

FOOD SCIENCE AND TECHNOLOGY

Our Website (<http://www.fst.vt.edu>)

Overview

Food science benefits consumers every day with healthier diets, better tasting affordable foods, and increased food safety. In the Department of Food Science and Technology, you really do get to play with your food! Food Science is an exciting area that applies a blend of basic sciences such as biology, chemistry and physics with microbiology, biochemistry, mathematics and engineering to improve the taste, nutrition and value of the world's food supply. The Food Science and Technology curriculum includes hands-on experiences that supports classroom instruction with practical applications and creative opportunities for product development.

Demand for Food Science and Technology graduates has never been greater. Practically 100% of Virginia Tech's Food Science and Technology graduates have jobs in product development, research, sales and marketing, quality assurance, production management, analytical and technical services and regulatory affairs at graduation. Food processing is the largest industry in the United States. This industry employs nearly 2 million people and accounts for more than 16 percent of the country's gross national product. In a recent survey of U.S. Food Science programs, Virginia Tech ranked 6th nationally in placing Food Science B.S. graduates into graduate or professional schools.

The Virginia Tech Department of Food Science and Technology is the only food science department in Virginia. The program is recognized by the national Institute of Food Technologists (IFT) as having curricula and options that meet the "IFT Undergraduate Education Standards for Degrees in Food Science." Students enrolled in these programs are eligible to apply for IFT Scholarships. The Virginia Tech Food Science Club is a student chapter of the national IFT organization and houses the Product Development and College Bowl teams that permits students to meet professionals in the food industry, develop leadership skills and enhance their educational experience. Students have excellent opportunities for internships as an additional way to explore different facets of the food industry.

The Food Science and Technology building is home to a 5,000 square-foot processing pilot plant, a fully-equipped research winery, a cutting-edge high-pressure processing area as well as laboratories modernly equipped for chemical, physical and microbiological analysis of foods. Due to the department's success and growth we expanded to the Human and Agricultural Biosciences Building (HABB1) and the Integrated Life Sciences Building in the VT Corporate Research Park. HABB1 is, located across the street from our present building provides the department with additional laboratories, pilot plants, taste panel and food preparation facilities, conference rooms, graduate student research spaces and faculty and staff offices. In the Department of Food Science and Technology you may receive a Bachelor of Science in one of four options: Food Business, Food and Health, Science or Food and Beverage Fermentation.

The Department also offers a minor, as well as a double-major option in Food Science and Technology to students in all other colleges of the university. Students completing the Science or Food & Health option requirements will also be prepared for graduate schools and professional

schools of pharmacy medicine, dentistry and veterinary medicine. Food Science and Technology students have the opportunity to participate in stimulating undergraduate research projects and internships.

Satisfactory Progress

University policy requires that students who are making satisfactory progress toward a degree meet minimum criteria toward the General Education (Curriculum for Liberal Education) (see "Academics (<https://catalog.vt.edu/undergraduate/academic-policies/>)") and toward the degree.

Satisfactory progress requirements toward the specific degree can be found on the major checksheet by visiting the University Registrar website at <http://registrar.vt.edu/graduation-multi-brief/index1.html>.

- Food Science and Technology Major with Food and Beverage Fermentation Option (<https://catalog.vt.edu/undergraduate/agriculture-life-sciences/food-science-technology/food-science-technology-bs-fermentation/>)
- Food Science and Technology Major with Food and Health Option (<https://catalog.vt.edu/undergraduate/agriculture-life-sciences/food-science-technology/food-science-technology-bs-food-health/>)
- Food Science and Technology Major with Food Business Option (<https://catalog.vt.edu/undergraduate/agriculture-life-sciences/food-science-technology/food-science-technology-bs-food-business/>)
- Food Science and Technology Major with Science Option (<https://catalog.vt.edu/undergraduate/agriculture-life-sciences/food-science-technology/food-science-technology-bs-science-concentration/>)

Head: J. D. Eifert, Interim

Professors: R. R. Boyer, J. D. Eifert, M. Ferruzzi, S.F. O'Keefe, M.A.

