

FOOD SCIENCE AND RELATED GRADUATE LEVEL COURSES BY AREA OF SPECIALIZATION

Food Chemistry

530 Food Ingredient Technology, 1 cr., Alternate years, Mauer

Identifies functions of ingredients listed on ingredient labels of food products and discusses alternative ingredient choices for food products.

534 (F&N) Human Sensory Systems and Food Evaluation, 3 cr., Mattes

Overview of human chemosensory (taste, smell, chemesthetic) mechanisms and abilities; procedural and statistical methods for evaluating the sensory responsiveness of people and the sensory properties of foods.

541 Postharvest Technology of Fruit & Vegetables (HORT 541), 1 cr., Handa

Theoretical and applied aspects of methods being used for enhancing the quality and shelf life of harvested fruits and vegetables. Factors that affect the longevity of produce and technology used to control these factors and reduce deterioration of produce between harvest and consumption/processing will be emphasized. Meets during weeks 11-15).

591E Water-Solid Interactions (IPPH 590W), 3 cr., Alternate years, Mauer and Taylor

Water plays a vital role in influencing product quality and is important because it is ubiquitous in the environment where numerous products (e.g. foods, pharmaceuticals, chemicals, etc.) are processed, stored, and used. While scientists are aware in a general sense that water has a deleterious effect on 'dry' product quality, a fundamental understanding of modes of water-solid interactions and impacts on product quality and stability is lacking. The goals of this course are: 1) to provide students with fundamental information on water-solid interactions (basic modes, etc.) as well as practical applications of water-solid interactions to food, pharmaceutical, and other systems; and 2) to provide each student the opportunity to delve deeper into a selected water-solid interaction topic via a literature review, experiment, written report, and class presentation.

591S Advanced Analytical Techniques in Agriculture, 2 cr., Nivens

Specialized topics not covered in other courses will be offered. Topics, requirements, and credits to be determined yearly. Course may be repeated by a student when different topics are taught.

609 Food Lipids (F&N 609), 1-3 cr., Alternate years, Watkins

Importance of lipids in the diet and food systems with emphasis on changes occurring during processing, preparation, and storage. Nomenclature, physical attributes, and oxidation of lipids, as well as properties of antioxidants will be major components of the course.

610 Food Proteins (F&N 610), 3 cr., Alternate years, Nielsen

Chemical and physical properties, distribution and function, and alteration of proteins in food. Protein toxicology and nutritional quality.

630 Carbohydrates (F&N 630), 3 cr., Alternate years, Yao/Daniel

Carbohydrates with an emphasis on those of low molecular weight in foods. Structures, reactions, and properties of mono- and oligosaccharides. Introduction to polysaccharides and food gums.

631 Polysaccharide Structure and Function, 3 cr., Alternate years, Chandrasekaran

Chemical structures, molecular structures, and physical properties of polysaccharides with methods for determining each, and relationships to practical applications.

632 Laboratory in X-Ray Fiber Diffraction, 2 cr., Alternate years, Chandrasekaran

Molecular model building and x-ray diffraction analysis of fibrous polymer structures such as nucleic acids, polysaccharides and polypeptides.

650 Food Chemistry, 1 cr., Hamaker

Principles and concepts of the effects of heat, light, oxygen, and water activity on chemical reactions and physical events involved in processing, storage, and preparation of food products and their relationships to nutritional quality, organoleptic quality, and safety. Class meets weeks 1-5.

651 Food Analysis, 1 cr., Nielsen

Principles and applications of chemical, physical and sensory techniques to analyze foods. Class meets weeks 6-10.

690W Phytochem:Biochem & Phys, 3 cr., Alternate years, Watkins

The learning approach is a systematic study of the chemistry, nutrition, and physiology of phytochemicals in mammalian species. A principle emphasis will be on exploring the biological actions of these compounds in experimental models and the human. Critical review of the published literature on phytochemicals is an important learning goal for this course. How phytochemicals modulate genes to influence protein expression and chronic disease risk will be discussed.

Foods & Health

620 (ANSC) Proteins & Amino Acids in Nutrition, 3 cr., Alternate years

Presentation of concepts concerning requirements for dietary amino acids, nutritional regulation of amino acid metabolism, and regulation of protein metabolism. Integrates biochemical and physiological functions of amino acids and features topics in nutritional regulation of whole-body protein turnover in mammalian and avian species. Offered in odd-numbered academic years.

605 (F&N) Nutritional Biochemistry & Physiology I, 4 cr., Fleet, Teegarden, and Weaver

(ANSC 625) Integration of biochemical and physiological functions of nutrients in humans and animals emphasizing interactions in bone and gut.

