The graduate program in Nutrition and Food Science is administered by the Department of Nutrition and Food Science (B. Chew, Head), and its membership includes faculty from Nutrition and Food Science, Animal Science, Biochemistry and Biophysics, Biological and Agricultural Engineering, Health and Kinesiology, Horticultural Sciences, Poultry Science, Sociology, Soil and Crop Sciences, Wildlife and Fisheries Sciences, Agricultural Economics, the School of Rural Public Health, and Veterinary Integrative Biosciences.

Graduate training in Food Science is designed to provide advanced training in the basic sciences, processing technology, and engineering processes related to the production, processing, distribution, or utilization of food. Food sciences courses to strengthen the primary interest of the student are selected from those listed by the departments participating in the program. Areas of specialization include meat science, cereal chemistry, horticultural sciences, engineering, food chemistry, food microbiology, food safety, toxicology, and poultry science.

The graduate program in Nutrition offers the opportunity for advanced studies in both human and animal nutrition. The program is designed to allow students to build a strong research expertise in nutritional sciences as well as obtain advanced knowledge of basic and practical nutrition. Participating faculty members have research programs that address nutrient bioavailability, energy metabolism and performance, biochemical interactions and molecular nutrition. Programs are also available in social nutrition.

Courses of study lead to the Master of Agriculture, the Master of Science, and the Doctor of Philosophy degrees. Courses for the degree program are selected from the various departments to serve the needs of the graduate student. Questions about the graduate degrees in nutrition and food science can be directed to the graduate program coordinator at kderuiter@tamu.edu.

For more information, see http://nfs.tamu.edu.

Faculty

Acuff, Gary R, Professor
Nutrition & Food Science
PHD, Texas A&M University, 1985

Allred, Clinton D, Associate Professor
Nutrition & Food Science
PHD, University of Illinois at Urbana-Champaign, 2002

Chapkin, Robert S, Professor
Nutrition & Food Science
PHD, University of California, Davis, 1986

Chew, Boon P, Professor
Nutrition & Food Science
PHD, Purdue University, 1978

Giles, Erin D, Assistant Professor
Nutrition & Food Science
PHD, McMaster University, 2015

Guo, Shaodong, Associate Professor
Nutrition & Food Science
PHD, Peking University, China, 1995

Kubena, Karen S, Professor
Nutrition & Food Science
PHD, Texas A&M University, 1982

McIntosh, Alex, Professor
Nutrition & Food Science
PHD, Iowa State University, 1975

Murano, Elsa, Professor
Nutrition & Food Science
PHD, Virginia Polytechnic Institute and State University, 1990

Murano, Peter S, Senior Associate Professor
Nutrition & Food Science
PHD, Virginia Polytechnic Institute and State University, 1989

Patil, Bhimanagouda, Professor
Nutrition & Food Science
PHD, Texas A&M University, 1994

Riaz, Mian, AgriLife Professor
Nutrition & Food Science
PHD, University of Maine, 1992

Sun, Yuxiang, Assistant Professor
Nutrition & Food Science
PHD, University of Manitoba, Canada, 2000

Talcott, Stephen T, Professor
Nutrition & Food Science
PHD, University of Arkansas, 2000

Talcott, Susanne U, Associate Professor
Nutrition & Food Science
PHD, University of Florida, 2004

Turner, Nancy D, Research Professor
Nutrition & Food Science
PHD, Texas A&M University, 1995

Wu, Chaodong, Associate Professor
Nutrition & Food Science
PHD, Beijing Medical University, 1998

Xie, Linglin, Assistant Professor
Nutrition & Food Science
PHD, Kansas State University, 2008

Masters

• Master of Agriculture in Food Science and Technology (http://catalog.tamu.edu/graduate/colleges-schools-interdisciplinary/agriculture-life-sciences/nutrition-food-science/magr)
• Master of Science in Food Science and Technology (http://catalog.tamu.edu/graduate/colleges-schools-interdisciplinary/agriculture-life-sciences/nutrition-food-science/food-science-technology-ms)
• Master of Science in Nutrition (http://catalog.tamu.edu/graduate/colleges-schools-interdisciplinary/agriculture-life-sciences/nutrition-food-science/nutrition-ms)