Ponder, L. Strawn, S.S. Sumner

Associate Professors: D. D. Kuhn, A.C. Stewart, H. Huang, J. Lahne

Assistant Professors: Y. Cheng, R. Cheng, D. Cladis, A. Hamilton, Y. Yin

Assistant Professor of Practice: H. Bruce

Undergraduate Program Director: H. Bruce

Graduate Program Director: J. Lahne

Collegiate Faculty: K. Hurley

Undergraduate Laboratory Manager: Open

Research Assistant Professor: R. Carneiro

Research and Extension Faculty: B. Driver, A. Sandbrook, L. Schonberger, T. Sun, B. Wiersema, M. Wright

Research Associates: M. Ac-Pangan, X. Liu, H. Shen

Adjunct Faculty: T. Lorca, D. Weller

Research Staff: S. Hayes, K. Waterman

Communication: Open

Administrative Staff: M. Breen, C. Dalton

Undergraduate Course Descriptions (FST)

FST 2004 - Exploring Food Science Careers (1 credit)

Food science specialization areas and career opportunities. Experiential learning opportunities developed through bridge experience platform. Introduction to research, internship, study abroad and individualized learning. Career preparation, job and internship search strategies.

Instructional Contact Hours: (1 Lec, 1 Crd)

FST 2014 - Introduction to Food Science (2 credits)

Fundamentals for food science and technology. Integration of basic principles of food safety, human nutrition, food spoilage, and sensory evaluation with the appropriate technology of food preservation and processing.

Instructional Contact Hours: (2 Lec, 2 Crd)

FST 2024 - From Raw to Burnt: Exploring Science and Society through Foods (3 credits)

Food as a method of studying scientific principles and development of society, including acquiring, preserving, processing and consuming foods. Integration of chemistry, biology and physics of grains; salt and spices; meat, poultry, and fish; dairy and eggs; fruits and vegetables; and fat and oils, with the advancements in and the cost to human civilization from historical and ethical perspectives of food production. Scientific principles demonstrated in food preparation.

Pathway Concept Area(s): 2 Critical Thinking Humanities, 4 Reasoning in Natural Sci., 10 Ethical Reasoning

Instructional Contact Hours: (3 Lec, 3 Crd)

FST 2044 - Food, War and Conflict (3 credits)

Explores historical developments in food preservation, processing and distribution relative to the commencement or continuation of conflict. Examines why and how wars have been fought over economic policies, food trade, and control of food supplies. Examines food defense efforts to protect food and water from intentional contamination and acts of terrorism and bioterrorism. Focus on food products and the preservation, processing and distribution technologies that arose from, or enabled, war and conflict.

Pathway Concept Area(s): 3 Reasoning in Social Sciences, 11 Intercultural&Global Aware.

Instructional Contact Hours: (3 Lec, 3 Crd)

Course Crosslist: IS 2044, PSCI 2044

FST 2244 - Topics in Food Science and Technology (1-3 credits)

Variable topics in food science and technology such as emerging trends, challenges and regulatory policy. Qualitatively and quantitatively explore relevant and timely issues facing food systems. May be repeated for a maximum of six credits with different topics. Pre: Sophomore standing.

Instructional Contact Hours: (1-3 Lec, 1-3 Crd)

Repeatability: up to 6 credit hours

FST 2424 - Introduction to Food and Beverage Fermentation (3 credits)

Principles, processes, and applications of fermentation in the context of food and beverage production. Explores various fermentation techniques, the chemical processes and microbiology involved, and the role of fermentation in enhancing flavor, texture, preservation, and nutritional value. Hands-on experience through workshops and sensory evaluation.

Prerequisite(s): CHEM 1036

Instructional Contact Hours: (3 Lec, 3 Crd)

FST 2544 - Functional Foods for Health (3 credits)

Introduction to functional foods (foods with additional value beyond basic nutrition) including development of functional foods, novel sources, and traditional foods with value-added health benefit; regulatory issues; and media messages.

Instructional Contact Hours: (3 Lec, 3 Crd)

Course Crosslist: HNFE 2544

FST 2974 - Independent Study (1-19 credits)

Instructional Contact Hours: Variable credit course

FST 2984 - Special Study (1-19 credits)

Instructional Contact Hours: Variable credit course

FST 2994 - Undergraduate Research (1-19 credits)

Instructional Contact Hours: Variable credit course

FST 3024 - Principles of Sensory Evaluation (3 credits)

Principles of sensory evaluation including theory, sensory physiology and psychology, experimental methods, applications, and statistical analysis.

