



FOOD SCIENCE & TECHNOLOGY AT OREGON STATE UNIVERSITY

Graduate Program

"OSU, a land grant institution, promotes economic, social, cultural and environmental progress for people across Oregon, the nation, and the world through our graduates, research, scholarship, outreach and engagement."

GRADUATE STUDY in Food Science and Technology concerns the application of biological, physical and engineering sciences to further our understanding of, and to improve the quality, safety, nutritional, and economic value of foods and beverages.

The Department of Food Science and Technology offers graduate programs leading to the M.S. and Ph.D. degrees. Students completing advanced degrees have excellent employment opportunities that include research and development in industry and government; teaching and research in colleges and universities; regulation of food quality and safety through governmental agencies and within companies; and management of food processing plants.

FACILITIES in the department include well-equipped laboratories with advanced analytical instrumentation, and pilot plants for instruction and research. The pilot plant facilities include a pilot winery, a pilot research brewery, cheese plant and ultra-high pressure food treatment equipment.

The **Seafood Laboratory**, (established in 1940) in Astoria, Oregon focuses on marine and related resources. Its principal goals are: 1) Research and Product Development; 2) Extension Service to the Fishing Industry; 3) Graduate Research, Training, and Instruction.

The Food Innovation Center, located in Portland, provides technical development services which include: concept and product development, business and market planning, process and packaging technology, and sensory and consumer analysis.

Through direct and collaborative arrangements, faculty and students have access to analytical services that include mass spectrometry, cell structure, flow cytometry, DNA and protein sequencing, DNA and peptide synthesis, confocal microscopy and computer support.

Areas of Thesis Research

Food Chemistry/Biochemistry: Areas of emphasis include functional foods, bioactive compounds and human health, processing and chemical reactivity, plant cell wall biochemistry, cereal polymer chemistry and enzyme technologies.

By-product Utilization: Research areas include characterization of the chemical and physical properties of food and agricultural byproducts as well as those focused on applying emerging technologies for byproduct utilization, such as the production of biofuels, bioproducts, and biomaterials.

Flavor Chemistry: Research areas include identification and measurement of aroma compounds and their chemical/biochemical formation in foods, and flavor retention and changes during food processing and storage. Additional studies include measurements of flavor interactions with food components and packaging materials, and flavor release in food systems.

Food Microbiology/Biotechnology: Studies focus on the physiology, genetics, and applications of yeast and lactic acid bacteria used in food and beverage fermentation, bacterial spores germination and development of technologies to inhibit microorganisms of public health concern.

Food Engineering: Studies include new and conventional preservation technologies, identification of valuable co-products from food processing streams and modification of ingredient functionality by pressure and thermal treatments.

Food Processing: Dairy, wine, fruit and vegetable processing, value-added food product development, and the application of high pressure processing and pressure-assisted thermal processing technologies as a means of food preservation. Two pilot plant high pressure vessels are used for research and service work.

Seafood Processing: Seafood processing, conducted at the Seafoods Laboratory in Astoria, Oregon, covers surimi, finfish, and shellfish with an emphasis on biochemistry, microbiology, safety, rheology, quality assurance, ingredients, product development and various processing technologies.

Sensory Evaluation: Research areas include 1) developing sensory test methodology, 2) understanding human oral perception, and 3) applying sensory analysis to product-focused research.

Enology / Brewing / Distilling: Studies focus on processing technologies, biochemistry, microbiology and chemistry of beer, wine and distilling production. Experimental brewery and winery facilities are used for experimental production and research. The pilot research brewery also focuses on raw materials quality and improved economics.

PROGRAMS OF STUDY: M.S. and Ph.D. degrees are offered in Food Science.

MASTER OF SCIENCE DEGREE:

M.S. candidates are expected to complete their degree requirements in approximately two academic years. All M.S. degree programs require a minimum of 45 graduate credit hours including the thesis (6-12). All Masters students must conduct scholarly research and in a professional and ethical manner. Only a thesis option is offered.

All Master's students are required to serve as a teaching assistant for two graded credits during their tenure as graduate students.