**Doctoral**

• Doctor of Philosophy in Food Science and Technology (http://catalog.tamu.edu/graduate/colleges-schools-interdisciplinary/agriculture-life-sciences/nutrition-food-science/food-science-technology-phd)

• Doctor of Philosophy in Nutrition (http://catalog.tamu.edu/graduate/colleges-schools-interdisciplinary/agriculture-life-sciences/nutrition-food-science/nutrition-phd-phd)

**Certificates**

• Dietetic Internship Certificate (http://catalog.tamu.edu/graduate/colleges-schools-interdisciplinary/agriculture-life-sciences/nutrition-food-science/dietetic-internship-certificate)

**Courses**

FSTC 605 Chemistry of Foods
Credits 3. 3 Lecture Hours.
Chemical covalent and noncovalent interactions in food systems; the glass transition and moisture in foods; carbohydrate chemistry; reactions of food lipids; food protein functionality; chemistry of flavor; processing chemistry; food additives; and nutraceutical phytochemicals.
Prerequisite: BICH 410 or BICH 603.

FSTC 606/DASC 606 Microbiology of Foods
Credits 3. 3 Lecture Hours.
Nature and function of beneficial and defect-producing bacteria in foods; food-borne illness, effects of processing, storage and distribution; techniques for isolation and identification from foods.
Cross Listing: DASC 606/FSTC 606.

FSTC 607/ANSC 607 Physiology and Biochemistry of Muscle as a Food
Credits 3. 3 Lecture Hours.
Biochemical, histological, anatomical and physical characteristics of muscle cells and factors associated with transformation of muscle cells into meat.
Prerequisite: BICH 410 or approval of department head.
Cross Listing: ANSC 607/FSTC 607.

FSTC 610/NUTR 610 Nutritional Pharmacometrics of Food Compounds
Credits 3. 3 Lecture Hours.
Introduction into nutritional pharmacokinetics and pharmacodynamics of food compounds; specific examples of toxicological and pharmacological effects of food compounds.
Prerequisite: NUTR 202 or NUTR 203 or FSTC 201 or CHEM 227 or CHEM 222 or instructor approval.
Cross Listing: NUTR 610/FSTC 610.

FSTC 611/POSC 611 Advanced Egg & Poultry Meat Processing
Credits 3. 3 Lecture Hours.
Advanced Egg & Poultry Meat Processing. Focuses on egg markets, egg processing, grading, packaging, safety, quality and consumer acceptance of shell eggs; poultry meat processing (specifically turkeys and broilers), meat quality, markets, consumer acceptance of poultry meat and safety.
Prerequisite: Graduate classification.
Cross Listing: POSC 611/FSTC 611.

FSTC 619 Molecular Methods for Microbial Characterization
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Underlying principles of molecular methods for microbial detection and characterization in natural and man-made ecosystems; emphasis on method application and data interpretation; emphasis on microbial pathogens and indicator organisms in foods and environment; laboratory covers select protocols.
Prerequisites: FSTC 326/DASC 326; SCSC 405; POSC 429; approval of instructor.
Cross Listing: SCSC 619, POSC 619, and VTMI 619.

FSTC 623/BAEN 623 Nanotechnology in Food Processing
Credits 3. 3 Lecture Hours.
Fundamental and applied knowledge related to nanoscale systems and technologies utilized in processing of foods; includes nanoscale physico-chemical properties of foods, applications, manufacture and analysis of nanotechnologies for food processing and preservation; relevant industrial and regulatory food nanotechnology associated aspects.
Prerequisites: FSTC 312/DASC 312, FSTC 313/DASC 313, FSTC 315/AGSM 315, or AGSM 315/FSTC 315, or equivalent coursework, or approval of instructor.

FSTC 629/POSC 629 Microbiology of Food Irradiation
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Lecture plus laboratory overview of electron beam and x-ray based food irradiation principles; provides a working knowledge of using electronic pasteurization as a means of destroying microbial pathogens or retarding microbial spoilage in foods.
Cross Listing: POSC 629/FSTC 629.

