

FOOD SCIENCE & RELATED GRADUATE COURSES BY AREA OF SPECIALIZATION

Food Chemistry

ANSC 620: Proteins and Amino Acids in Nutrition (Fall Odd Years) (Pre-req. BCHM 562)
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.

BCHM 561 Biochemistry I (Fall)

This course provides upper-division undergraduate and graduate students with basic understanding of biochemical and structural properties of amino acids, nucleic acids, lipids, and carbohydrates. This course allows students to connect the relationship between structure and function of biomolecules. In addition, students learn to understand enzyme properties, enzyme mechanism of action, and enzyme regulation.

BCHM 562 Biochemistry II (Spring)

This course provides upper-division undergraduate and graduate students with an understanding of core metabolic pathways. Anabolic and catabolic processes of metabolic pathways are studied. Biochemical and structural knowledge is used to determine how enzymes and coenzymes are needed to regulate and control metabolic pathways.

BCHM 60501: Macromolecules (Fall)

This course will provide students with an understanding of the basic principles that underlie the secondary and tertiary structure of proteins and nucleic acids which contribute to their function. It will inform students of current efforts to engineer macromolecules with novel functions. Students will become familiar with methods used to determine the three-dimensional structures of macromolecules, and they will learn to critically evaluate the accuracy of structural models. Special topics in the current literature, including membrane proteins, drug design and ribozymes, will be covered. The class will typically include students from a variety of departments, graduate programs, and scientific backgrounds. The course will be taught primarily from various textbook and from the primary literature. A biochemistry course designated for majors is a prerequisite of the course. Lack of the prerequisite will require approval of the instructor. Permission of Department required.

BCHM 620: Protein Mass Spectrometry and Proteomics (Spring Even Years)

The goals of this course are to introduce students to 1) basic principles of mass spectrometry, 2) the most common instruments used for protein mass spectrometry including the advantages and disadvantages of each, 3) the most common applications of protein mass spectrometry in biological research, 4) current approaches to quantitative protein mass spectrometry and their use in proteomic studies 5) the skills necessary to analyze mass spec data from a variety of experiment types including the ability to use and understand common database search programs, and 6) contemporary issues associated with large-scale proteomics experiments (including technical challenges and limitations) culminating in the ability to design appropriate experiments to answer a specific proteomic question. Prerequisite: Students need to have taken an undergraduate level biochemistry course and be familiar

with basic aspects of protein structure that are taught in such courses. In the absence of an undergraduate biochemistry course, students should discuss their qualifications with the instructor before registering.

BIOL 517: Molecular Biology Proteins (Spring)

Principles of protein three-dimensional architecture. The molecular and structural basis of protein folding, function, and evolution.

FS 530 Food Ingredient Technology (Spring)

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

FS 550 Food Chemistry (Fall)

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, stability, and safety. Class meets for 5 weeks.

FS 551 Food Analysis (Fall)

Principles and applications of chemical, physical, and sensory techniques to analyze foods.

FS 591 Aquatic Products (Fall Odd Years) *

Individual study of specialized materials. Permission of instructor required.

FS 591 Food Physical Chemistry (Fall Even Years) *

Individual study of specialized materials. Permission of instructor required.

FS/NUTR 609 Food Lipids (Fall Odd Years)

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.

FS/NUTR 630 Carbohydrates (Fall Odd Years)

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. Offered in alternate years. Prerequisite: 6 credit hours in Organic Chemistry.

FS 690 Polysaccharide Analysis (Spring Even Years) *

Individual study of specialized materials. Permission of instructor required.

FS 690 Sensory Evaluation Techniques (Summer Odd Years) *

Individual study of specialized materials. Permission of instructor required.

HORT 541 Postharvest Technology of Fruit & Vegetables (Spring)

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. Weeks 11-15.

NUTR 534 Human Sensory Systems and Food Evaluation (Fall)

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

Foods for Health

ANSC 620: Proteins and Amino Acids in Nutrition (Fall Odd Years) (Pre-req. BCHM 562)

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.

FS 552 Nutritional Sciences (Fall)

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.

FS 591 Functional Foods (Fall Even Years) *

Individual study of specialized materials. Permission of instructor required.

FS 690 Phytochem: Biochemistry & Physiology (Spring Even Years) *

Individual study of specialized materials. Permission of instructor required.

FS 690 Phytochemicals*

Individual study of specialized materials. Permission of instructor required.

NUTR 605/ANSC 625 Nutritional Biochemistry & Physiology I

Integration of biochemical and physiological functions of nutrients in humans and animals emphasizing interactions in bone and gut. Prerequisite: BCHM 30700, 30900, BIOL 20300, 20400, NUTR 31500.

NUTR 606/ANSC 626 Nutritional Biochemistry & Physiology II

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. Prerequisite: NUTR 60500.

NUTR 607/ANSC 627 Nutritional Biochemistry & Physiology III

Integration of biochemical and physiological functions of nutrients in humans and animals, emphasizing lipid metabolism and transport in the context of cardiovascular function. Prerequisite: NUTR 60600.

NUTR 534 Human Sensory Systems and Sensory Evaluation

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

NUTR 640 Human Feeding

Critical review of the genetic, neural, metabolic, endocrine, sensory, cognitive, and cultural determinants of appetite, food selection, and energy balance. Offered in alternate years. Prerequisite: physiology, biochemistry. Masters student standing.

NUTR 616 Special Topics in Ingestive Behavior

Individual problems dealing with various aspects of nutrition. Permission of instructor required.

NUTR 590 Journey through the Digestive Tract

Individual problems dealing with various aspects of nutrition. Permission of instructor required.

PSY 692 Models of Feeding Behavior *

Various topics which may change from semester to semester are presented by faculty in the Department of Psychological Sciences.