DOCTOR OF PHILOSOPHY DEGREE:

A master's degree or equivalent is required before entering the Ph.D. program. Rare exceptions, on a case by case basis, may be considered for applicants having post-baccalaureate training and/or experience judged to be equivalent to an M.S. degree. Ph.D. candidates generally complete their degree requirements in about four academic years (a minimum of 108 total credits).

All Ph.D. candidates are required to serve as a teaching assistant for four graded credits during their tenure as graduate students.

There is no rigid credit requirement, but usually 75-90 graduate credit hours are needed beyond the Master's degree. Of this total, 36 credit hours should be devoted to the preparation of the thesis.

All graduate student programs of study submitted to the Graduate School must consist of, at a minimum, 50% graduate stand-alone courses. The remaining credits may be the 500 component of 400/500 slash courses.

MINOR FIELDS OF STUDY

The purpose of the minor is to provide supporting coursework in basic sciences (chemistry, biochemistry, and microbiology) and applied sciences (horticulture, bioresource engineering, and business administration) for coursework and thesis research in Food Science. A minor is optional, but if a minor is declared, a minimum of 15 credits of graduate coursework must be included on a Master's program and 18 credits must be included on a doctoral program. The thesis committee must include a member from the minor department.

MINIMUM GRADE REQUIREMENTS

Failure to maintain a cumulative grade point average of 3.0 in course work or unsatisfactory progress in thesis research is cause for dismissal from the graduate program.

The Admission Process

The Food Science & Technology graduate program at Oregon State University is designed for students who have completed an undergraduate program in Food Science and Technology or one that is similar (see “B.S. Degree Requirements”). Students from related fields such as chemistry, biology, and microbiology are majors that could be compatible to research in Food Science. The undergraduate preparatory coursework should include general chemistry, biology, calculus, organic chemistry, microbiology and general physics.

Students desiring to do graduate study in Food Science and Technology must meet the requirements of the OSU Graduate School. The minimum entrance requirements are 1) a four-year baccalaureate degree from an accredited college or university, and 2) a combined GPA of 3.0 on the last 90 quarter credit hours (60 semester credit hours) of graded undergraduate work on the first baccalaureate degree plus all work completed thereafter. **Admission to OSU is competitive and meeting the minimum admission requirements does not guarantee admission.**

In general, applications should be submitted at least two terms in advance of the term in which the student wishes to enter. Applications may be received at any time. The academic calendar consists of four terms (quarters): fall, winter, spring, summer. New students should plan to enter fall term if possible, since many courses are given in sequence beginning fall term. An application is valid during the academic year in which you make application. A student may defer matriculation to a following term if not admitted upon first request. However, an international student may be required to submit new financial documents prior to having a new I-20 issued. To do so, please submit the application change form http://oregonstate.edu/dept/grad_school/forms.php#changeterm online or print the form and post or fax it to the Office of Admissions. A new I-20 with a new start date, will then be issued and mailed to you at an address that you specify.

Applications are submitted on-line through the following link: <http://gradschool.oregonstate.edu/admissions>

All admissions application forms are available on the graduate admissions web site. Although we no longer provide printable forms, if you are unable to access a form because you lack reliable internet access or you do not have a credit card for payment, please send a message to graduate.admissions@oregonstate.edu or a note to the following postal address to see if alternative arrangements can be made.

All other application materials should be mailed in one packet to:

**Graduate School
Oregon State University
300 Kerr Administration Building
Corvallis, Oregon 97331-2106**

The Department of Food Science will receive a copy of your application through graduate admissions. Application materials should consist of: application form; official transcripts; statement of objectives; three letters of professional reference; official GRE and TOEFL scores (unofficial scores may be submitted for preliminary review); curriculum vitae (CV) or resume; certification of finances and evidence of funding (for international students only).

The application fee is not waived and is non-refundable. If submitting an online application, please be prepared to provide a credit card number (VISA or MasterCard). If mailing an application, please submit a money order or check in U.S. dollars made payable to Oregon State University.