FSTC 630/SCSC 630 Cereal Grains for Human Food
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Fundamental concepts of dry milling, wet milling, oil extraction, baking, malting, brewing, storage, sanitation and quality evaluation and control interrelated with physical and biochemical properties of cereals and their products; use of instruments and techniques to evaluate cereal quality.
Prerequisite: Approval of instructor.
Cross Listing: SCSC 630/FSTC 630.

FSTC 631 Food Carbohydrates
Credits 3. 3 Lecture Hours.
Chemistry, structure, functionality and nutritional properties of food carbohydrates; fiber chemistry, functionality and nutritional properties, artificial sweeteners, starch structure and functionality and hydrocolloid functionality.
Prerequisite: BICH 410. (Offered in alternate years.)

FSTC 634 Oilseed Proteins for Foods
Credits 3. 3 Lecture Hours.
World production, composition, processing technologies, uses of products (oil, meal, protein concentrates and isolates, and texturized products) in feeds and foods; present and potential food applications of oilseed proteins.
Prerequisites: CHEM 228 and CHEM 317. (Offered in alternate years.)

FSTC 635 Oil and Fat Food Products
Credits 3. 3 Lecture Hours.
Composition, properties and reactions; sources, handling and storage of raw materials; extraction refining and bleaching; hydrogenation, deodorization, esterification and interesterification; fractionation; uses in salad oils, shortenings, margarine, bakery products, and other foods.
Prerequisites: CHEM 228 and CHEM 317. (Offered in alternate years.)
FSTC 640/NUTR 640 Therapeutic Microbiology I
Credits 3. 3 Lecture Hours.
Alimentary (gastrointestinal) microbiology including (i) the "normal" intestinal microbiota; (ii) probiotic and prebiotic nutritional supplements; (iii) recombinant pharmabiotics; (iv) gut-associated lymphoid tissue and mucosal immunity; (v) foodborne gastrointestinal pathogens; and (vi) fermented products as functional foods.
Prerequisite: Undergraduate survey course in microbiology (or instructor's consent).

Cross Listing: NUTR 640/FSTC 640.

FSTC 644 Disease Mechanisms of Foodborne Pathogens
Credits 3. 3 Lecture Hours.
Principles of pathogenicity of foodborne bacteria; mechanisms used by disease-causing bacteria leading to human illness; basic principles of immunology and human and bacterial physiology; investigation of bacterial virulence factors and effects of stress response, quorum sensing and other external factors.
Prerequisite: FSTC 326/DASC 326 or BIOL 351, or approval of instructor.

Cross Listing: ANSC 644/FSTC 644/BICH 432 recommended; under graduate survey course in microbiology (or instructor's consent).

FSTC 647/ANSC 647 Technology of Meat Processing and Distribution Credits 3. 3 Lecture Hours.
Quantitative and qualitative characteristics of meat and meat products as related to food technology processing operations; manufacturing, preservation, packaging and merchandising.
Cross Listing: ANSC 647/FSTC 647.

FSTC 657/ANSC 657 Hazard Analysis and Critical Control Point System Credits 3. 3 Lecture Hours.
Examination of the Hazard Analysis and Critical Control Point (HACCP) principles specifically related to meat and poultry; microbiological and process overviews; good manufacturing practices (GMP) and standard operating procedures (SOP) development; team-building and implementation into industry operations. This class is designed for the production of food and fulfills the training requirements of USDA's HACCP regulation for meat and poultry (9 CFR Part 417), and FDA's HACCP regulations for fish and fishery products (21 CFR Part 123 and 1240) and for juice (21 CFR Part 120).
Cross Listing: ANSC 657/FSTC 657.

FSTC 667/ANSC 667 Industrial Processed Meat Operations Credits 3. 2 Lecture Hours. 2 Lab Hours.
Application of scientific principles and business practices to manufactured meat products; interrelationships among marketing, manufacturing, product development, regulatory compliance and quality assurance in commercial processed meat operations.
Prerequisite: Approval of instructor.
Cross Listing: ANSC 667/FSTC 667.