606 (F&N) Nutritional Biochemistry & Physiology II, 2 cr.

(ANSC 626) Integration of biochemical and physiological functions of nutrients in humans and animals emphasizing post-absorptive use of nutrients as sources of energy and for the synthesis of macromolecules. Offered weeks 1 - 8.

607 (F&N) Nutritional Biochemistry & Physiology III, 2 cr., Burgess, Fleet, Jiang, Adams Latour, and Mattes

(ANSC 627) Integration of biochemical and physiological functions of nutrients in humans and animals, emphasizing transport and metabolism in the context of cardiovascular function. Offered weeks 9 - 16.

652 Nutritional Sciences, 1 cr., Watkins

Study of perspectives on established nutrition knowledge, concepts, and principles pertinent to the field of food science. Contemporary information about diet as it relates to health and safety issues. Controversies regarding nutrients and functional foods. Class meets weeks 11-15.

Food Microbiology/Biotechnology

564 Food Fermentations, 2 cr., Alternate years, Cousin

Microbiology and biochemistry of traditional and nontraditional food fermentations. Starter culture technology used in food fermentations. New developments in the use of microorganisms for food and energy.

565 Microbial Foodborne Pathogens, 3 cr., Alternate years, Bhunia

Microbial pathogens involved with foodborne diseases. Course emphasis is on molecular and genetic basis of virulence of bacterial foodborne pathogens and host parasite interactions. Topics include incidence and source of pathogens, immune response to infection, virulence factors and mechanism of pathogenesis of specific infections and intoxicating foodborne bacteria, mycotoxins, viruses and parasites.

566 Microbl Tech Food Path, 2 cr., Alternate years, Bhunia

Molecular biology, immunochemistry and tissue culture-based rapid and automated techniques currently used for detection and identification of foodborne pathogens. The techniques include metabolic fingerprinting identification system, enzyme immunoassay and dot blotting, lateral flow assay, polymerase chain reaction, genomic fingerprinting, cytotoxicity assays, and selected biosensor tools. Laboratory experiments are scheduled for four hours, with up to two additional hours of arranged time. (Weeks 6-16)

591A Food Sanitation, 3 cr., Keener

A practical application of hygienic practices, requirements for sanitation programs, and modern sanitation practices in food processing facilities.

591B Food Biotechnology, 1 cr., Applegate

The course begins with a brief introduction to the history of biotechnology associated with primary food production and creation of value added products from 6000 BC to the present. This will be followed by coverage of modern biotechnology, including technical aspects of molecular biology and the ethical, environmental, and social impact of food-related applications of biotechnology. Public perception of food biotechnology in the Genetically Modified Organism (GMO) context, both pro and con, will be addressed using real life examples. The course culminates in a group project in which students develop and present their business plan for a hypothetical GMO product.

591M Microbes and Environment, 2 cr., Applegate

“Microbes and Their Environment” is a hybrid literature-based, laboratory-focused class for students who wish to survey current research within the realm of environmental microbiology or microbial ecology, and obtain hands-on experience in the laboratory. In this multicomponent course, students will meet weekly in a journal club format, and during the class periods will be required to present a current research article related to microbes and their responses and adaptation to the environment. Additionally, students will perform experiments using bioluminescent based biosensors. The focus of this part of the course is to allow students to create/use whole cell biosensors, using molecular biology techniques, which can respond to their environment to analyze the presence or absence of specific environmental perturbations to which the microbes respond. Perturbations can include: presence or absence of compounds including xenobiotics, carbon, metals, temperature, etc. Students will design, construct, and evaluate a whole cell biosensor. Final grades will be assigned following an interdepartmental poster presentation of the students’ research.

653 Food Microbiology, 1 cr., Cousin

Principles and applications of the microbiology of foods. Focus is on the important conditions that may lead to foodborne illness and food spoilage. Course is organized in three sections related to foodborne hazards: (1) identification, 2) control and prevention, and 3) detection. Class meets weeks 1-5.

690C Gut Micro Journal Club, 1 cr., Bhunia

Overall theme is to discuss and critique recent journal articles related to intestinal microbiology/immunology. The specific areas covered under this forum are; (i) Intestinal

microbiology, (ii) Food Microbiology as it relates to gastrointestinal diseases, (iii) Probiotics and prebiotics- related to intestinal health or pathogen control and (iv) Mucosal immunity with major emphasis on intestinal immunology.