Food Microbiology**BCHM 561 Biochemistry I (Fall)**

This course provides upper-division undergraduate and graduate students with basic understanding of biochemical and structural properties of amino acids, nucleic acids, lipids, and carbohydrates. This course allows students to connect the relationship between structure and function of biomolecules. In addition, students learn to understand enzyme properties, enzyme mechanism of action, and enzyme regulation.

BCHM 562 Biochemistry II (Spring)

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BIOL 529 Bacterial Physiology (Spring)

A detailed consideration of the central metabolic routes, their role in generation of energy and key intermediates, and the conversion of those intermediates to small molecule building blocks. Regulatory mechanisms will be stressed.

BIOL 533 Medical Microbiology (Fall)

Host-parasite relationships. Immunology. Bacteria and viruses associated with infectious diseases.

BIOL 537 Immunobiology (Spring)

Readings and discussion in the structural, cellular, and genetic basis of the immune response. Biology 420 recommended as a pre-requisite.

BIOL 541 Molecular Genetics of Bacteria (Fall)

Advanced bacterial genetics, with emphasis on the use of genetics as a powerful and creative intellectual activity that enables us to discover biological functions and to construct new organisms by the manipulation of DNA. Major topics include: mutations, genetic selections, recombination, regulatory mechanisms, and genomic evolution.

BIOL 549 Microbial Ecology (Spring Even Years)

A study of microbial interactions with other organisms and the environment. Aquatic and terrestrial ecosystems as well as interactions between nonpathogenic microbes and plants and animals will be discussed.

FS 553 Food Microbiology (Fall)

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

FS 564 Commercial Food and Beverage Fermentation (Spring Even Years)

This course will provide a study of the principles and practices of international food and beverage fermentations with emphasis on the microbiology, biochemistry and processing techniques used in commercial fermentations that utilize fruits, vegetables, grains, dairy, and meats. Instructional Format: This is a two-credit lecture that can be linked to a separate optional one credit hour laboratory combination. Students must be 21 years of age with ID check for proof of age. Permission of department required.

FS 565 Microbial Foodborne Pathogens (Spring Odd Years)

The primary focus is to study the microbial pathogens involved with foodborne diseases. Course emphasis is on molecular and genetic basis of virulence of 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 infectious and intoxicating foodborne bacteria, mycotoxins, viruses and parasites.

FS 566 Microbial Techniques (Spring Even Years)

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.

FS 591 Food Sanitation (Fall) *

Specialized topics not covered in other courses will be offered as one-credit minicourses. Topics, requirements, and credits will be determined yearly. Permission of instructor required.

FS/ANSC 660 Intestinal Microbiology Immunology (Fall)

Discussion and critique of recent journal articles related to intestinal microbiology/immunology. The specific areas covered under this forum are: (1) intestinal microbiology, (2) food microbiology as it relates to gastrointestinal diseases, (3) probiotics and prebiotics-related to intestinal health or pathogen control, and (4) mucosal immunity with major emphasis on intestinal immunology.

Food Processing**ABE 557** Transport Operations in Food and Biological Systems II

Course includes analysis and design of operations, such as dehydration, fermentation, and separation processes. Development of experimental designs, integration of pilot plant results into the design,

operation and scale-up process systems. Emphasis on how the properties of biological materials influence the quality of the processed product.

ABE 558 Process Design for Food and Biological System

This course will focus on the design, synthesis, creation, evaluation, and optimization of processes 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. Course will include group projects, oral and written reports.

ABE 580 Process Engineering of Renewable Resources

Physical and chemical structure of biomass. Reaction kinetics of hydrolysis of hemicellulose and cellulose to fermentable sugars. Fundamentals of ethanol production by fermentation. Separation of fermentation products into pure components.

ABE 560/BME 52100 Biosensors: Applications and Fundamentals (Spring)

An introduction to the field of biosensors and an in-depth and quantitative view of device design and performance analysis. An overview of the current state of the art to enable continuation into advanced biosensor work and design. Topics emphasize biomedical, bioprocessing, environmental, food safety, and biosecurity applications.

ABE 627 Colloidal Phenomena in Bioprocessing

The structure, stability, and rheology of biological dispersions, emulsions, and foams are explained in terms of the principles of electrostatics, hydrodynamics, thermodynamics, and statistical mechanics. Additional topics include colloidal phenomena in downstream bioprocessing, as well as colloidal aspects of some food systems. Prerequisite: Thermodynamics and physical chemistry.

CHE 540 Transport Phenomena (Fall)

Continuation of CHE 37700 and 37800. Topics in fluid mechanics, heat transfer and mass transfer including unsteady state transport problems, stream functions, potential flow, hydrodynamic and thermal layers, turbulence, and multicomponent diffusion.

CHE 620 Transport Phenomena I

Analysis of transport of momentum, energy, and mass by molecular and turbulent mechanisms. Prerequisite: CHE 52700.

FS/HORT 506 Grape Wine Production (Fall)

A study of professional grape growing and wine production with an emphasis on Midwestern climates, adapted varieties, and recommended wine styles. This course is especially intended for upper level undergraduate, or graduate students in the College of Agriculture that have completed basic course work in plant sciences, biology and chemistry. Students will learn the principles of viticulture and enology and the practices of commercial grape growing and wine making. Must be 21 years old. Permission of instructor required.

FS 530 Food Ingredient Technology

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

FS 535 Aseptic Processing Technology (Spring)

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.

FS 554 Food Processing & Packaging

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 also will be covered. Students work in teams on a project and present their findings to the entire class. Class meets weeks 6-15.

FS 691 Advanced Food and Biological Material Characterization Techniques *

***Temporary Course** – Consult instructor for course availability