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|---------------------------|---------------------------------------|----------|
| Current application fees: | Degree seeking domestic student: | \$ 75.00 |
| | Degree seeking international student: | 85.00 |
| | Non-degree application fee: | 35.00 |

A one time matriculation fee of \$350 is charged at the first term at OSU.

Other University graduate admission information is available at this link:

<http://gradschool.oregonstate.edu/admissions>

International student information: <http://oregonstate.edu/admissions/international.html>

GRE (Graduate Record Examination) scores are required by the Department of Food Science and Technology (www.gre.org). Official results must be submitted with the formal application materials. A combined score of 300 (on the new exam) for the verbal and quantitative aptitude sections is considered minimal for admission by the department.

Graduate applications are reviewed by the departmental Graduate Committee. Applicants recommended for admission on the basis of test scores (GRE and TOEFL), undergraduate record, personal statement, research interests, resume, and letters of reference are only accepted if a faculty member is prepared to make a commitment in advance to serve as a major advisor, and to provide financial support if necessary. Applicants with journal or book chapter publications are encouraged to include them in the application. Applicants that meet initial screening have the option of maintaining an active application for the academic year in which you apply, but must officially defer the application each term.

IMPORTANT: Due to faculty interests, space availability, and limited financial resources, some otherwise qualified students may not be accepted. Because no student can be admitted without a prior commitment by a professor to serve as major advisor, applicants are expected to contact potential advisors with shared research interests (see “Faculty Research Interests”) to learn about specific research and funding possibilities concurrent with a formal application. This is best done on an individual basis.

FINANCIAL INFORMATION

EDUCATION COSTS:

Graduate tuition for the academic year 2016-2017 (not including summer) is approximately \$13,722 (3 terms) for full-time Oregon residents and \$23,640 (3 terms) for full-time non-resident graduate students who do not qualify for graduate assistantships.

FINANCIAL ASSISTANCE:

Loans, Grants, Scholarships and Work Study: For U.S. citizens or permanent residents obtain information at the following web site: http://financialaid.oregonstate.edu/review_aidtypes

Graduate Research Assistantships:

A Graduate Research Assistantship is a stipend paid for specific research, typically a faculty research project. The money that funds the research also funds the assistantship position. A GRA carries the added benefit of a tuition waiver but GRA's must pay mandatory student fees of about \$574 per term. Most graduate students are supported as GRA's on the research grants of their major advisors. **Because this type of support is limited, applicants should contact potential advisors to inquire about the availability of such assistantships early in the admission process.** In evaluating applications, consideration is given to the extent and quality of previous academic work, evidence of research ability and intellectual capacity, and promise of productive scholarship.

The research grant market is highly competitive, and funding agencies expect results, thus your professors need the most motivated graduate assistants who are capable of getting the work done, communicating results, and being a team player.

Stipends for a 12-month .20 to .49 FTE (full time employment) graduate assistantships range from about \$9,050 to 22,173 for an incoming M.S. student and \$9,749 to \$23,996 for an incoming Ph.D. student. Graduate tuition is waived for students holding at least a .20 graduate assistantship or is paid by the granting agency funding the assistantship.

For more information, please contact:

Holly Templeton
Department of Food Science and Technology
100 Wiegand Hall
Oregon State University
Corvallis, OR 97301-6602
1-541-737-6486; 1-800-823-2357
Holly.Templeton@oregonstate.edu

Find us on the web at: <https://foodsci.oregonstate.edu/>

FACULTY RESEARCH INTERESTS

Chris Curtin, Ph.D. Asst. Prof. Brewing Microbiology. Fermentation microbiology with an emphasis on brewing yeast and microbial ecology of beer production. Major interests are the development of new yeast strains, biology of *Brettanomyces* species, and the application of genomic techniques in food science. 541-737-1599. christopher.curtin@oregonstate.edu

Christina A. Mireles DeWitt, Ph.D., Assoc. Prof; Director- OSU Seafood Lab in Astoria, OR. My research interests are focused on efforts that improve seafood/muscle food quality and safety. Particularly with regard to understanding how injection/marinade and high pressure processes can be used to enhance product safety while minimizing impacts on nutritional value and quality. Interests also center on enhancing utilization of co-products generated from seafood processing and minimization of processing waste. 503.325.4531 Christina.dewitt@oregonstate.edu