690N Atomic Force Microscopy System, 1 cr., Nivens

The course is design to allow you to learn basic concepts in scanning probe microscopy (atomic force microscopy), develop an understanding of the current literature on atomic force microscopy (AFM) and related topics, and gain experience through hands-on imaging of samples that are important to your research. The first five weeks of the class will be classroom-based, while the final 10 weeks will focus on work in the AFM lab. Grades will be based on your ability to pass a proficiency exam (25%), discuss current literature (25%), and write a 5 to 10 page paper about AFM imaging of your sample (50%).

Food Processing and Technology

555 (ABE) Biological and Food Processing Unit Operations, 3 cr., Okos

Analysis and design of unit operations such as dehydration, fermentation, separations, and granulation. Integration of pilot plant results into the scale up of process systems. Emphasis on how the properties of biological materials influence the quality of the processed product. Use of optimization methods for the analysis of process alternatives.

556 (ABE) Biological and Food Process Design, 4 cr., Okos

The course will focus on the synthesis, creation, evaluation and optimization of a preliminary process design to convert basic biological materials into a finished product. Concepts of materials and energy balances, thermodynamics, kinetics, transport phenomena of biological systems will be used to design processes to minimize energy and environmental impacts, and evaluate economic factors while maintaining product quality. Group projects, written and oral reports.

591G Better Process Control, 2 cr, Linton

Better Process Control - This course focuses on FDA and USDA regulations for low acid and acidified foods and includes information related to pH and acidification, sanitation, microbiology, thermal processing, thermal processing systems, food container handling, and different packaging systems.

640 Aseptic Processing Technology, 1 cr., Cousin

Overview of aseptic processing and packaging systems; thermal processing and fluid flow in continuous heat exchangers; food microbiology, chemistry, and packaging as applied to aseptic processing. Establishing processes for aseptic processing of liquid and particulate foods.

654 Food Processing and Packaging, 2 cr., Corvalan and Mauer

This course covers relevant basic engineering concepts and their applications to solve food processing and packaging problems. Key unit operations and regulations or recommended practices for manufacture of a variety of foods will also be covered. The students will work in teams on a project and present findings to the entire class. Class meets weeks 6-15.

General Food Science Courses

590 Special Problems, 1-5 cr.

Specialized study in research laboratories, libraries, or computer laboratories for problems related to food science that are not taught in regular courses.

591 Special Topics, 1-3 cr.

Specialized topics not covered in other courses will be offered as one-credit minicourses.

655 Case Study, 1 cr.,

A brief overview of problem solving and teamwork concepts will be presented in class. A problem will be given by an industrial sponsor, and work groups (teams) will be assigned to solve the problem and present the findings.

684 Food Science Seminar, 1 cr., Every semester, Chandrasekaran and Reuhs

Current topics in food science.

690 Special Topics in Food Science, 1-3 cr.

Individual study of specialized material.

690B Scientific Writing, 2 cr., Cousin and Reuhs

This course will cover the essential elements of publishing original research at professional meetings (oral presentations and posters) and in peer-reviewed journals (original research manuscripts). Topics include: ethics in writing, effective reading of the literature, organizing research data, choosing a journal, writing the manuscript (results, materials and methods, introduction, discussion, title, abstract, references), publication process, revising and reviewing, poster presentation, and short oral presentations. Each student will write a paper, prepare a 12 minute oral presentation and prepare a poster based on data from her/his graduate research project.

690I Homeland Security Simulation, 1-3 cr., Bhunia

The Department of Food Science, in collaboration with Purdue's Homeland Security Institute and the Krannert School of Management, has developed a realistic simulation environment that assists companies, local and national-level first responders, and academicians to understand and measure the impacts of an intentional contamination of our food supply. The Food Defense Simulation also measures the impacts of decision-making by first responders, government officials, and industry executives. Students enrolled in FS 690I collect real-life data from companies and government officials. This data is then put into the simulation algorithms through the members of the 'simulation team' that includes the Krannert School of Management and Homeland Security Institute personnel. The 'simulation team' works collaboratively with the students ensuring that the communication and research is complimentary to each other, enhancing the existing model. Once the data is collected and the model improved, the students, along with the Department of Food Science's Administrative Director, hold a simulation event, inviting stakeholders from around the country.

697 Supervised Teaching in Food Science (Ph.D. only), 1 cr.

Students assist a faculty member in teaching a food science course to obtain training and experience in various aspects of classroom and laboratory teaching.

698 Research, M.S. Thesis, 1-18 cr.

699 Research, Ph.D. Thesis, 1-18 cr.