FSTC 669/NUTR 669 Experimental Nutrition & Food Science Laboratory Credits 4. 1 Lecture Hour. 6 Lab Hours.
Experimental Nutrition & Food Science Laboratory. Nutritional intervention in animal models of metabolic or emotional disorders; genetic modifications or pathogens in food products; analyses of gene expression and behavior.
Prerequisite: BICH 432/GENE 432/GENE 432/BICH 432 recommended; graduate in nutrition or related major.
Cross Listing: NUTR 669/FSTC 669.

FSTC 670/ANSC 670 Quality Assurance for the Food Industry
Credits 3. 3 Lecture Hours.
Principles of food system process control; statistical process control (SPC); tools required to assure uniform communication and understanding of quality assurance systems.
Prerequisite: Graduate classification.
Cross Listing: ANSC 670/FSTC 670.

FSTC 671/NUTR 671 Critical Evaluation of Nutrition and Food Science Literature: Evidence Based Reviews Credits 3. 3 Lecture Hours.
Evaluation of scientific literature, research methods within the literature, and the quality of scientific studies to produce an evidence-based review in areas specific to nutrition and food science.
Prerequisites: NUTR 202 or NUTR 203 and STAT 302; knowledge of nutrition, statistics, and technical writing helpful.
Cross Listing: NUTR 671/FSTC 671.

FSTC 681 Seminar
Credits 0-1. 0-1 Lecture Hours.
Oral reports and discussions of current research and developments in food technology designed to broaden understanding of problems and to stimulate research.

FSTC 684 Professional Internship
Credits 0 to 16. 0 to 16 Other Hours.
Experience in application of formal training to a commercial operation under supervision of operations manager and designated faculty member; investigation of matter of mutual interest and report results in a professional paper approved by the graduate committee.

FSTC 685 Directed Studies
Credits 0 to 4. 0 to 4 Other Hours.
Directed study of selected problems emphasizing recent developments in research techniques.

FSTC 687/ANSC 687 Sensory Evaluation of Foods
Credits 3. 2 Lecture Hours. 1 Lab Hour.
Application of sensory science principles and practices to food systems including an understanding of discriminative, descriptive and consumer sensory techniques.
Prerequisite: CHEM 222 or CHEM 228.
Cross Listing: ANSC 687/FSTC 687.

FSTC 689 Special Topics in...
Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours.
Special topics in an identified area of food science and technology. May be repeated for credit.

FSTC 691 Research
Credits 1 to 23. 1 to 23 Other Hours.
Investigations leading to thesis or dissertation in various areas of food science and technology.

FSTC 697/ANSC 697 Applied Microbiology for Foods of Animal Origin: Processing, Sanitation and Sanitary Design
Credits 3. 3 Lecture Hours.
Application of basic food microbiology knowledge and principles to food production processes and products; sources of microbiological contamination and their impact on food safety and spoilage; application of sanitary design and validation; testing and auditing to monitor and trouble-shoot the process.
Prerequisites: DASC/FSTC 326/DASC 326 or FSTC 606/DASC 606 or equivalent.
Cross Listing: ANSC 697/FSTC 697.
NUTR 601/ANSC 601 General Animal Nutrition
Credits 3. 3 Lecture Hours.
Comparative nutrition of animal species contrasting digestive, metabolic and physiological functions involved in processing and using nutrients.
Prerequisite: ANSC 303 or 318 or equivalent.
Cross Listing: ANSC 601/NUTR 601.

NUTR 602/ANSC 602 Energetics of Metabolism and Growth
Credits 3. 3 Lecture Hours.
Current fundamental concepts in protein and energy metabolism relating to nutrients required for maintenance, growth and development of animals.
Prerequisite: BICH 410 or approval of instructor.
Cross Listing: ANSC 602/NUTR 602.

NUTR 610/FSTC 610 Nutritional Pharmacometrics of Food Compounds
Credits 3. 3 Lecture Hours.
Introduction into nutritional pharmacokinetics and pharmacodynamics of food compounds; specific examples of toxicological and pharmacological effects of food compounds.
Prerequisite: NUTR 202 or NUTR 203 or FSTC 201 or CHEM 227 or CHEM 222 or approval of instructor.
Cross Listing: FSTC 610/NUTR 610.