Lisbeth Goddik, Interim Dept. Head, Ph.D., Prof. - Extension Dairy Processing Specialist; Extension dairy processing; dairy product safety; product and process development; optimization of product quality; Economics of artisan cheese production, specialty cheese processing, and understanding terroir effect on Oregon dairy products. 541-737-8322. lisbeth.goddik@oregonstate.edu

Paul Hughes, Ph.D., Asst Prof. MBA Prof. Research interests include all aspects of beer and distilled spirit quality (taste, visual) and product stability, innovation in the distilled spirits sector including alternative methods of ethanol-water separation, accelerated- and photo-maturation of distilled spirits, and the application of ab initio computational chemistry and kinetic modelling to beer and distilled spirits problems. 541-737-4595. paul.hughes@oregonstate.edu.

Jovana Kovacevic, Ph.D., Assistant Professor, Food Safety Extension and Research, Food Innovation Center Experiment Station, Portland, OR - Research interests are in the application of molecular methods and genomics in food safety. In particular, how methods and tools can be used to improve pathogen tracing and understanding of contamination events in the farm-to-fork food chain in order to develop targeted interventions. Particularly interested in stress response mechanisms, survival, and prevention of *Listeria monocytogenes* contamination in food processing environments.

Jung Y. Kwon, Ph.D. Asst. Prof. Biological functions of natural dietary molecules derived from marine resources in health promotion and disease prevention. Research interest includes identifying marine-derived bioactive compounds with beneficial effects in obesity and associated metabolic syndrome focusing on the regulation of lipid metabolism and inflammation in adipose tissue; uncovering potential health value of seafood materials and underutilized aquatic resources to promote efficient utilization of the harvested resources. 503-325-4513 Jung.Kwon@oregonstate.edu

Juyun Lim, Ph.D. Assoc. Prof. Sensory science with emphasis on sensory perception and sensory methodology. Current research focusing on understanding the role of human sensory perception in ingestive behavior and also developing sensory and consumer testing methodology. 541-737-6507. juyun.lim@oregonstate.edu

Robert McGorin, Ph.D. Prof. Focus is primarily in flavor chemistry and trace volatile analysis. Additional research interests are in food analysis, chromatography and separations, spectrometry, and natural products chemistry. robert.mcgorin@oregonstate.edu (not supervising graduate students)

James Osborne, PhD. Assoc. Prof. Enology. Wine microbiology with emphasis on malolactic fermentation and the microbial spoilage of wine. Influence of various wine microorganisms on wine quality. 541-737-6494 james.osborne@oregonstate.edu

Jae Park, Ph.D. Prof. Fish proteins; surimi processing and by-products utilization including nano fish bone; functional and rheological properties of food additives; advanced food processing techniques. 503-325-4531 jae.park@oregonstate

Si Hong Park, Ph.D. Asst. Prof. Food Safety Biologist; Genomics, metagenomics (microbiome and whole genome sequencing) and transcriptomics based on a next generation sequencing and bioinformatics. Research is focusing on the detection, identification and control of foodborne pathogens such as *Salmonella*, *Listeria*, *Campylobacter* and *E. coli* in foods using various molecular techniques. Microbiome sequencing in gastrointestinal tracts of humans, food animals (poultry and cattle) and experimental animals to evaluate the microbial diversity in the presence of food and feed supplements (prebiotics, probiotics and antimicrobials) and/or foodborne pathogen challenge. 541-737-1684. sihong.park@oregonstate.edu

Michael Penner, Ph.D. Assoc. Prof. Bio-based processes for the conversion of plant-derived biomass to fermentable sugars for bioproduct and biofuel production; mechanisms dictating rates of plant-derived biomass biodegradation; analytical approaches for the characterization of plant-derived biomass. 541-737-6513. mike.penner@oregonstate.edu

Michael Qian, Ph.D., Prof. Flavor Chemistry, Food Analysis, and Dairy chemistry. Characterization of aroma compounds, chemical and biological generation in dairy, small fruits and wines. Instrumental analysis of food components. 541-737-9114. michael.qian@oregonstate.edu.