Prerequisite(s): STAT 3005 or STAT 3615

Instructional Contact Hours: (3 Lec, 3 Crd)

FST 3114 - Wines and Vines (3 credits)

Development of a working knowledge of world wine styles, wine appreciation, and sensory evaluation of wine. Emphasis on the influences of grape growing and winemaking practices on wine quality, style, economic value, and significance in global food culture. Pre: Must be at least 21 years of age.

Instructional Contact Hours: (3 Lec, 3 Crd)

Course Crosslist: HORT 3114

FST 3124 - Brewing Science and Technology (3 credits)

Study of chemical reactions important in brewing of beer and hard cider. Effects of variations in malting, mashing, and other processing steps on characteristics and quality of beer; fruit sugar, acid and fermentation impacts on cider composition and quality. Investigation of reactions that cause flavor deterioration.

Instructional Contact Hours: (3 Lec, 3 Crd)

FST 3214 - Principles of Meat Science (3 credits)

Muscle biology and biochemistry, fresh meat processing, meat merchandising, processed meats, food safety, meat cookery, and regulations.

Prerequisite(s): ALS 2304 and CHEM 1036

Instructional Contact Hours: (3 Lec, 3 Crd)

Course Crosslist: APSC 3214

FST 3514 - Food Analysis (4 credits)

Data analysis, sampling techniques, theory and practice of chemical and physical methods of food analysis for determination of food composition; application of analytical methods of quality control and food laws and regulations.

Prerequisite(s): (STAT 3615 or BIT 2405) and (CHEM 2535 or CHEM 2514)

Instructional Contact Hours: (3 Lec, 3 Lab, 4 Crd)

FST 3604 - Food Microbiology (4 credits)

Role of microorganisms in foodborne illness, food quality, spoilage, and preservation. Control of microorganisms in foods. Method to enumerate, identify, and characterize microorganisms in foods.

Prerequisite(s): BIOL 2604 and BIOL 2614

Instructional Contact Hours: (3 Lec, 3 Lab, 4 Crd)

Course Crosslist: BIOL 3604

FST 3900 - Bridge Experience (0 credits)

Application of academic knowledge and skills to in a work-based experience aligned with post-graduation goals using research-based learning processes. Satisfactory completion of work-based experience often in the form of internship, undergraduate research, co-op, or study abroad; self-evaluation; reflection; and showcase of learning. Pre: Departmental approval of 3900 plan.

Instructional Contact Hours: (0 Crd)

FST 4004 - Food Science Experiential Learning Reflection (1 credit)

Reflection of skills and knowledge developed during food science experiential learning process. Analyze curriculum. Development of communication skills to reflect and evaluate their experience.

Instructional Contact Hours: (1 Lec, 1 Crd)

FST 4014 - Concepts of Food Product Development (3 credits)

Application to the food industry of principles and standard practices of research and product development; functionality of food ingredients; students will work in teams to design and develop a new food product.

Prerequisite(s): FST 3604

Corequisite(s): FST 4405, FST 4504

Instructional Contact Hours: (3 Lec, 3 Crd)

FST 4104 - Applied Brewing Science and Engineering (3 credits)

Chemistry, biochemistry, and engineering aspects of brewing operations in the production of beer. Barley, malting, hops, brewing operations, fermentation chemistry, yeast characteristics and finishing operations examined. Calculations of raw materials, brewing and fermentation schedules, and final specifications conducted. Laboratory exercises focused on brewing, brewery engineering, and analysis of intermediate and final products.

Prerequisite(s): FST 3604

Instructional Contact Hours: (2 Lec, 3 Lab, 3 Crd)

FST 4204 - Advanced Topics in Food Science and Technology (1-3 credits)

Variable advanced topics in food science and technology such as emerging trends, challenges and regulatory policy. Qualitative and quantitative exploration of relevant and timely issues facing food systems. May be repeated for a maximum of six credits with different topics. Pre: Junior standing.

Instructional Contact Hours: (1-3 Lec, 1-3 Crd)

Repeatability: up to 6 credit hours

FST 4304 - Food Processing (3 credits)

Basic principles of unit operations. Heat and mass transfer. Equipment in commercially important food processing applications. Raw food materials and packaging. Processing methods to ensure food safety and quality.