NUTR 613/ANSC 613 Protein Metabolism
Credits 3. 3 Lecture Hours.
Basic concepts and recent advances in protein metabolism in animals with emphasis on physiological and nutritional significances; discussion of protein digestion; absorption of peptides; absorption, synthesis and degradation of amino acids; hormonal and nutritional regulation of protein turnover; determination of protein quality and requirements.
Prerequisite: BICH 411 or BICH 601 or equivalent or approval of instructor.
Cross Listing: ANSC 613/NUTR 613.

NUTR 614 Fermentation and Gastrointestinal Microbiology
Credits 3. 3 Lecture Hours.
Fermentation and gastrointestinal ecosystems in terms of microorganisms present, their activities and requirements and their interactions in a dynamic system.
Prerequisite: Beginning microbiology and/or biochemistry or approval of instructor.
Cross Listing: POSC 614 and VTMI 614.

NUTR 617/ANSC 617 Experimental Techniques in Meat Science
Credits 3. 1 Lecture Hour. 6 Lab Hours.
Methods used in separating and identifying muscle proteins and fats; techniques for determining postmortem changes of muscle tissue as a result of antemortem treatments.
Prerequisite: ANSC 607/FSTC 607; BICH 411.
Cross Listing: ANSC 617/NUTR 617.

NUTR 618/ANSC 618 Lipids and Lipid Metabolism
Credits 3. 3 Lecture Hours.
Chemical nature of various classes of lipids and lipid-derived hormones; absorption and metabolism of fatty-acids and lipids; regulation of lipid biosynthesis and obesity; relationship between lipid metabolism and cholesterol homeostasis; lipids as hormones.
Prerequisite: BICH 410 or approval of instructor.
Cross Listing: ANSC 618/NUTR 618.

NUTR 620/ANSC 620 Cholesterol Homeostasis
Credits 3. 3 Lecture Hours.
Prerequisite: ANSC 303 or 318 or equivalent.
Cross Listing: ANSC 620/NUTR 620.

NUTR 630 Nutrition in Disease
Credits 3. 3 Lecture Hours.
Human nutritional requirements in health and disease, emphasizing effects of disease states on intake, digestion, absorption, metabolism and excretion of nutrients; relationship of diet to development of certain diseases.
Prerequisites: NUTR 202; BICH 410 or equivalent.

NUTR 640/FSTC 640 Therapeutic Microbiology I
Credits 3. 3 Lecture Hours.
Alimentary (gastrointestinal) microbiology including: (i) the "normal" intestinal microbiota; (ii) probiotic and prebiotic nutritional supplements; (iii) recombinant pharmabiotics; (iv) gut-associated lymphoid tissue and mucosal immunity; (v) foodborne gastrointestinal pathogens; and (vi) fermented products as functional foods.
Prerequisite: Undergraduate survey course in microbiology (or instructor's consent).
Cross Listing: FSTC 640/NUTR 640.

NUTR 641 Nutritional Biochemistry I
Credits 3. 3 Lecture Hours.
Integration of the intermediary metabolism of glucose, amino acids and lipids with nutrition, physiology and pathophysiology in animals; regulation of metabolic pathways in cells, tissues and the whole body under normal and disease conditions; functions of vitamins and minerals in nutrient metabolism and health.
Prerequisite: BICH 411 or BICH 604. Offered during the fall semester.

NUTR 642 Nutritional Biochemistry II
Credits 3. 3 Lecture Hours.
Mechanisms through which specific nutrients modulate intracellular signal transduction and gene expression; molecular mechanisms by which nutrition modulates disease states such as atherosclerosis, cancer and arthritis.
Prerequisites: BICH 411; BICH 431/GENE 431 or equivalent.