Andrew Ross, Ph.D. Prof. Fundamental and applied research of cereal grain components, wheat-based foods (noodles, artisan breads, food barley), and bio-products from cereal grain fractions. Located in the OSU Cereal Breeding & Cereal Genetics Program in the Crop and Soil Science Department. 541-737-9149. andrew.ross@oregonstate.edu

Neil Shay, Ph.D. Prof. Bioactive compounds in fruits and vegetables that impact human metabolism and disease conditions including atherosclerosis, obesity, and diabetes; investigations on the health benefits of pigmented fruits and wine consumption; studies include the ability of bioactive compounds to lower blood cholesterol and triglyceride levels, combat fatty liver disease, and improve blood glucose control. 541-737-0685 neil.shay@oregonstate.edu

David Stone, Ph.D., Assoc. Prof. Superintendent Food Innovation Center, Portland. General interests include food safety and public health, development of value-added products in agriculture and engagement with under-represented communities in the food sector. Specific research interests include the assessment of biotoxins and metals in marine and freshwater organisms. I also direct a talented team at the Food Innovation Center (FIC), where we work with clients to advance Northwest foods. dave.stone@oregonstate.edu 503.872.6656

Elizabeth Tomasino, Ph.D., Asst. Prof. Enology. Relationships between wine sensory and chemical data; determination and importance of chiral aroma compounds in wine; differentiation of regional wine styles. 541-737-4866. elizabeth.tomasino@oregonstate.edu

Joy Waite-Cusic, PhD. Asst. Prof. Food Safety. Food microbiology with food safety emphasis; specifically interested in pathogen prevalence studies and risk assessment, method development and validation for detection of pathogens, and process validation and surrogate development. joy.waite-cusic@oregonstate.edu

Yanyun Zhao, Ph.D. Prof. Food processing and packaging techniques for enhancing food quality and safety. Development and characterization of edible and biodegradable packaging materials from food and agricultural byproducts. 541-737-9151. yanyun.zhao@oregonstate.edu

ADJUNCT FACULTY:

David E. Williams, Ph.D. Prof. Food toxicology; diet and cancer. 541-737-3277.
david.williams@oregonstate.edu

Mahfuzur Sarker, Ph.D. Prof. Bacterial Pathogenesis; molecular pathogenesis of *Clostridium perfringens* isolates associated with food poisoning and non-food borne gastrointestinal (GI) diseases in humans, and GI diseases in domestic animals; Mechanisms of *C. perfringens* sporulation, spore germination, and spore resistance. 541-737-2950. sarkerm@oregonstate.edu

David Dallas, Ph.D human milk and dairy bioactives, particularly milk proteins and how they are digested in humans (both infant and adult). Examines degradation of proteins and the release of bioactive peptides via liquid chromatography and mass spectrometry-based peptidomics and proteomics. Milk peptide and protein function via antimicrobial, antiviral, bacterial growth and immunomodulation assays.
Dave.Dallas@oregonstate.edu

For more information about fields of study in the Graduate Program at the Department of Food Science and Technology at Oregon State University, please contact:

Dr. Juyun Lim, Graduate Committee Chair, juyun.lim@oregonstate.edu

OR

Holly Templeton, Academic Program Support, holly.templeton@oregonstate.edu

Department of Food Science and Technology

100 Wiegand Hall

Oregon State University

Corvallis, OR 97301-6602

1-541-737-6486

About Oregon State University: OSU is one of only two U.S. universities designated a land-, sea-, space- and sun-grant institution. OSU is also Oregon's only university to hold both the Carnegie Foundation's top designation for research institutions and its prestigious Community Engagement classification. Its more than 29,000 students come from all 50 states and more than 90 nations. OSU programs touch every county within Oregon, and its faculty teach and conduct research on issues of national and global importance.