Prerequisite(s): BIOL 2604 and BIOL 2614 and (MATH 1025 or MATH 1524)

Instructional Contact Hours: (3 Lec, 3 Crd)

FST 4314 - Food Processing Laboratory (1 credit)

Safety and good manufacturing practice of food processing. Operation of key equipment found in the food industry. Collection, analysis and interpretation of data acquired in lab exercises. Documentation and reporting of findings.

Corequisite(s): 4304 or BSE 4604.

Instructional Contact Hours: (1 Lab, 1 Crd)

FST 4414 - Fermentation Process Technology and Instrumentation (2 credits)

Process design considerations for food and beverage fermentations, and other industrial fermentation processes. Critical process parameters, and instrumentation for fermentation process monitoring. Hands-on process instrumentation for fermentation.

Prerequisite(s): FST 4504 or FST 3604

Instructional Contact Hours: (1 Lec, 2 Lab, 2 Crd)

FST 4504 - Food Chemistry (3 credits)

Overview of the chemical and functional properties of food components including major (water, proteins, carbohydrates, enzymes and lipids) and minor (vitamins, minerals, flavors, pigments) constituents; chemical, biochemical reactions and physical phenomena occurring during food handling, processing, and storage; their impact on the nutritional and sensorial quality of food.

Prerequisite(s): BCHM 2024

Instructional Contact Hours: (3 Lec, 3 Crd)

FST 4524 - Food Safety and Quality Assurance (3 credits)

Monitoring safety and quality of food as well as compliance with government regulations. Description of regulatory agencies and food regulations. Development of specifications, food standards and safety critical control points. Systems to assure a safe and quality product, including acceptance sampling and statistical process control.

Prerequisite(s): FST 3604 and FST 4304

Instructional Contact Hours: (3 Lec, 3 Crd)

FST 4534 - Food Chemistry Lab (1 credit)

Investigation of functional properties of proteins, carbohydrates, and lipids in processed foods including effect of environmental conditions; solubility, foaming ability and textural properties of proteins, carbohydrate crystallization, ability of polysaccharides to form gels and pastes, lipid absorption and tenderization, characterization of a natural-occurring enzyme.

Corequisite(s): FST 4504

Instructional Contact Hours: (3 Lab, 1 Crd)

FST 4544 - Distillation and Fermentation Analysis (3 credits)

Sampling and analysis of pre-and post-fermentation foods and beverages to determine process termination, efficiency, and formation of desired and non-desired products. Laws and regulations pertaining to fermented foods and beverages. Distillation as an analytical tool and as a production method for food/beverage products.

Prerequisite(s): FST 4504 and FST 3514

Corequisite(s): FST 4104

Instructional Contact Hours: (2 Lec, 3 Lab, 3 Crd)

FST 4634 - Epidemiology Foodborne Disease (3 credits)

Overview of causes, transmission, and epidemiology of major environmental, food, and water borne diseases. Outbreak and sporadic detection, source tracking and control of pathogens. Overview of the impact of foodborne outbreaks on regulatory activities at the national and international level. Corequisite: Enrollment in either FST 3604 or BIOL 4674.

Corequisite(s): BIOL 4674, FST 3604

Instructional Contact Hours: (3 Lec, 3 Crd)

FST 4644 - Fermentation Microbiology (2 credits)

Physiology, biochemistry, and genetics of microorganisms used for production of food ingredients, fermented foods, and beverages. How microorganisms are used in fermentation and the effects of processing and manufacturing conditions on production of fermented foods.

Prerequisite(s): BIOL 2604

Instructional Contact Hours: (2 Lec, 2 Crd)

FST 4654 - Food and Beverage Fermentation (2 credits)

Introduction to the broad range of fermented foods and beverages. Defining quality parameters of fermented foods and beverages. In-depth examination of the processing methods and equipment employed in commercial-scale production of fermented foods and beverages. Historical, cultural, sensory, and nutritional attributes of fermented foods and beverages. Course requirements may be satisfied by taking FST 3604 or FST 4504 prior to or concurrent with course.

Prerequisite(s): FST 4504 or FST 3604

Corequisite(s): FST 4644

Instructional Contact Hours: (1 Lec, 2 Lab, 2 Crd)

FST 4974 - Independent Study (1-19 credits)

Instructional Contact Hours: Variable credit course

FST 4984 - Special Study (1-19 credits)

Instructional Contact Hours: Variable credit course

FST 4994 - Undergraduate Research (1-19 credits)

Instructional Contact Hours: Variable credit course