NUTR 645/POSC 645 Nutrition and Metabolism of Vitamins
Credits 3. 3 Lecture Hours.
Chemistry and metabolism of the fat soluble and water soluble vitamins and their roles in animals; integrates cellular biochemistry and metabolism of the vitamins in vertebrate animal.
Prerequisites: POSC 411 or ANSC 303/NUTR 303; BICH 410 or BICH 603.
Cross Listing: POSC 645/NUTR 645.

NUTR 646 Fundamentals of Space Life Sciences
Credits 3. 3 Lecture Hours.
Integrates nutrition, physiology, and radiation biology to define major biological problems in long duration space flight; provide an overview of the problems of bone loss, muscle wasting, and radiation-enhanced carcinogenesis along with potential countermeasures; focus on nutritional interventions and exercise protocols.
Cross Listing: NUEN 646 and KINE 646.

NUTR 647/WFSC 647 Nutritional Biochemistry of Fishes
Credits 3. 3 Lecture Hours.
Principles of nutritional biochemistry including nutrient metabolism and biochemical energetics with special emphasis on finfish and shell fish.
Prerequisite: BICH 410 or equivalent.
Cross Listing: WFSC 647/NUTR 647.
NUTR 650/POSC 650 Nutrition and Metabolism of Minerals
Credits 3. 3 Lecture Hours.
Nutritional significance of minerals in animal metabolism; chemical, biochemical and physiological role of minerals and homeostatic control in animal metabolism.
Prerequisites: POSC 411 or ANSC 303/NUTR 303; BICH 410 or BICH 603.
Cross Listing: POSC 650/NUTR 650.

NUTR 669/FSTC 669 Experimental Nutrition & Food Science Laboratory
Credits 4. 1 Lecture Hour. 6 Lab Hours.
Experimental Nutrition & Food Science Laboratory. Nutritional intervention in animal models of metabolic or emotional disorders; genetic modifications or pathogens in food products; analyses of gene expression and behavior.
Prerequisite: BICH 432/GENE 432/GENE 432/BICH 432 recommended; graduate classification in nutrition or related major.
Cross Listing: FSTC 669/NUTR 669.

NUTR 671/FSTC 671 Critical Evaluation of Nutrition and Food Science Literature: Evidence Based Reviews
Credits 3. 3 Lecture Hours.
Evaluation of scientific literature, research methods within the literature, and the quality of scientific studies to produce an evidence-based review in areas specific to nutrition and food science.
Prerequisites: NUTR 202 or NUTR 203 and STAT 302; knowledge of nutrition, statistics, and technical writing helpful.
Cross Listing: FSTC 671/NUTR 671.

NUTR 679/POSC 679 Lipoproteins in Health and Disease
Credits 3. 3 Lecture Hours.
Understanding of lipoprotein biology as it relates to nutrient delivery and disease development; emphasis on understanding how structure influences the function of different lipoprotein particles in human and avian systems; opportunity to study individual lipoprotein profiles or those of animals by modern imaging techniques; background in basic lipid biochemistry helpful.
Cross Listing: POSC 679/NUTR 679.

NUTR 681 Seminar
Credits 0-1. 0-1 Other Hours.
Current developments in the field of nutrition; review of current literature and oral presentation of scientific papers on selected nutrition topics.
Prerequisite: Graduate classification.

NUTR 684 Professional Internship
Credits 1 to 16. 1 to 16 Other Hours.
Experience in application of formal training to applied nutrition under supervision of nutritionists, dietitians and faculty member. Student will investigate matter of mutual interest and report results in a professional paper approved by the graduate committee.
Prerequisite: Graduate classification.

NUTR 685 Directed Studies
Credits 1 to 4. 1 to 4 Other Hours.
Nutrition problems and procedures; problems assigned according to experience, interest and need of individual student.
Prerequisite: Approval of instructor prior to registration.

NUTR 689 Special Topics in...
Credits 1 to 4. 0 to 4 Lecture Hours. 0 to 4 Lab Hours.
Special topics in an identified area of nutrition. May be repeated for credit.
Prerequisites: Graduate classification and approval of instructor.

NUTR 691 Research
Credits 1 to 23. 1 to 23 Other Hours.
Investigations leading to thesis or dissertation in various areas of nutrition.
Prerequisite: Graduate classification.