B.S. Food Science and Technology Curriculum with Options

| Food Science Major Core (100-104 Cr.) Required for all options | | | | | |
|---|---------------------------|-------|--|--------------|-----|
| Supporting courses (71-75 Cr.) | | | | | |
| Tech Wri, Science Wri, <u>or</u> Eng Comp | WR*327, 362 <u>or</u> 222 | 3 | FERM SCI OPTION (37 cr) + Additional elective courses (8 credits) (elective choices not listed) | | |
| Public Speaking | Comm 111* | 3 | Human Nutrition | NUTR 240 | 3 |
| General Chemistry | CH 231,232,233 | 4,4,4 | General Physics | PH 202 | 5 |
| General Chemistry Lab | CH 261,262,263 | 1,1,1 | Brewing Science | FST 460 | 3 |
| Organic Chemistry / Lab | CH 331,332/337 | 4,4,4 | Wine Production Principles | FST 466 | 3 |
| Quantitative Analysis | CH 324 | 4 | Fermentation Microbiology | FST 479 | 3 |
| Principles of Biology | BI* 211,212,213 | 4,4,4 | Food Processing Calc / Lab | FST 490/491 | 2,1 |
| Elementary Biochemistry | BB 350 | 4 | Food Packaging | FST 495 | 2 |
| General Microbiology/Lab | MB 302/303 | 3,2 | Food Analysis | FST 423 | 4 |
| Intro to Statistical Methods | ST 351 | 4 | Brewing Analysis | FST 461 | 3 |
| General Physics | PH 201 | 5 | Wine Prod, Analy, & Sensory Eval | FST 467 | 5 |
| Calculus & Probability for Life Science | MTH 227, 228 | 4 | Additional Ferm Sci Option Elective Courses totaling 8 credits | | |
| Differential / Integral Calculus | MTH 251,252 | 4,4 | | | |
| Core food science courses (29 credits) | | | | | |
| Food Safety and Sanitation | FST 360 | 3 | ENOLOGY & VITICULTURE (37 cr) + additional elective courses 9 credits (elective choices not listed) | | |
| Industry Preparation / HACCP | FST 370 | 3 | Plant Physiology | BOT 331 | 4 |
| Communicating Food & Ferm Sci | FST 385 (Writing Course) | 3 | Biology of Horticulture | HORT 301 | 3 |
| Senior Seminar | FST 407 | 1 | Grapevine Growth & Physiology | HORT 453 | 3 |
| Food Law | FST 421 | 3 | Prin & Practices Vineyard Prod | HORT 454 | 3 |
| Food Chemistry Fundamentals | FST 422 | 4 | Soil Science / Lab | SOIL 205/206 | 3,1 |
| Food Systems Chemistry | FST 425 | 4 | Wine Production Principles | FST 466 | 3 |
| Intro to Food Engineering Principles | BEE 472 | 5 | Wine Prod, Analysis & Sensory Eval | FST 479 | 3 |
| Intro to Food Eng Proc Design | BEE 473 | 3 | | | |
| FOOD SCI OPTION (38 cr) + Additional elective courses 12 credits (elective choices not listed) | | | | | |
| Human Nutrition | NUTR 240 | 3 | | | |
| General Physics | PH 202 | 5 | | | |
| Intro Statistical Methods | ST 352 | 4 | | | |
| Sensory Evaluation of Food | FST 420 | 4 | | | |
| Food Analysis | FST 423 | 4 | | | |
| Food Processing Calculations/Lab | FST 490/491 | 2,1 | | | |
| Food Packaging | FST 495 | 3 | | | |
| Food Microbiology | MB 440 | 3 | | | |
| Complete 3 credits from among FST 210, 212-213, or ANS 251. | | | | | |
| Fruit and Vegetable Processing | FST 210 | 3 | | | |
| Dairy Processing / Lab | FST 212,213 | 2,1 | | | |
| Animal Food Technology | ANS 251 | 3 | | | |
| Additional Food Science Option Elective Courses totaling 7 credits | | | | | |
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For more complete information for BS in Food Science refer to :

<https://foodsci.oregonstate.edu/>