economic challenges facing the US, China, and India.
- Describe barriers to food and nutrition security for all people in each of the three countries and globally and propose solutions for overcoming these barriers.
- Identify and quantify the requirements of energy and water for producing, processing, transporting, and/or preparing food.
- Evaluate various predictions of regional and global impacts of climate change on agricultural production and human health in the 21st century.
- Collaborate as members of interdisciplinary teams composed of students from the US, China, and India to analyze and solve problems that affect food, water, and energy security.
- Effectively and respectfully debate, with people of opposing views, issues related to food, water, and energy nexus.
- Prepare and deliver focused, clear, impactful, and culturally sensitive presentations to an international audience of peers.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6940 - Special Topics in Food Science (1-4 Credits)
The department teaches trial courses under this number. Offerings vary by semester and are advertised by the department before the semester starts. Courses offered under the number will be approved by the department curriculum committee, and the same course is not offered more than twice under this number.
Last Four Terms Offered: Spring 2023, Fall 2022, Spring 2022, Fall 2017
Schedule of Classes (https://classes.cornell.edu/)

FDSC 6950 - Current Readings in Food Science (1 Credit)
Seminar series on current topics chosen by participating faculty members and students on a rotating basis. Format consists of weekly discussion groups with each participant presenting at least one oral report based on independent reading. Multiple sections focusing on different topics may be taught in any given semester. Topics include food microbiology and food safety, food chemistry, sensory evaluation, and food engineering and materials science. Interested students should contact the designated instructor(s) for each semester.
Prerequisites: upper division course relevant to chosen topic.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:

- Participate in a habitual engagement with current literature.
- Demonstrate skills related to the critical evaluation of methods and conclusions.
- Lead academic conversation within a given field of literature

Schedule of Classes (https://classes.cornell.edu/)

FDSC 6960 - Graduate Internship in Food Science (1-6 Credits)
On-the-job learning experience under the supervision of professionals in a cooperating organization. A learning contract is written between the faculty supervisor and students, stating the conditions of the work assignment, supervision, and reporting. All 6960 internship courses must adhere to the CALS guidelines at www.cals.cornell.edu/cals/current/student-research/internship/index.cfm.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

FDSC 6970 - Graduate Individual Study in Food Science (0.5-3 Credits)
Independent study for graduate students.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

FDSC 6980 - Graduate Teaching Experience (1-3 Credits)
Designed to give graduate students teaching experience through involvement in planning and teaching courses under the supervision of field faculty members. The experience may include leading discussion sections; preparing, assisting in, or teaching lectures and laboratories; and tutoring.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:

- Communicate select scientific topics to undergraduate students.
- Organize class materials and activities to facilitate student learning.
- Assess student learning using tools appropriate to the specific types of classes.

Schedule of Classes (https://classes.cornell.edu/)

FDSC 8900 - Master's Level Thesis Research (1-12 Credits)
Thesis Research for MS students in the Field of Food Science & Technology.
Enrollment Information: Enrollment limited to: master's candidates.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

FDSC 9900 - Doctoral-Level Thesis Research (1-12 Credits)
Dissertation research for PhD students in the Field of Food Science & Technology.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)