

FOOD SCIENCE AND HUMAN NUTRITION

The Department of Food Science and Human Nutrition is jointly administered by the College of Agriculture and Life Sciences and the College of Human Sciences. All curricula offered by the department are available to students in either college. These majors include:

- Culinary food science (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofagricultureandlifesciences/culinariyscience>)
- Dietetics (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofagricultureandlifesciences/dietetics>)
- Diet and exercise (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofagricultureandlifesciences/dietandexercise>)
- Food science (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofagricultureandlifesciences/foodscience>)
- Nutritional science (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofagricultureandlifesciences/nutritionalscience>)

Visit the department web site at: www.fshn.hs.iastate.edu (<http://www.fshn.hs.iastate.edu>).

Undergraduate Study

Culinary Science

Culinary science is an interdisciplinary degree combining a strong food science foundation with acquisition of culinary skills. The program includes chemistry, organic chemistry, biology, microbiology, and biochemistry as well as quantity food production, fine dining management, and food safety and sanitation. Internship experience in the food industry or culinary business is required. Culinary science graduates are qualified to work as managers and specialists in food research, product development, culinary applications, and food marketing and sales.

Dietetics

The Didactic Program in Dietetics (DPD) is accredited by the Accreditation Council for Education in Nutrition and Dietetics, the accrediting agency of the Academy of Nutrition and Dietetics. The dietetics undergraduate curriculum meets the academic requirements as the DPD. Additionally, the curriculum for concurrent Bachelor's and Master's degrees in diet and exercise meets the academic requirements of the DPD. Graduates of the program are eligible to apply for admission to accredited dietetics internships/supervised practice programs. Upon successful completion of the experience program, graduates are eligible to take the national examination administered by the Commission on Dietetic Registration to become a Registered Dietitian (RD) / Registered Dietitian Nutritionist (RDN) and to practice in the field of dietetics. There is a \$30 fee for a statement of verification of completion of the DPD. For information about verification statements policies, see the dietetics program website: <http://www.fshn.hs.iastate.edu/undergraduate-programs/dietetics/>.

Students interested in pursuing the dietetics program enter the university designated as pre-dietetics students. During spring semester of the

second year, interested students apply to the Didactic Program in Dietetics. Admission to the program is based on overall GPA (3.0 or above required), completion of required coursework, completion of application and demonstrated interest in becoming a registered dietitian. Upon admission, students progress toward earning a Bachelor of Science degree in dietetics and receive a Verification Statement upon graduation, which is needed to enter an accredited dietetics internship. The dietetics program includes study in basic sciences, nutrition, and food science with applications to medical dietetics, nutrition counseling and education, and community nutrition. Foodservice management is also an important aspect of the program. Graduates work in clinical settings, consulting, food companies, food services, sports or athletic programs, corporate wellness programs, care facilities for patients from neonatal to geriatric, and community or school health programs.

A program for concurrent Bachelor of Science and Master of Science (BS/MS) degrees in diet and exercise (<http://www.fshn.hs.iastate.edu/undergraduate-programs/diet-exercise>) is available. The program is jointly administered by the Department of Food Science and Human Nutrition (FS HN), within the College of Agriculture and Life Sciences and College of Human Sciences, and the Department of Kinesiology within the College of Human Sciences. Students interested in this program enroll as pre-diet and exercise students. In the fall of the third year, students apply for admission to the BS/MS program. Students not accepted into the program can continue toward completion of the BS degree in dietetics or kinesiology and health. Coursework has been designed to facilitate a 4-year graduation date for those students not accepted into the program and electing to complete a single undergraduate degree. Students accepted into the program will progress toward completion of BS/MS degrees in diet and exercise.

Food Science

Food science is a discipline in which the principles of biological and physical sciences are used to study the nature of foods, the causes of their deterioration, and the principles underlying the processing and preparation of food. It is the application of science and technology to the provision of a safe, wholesome, and nutritious food supply. Biotechnology and toxicology interrelate with food science in the area of food safety. In the food industry, food scientists work in research and development of products or processes, production supervision, quality control, marketing and sales, test kitchens and recipe development, product promotion and communication. Food scientists also work in government regulatory agencies and academic institutions.

Two options are available in food science: food science and technology and food science and industry. Both options are approved by the Institute of Food Technologists, the national professional organization of food science. Career options include quality control/assurance; production supervision; management and sales; research careers in the food industry, government, or academia; business; journalism; food product formulation and recipe development; food promotion and communication; and consumer services in government and industry. Students who have an interest in graduate study or research are encouraged to select the food science and technology option. Students who wish to combine education in engineering with food science may select additional courses in chemical or agricultural engineering. Double majors are available and may require an additional year.

Students in food science have the opportunity to pursue a Master of Business Administration (<http://www.fshn.hs.iastate.edu/undergraduate-programs/food-science>) (MBA) concurrently with the Bachelor of Science (BS) degree in food science. The program is designed so students can

earn both the BS in food science and MBA in five years, to meet the needs of students who are interested in management careers in the food industry. Students apply for admission to the MBA program in the spring of the third year. The program for concurrent BS in food science/MBA degrees is a rigorous 5-year program, and admission is very selective.

Nutritional Science

Nutritional science offers two options: pre-health professional & research and nutrition & wellness. The pre-health professional & research option can serve as a pre-professional program for medicine, dentistry, veterinary medicine, or for graduate study in nutrition or other biological sciences. Students in the pre-health professional & research option gain a strong basic science education along with human nutrition expertise that enables them to attain the knowledge and skills necessary to work in research laboratories of colleges and universities, government agencies, industries, and foundations. Students in the nutrition & wellness option will learn about the role of nutrition and healthy eating for disease prevention and wellness with an emphasis on nutrition education for the public and community agencies as well as effective program planning and evaluation. Graduates will be prepared for employment opportunities in community and state agencies, nonprofit organizations and health promotion enterprises, or public health and related programs.

Departmental Learning Outcomes

Students graduating with degrees in culinary science, dietetics, diet and exercise, food science, or nutritional science will be able to: 1) demonstrate a high level of technical competence in their chosen field, perform successfully in a graduate program, supervised practice program or entry-level professional position; 2) communicate effectively as professionals; 3) successfully solve complex problems on their own and as members of a team; 4) correctly interpret and critically evaluate research literature as well as data from professional practice; 5) critically evaluate information related to food science and nutrition issues appearing in the popular press; 6) prepare and deliver effective presentations, orally and in writing, of technical information to professionals and to the general public; 7) thoughtfully discuss ethical, social, multicultural, and environmental dimensions of issues facing professionals in their chosen field.

Communication Proficiency is certified by a grade of C or better in 6 credits of coursework in composition (ENGL 150 Critical Thinking and Communication and ENGL 250 Written, Oral, Visual, and Electronic Composition or other communication-intensive courses) and a grade of C or better in 3 credits of coursework in oral communication.

Minors - Undergraduate

The department offers coursework for a variety of minors (<http://www.fshn.hs.iastate.edu/undergraduate-programs/minors>). Minors available include:

- culinary food science
- food safety (interdepartmental minor)
- food science
- nutrition
- food and society

All minors have the following requirements:

- At least 15 credits must be taken, including at least 6 credits taken at Iowa State University in courses numbered 300 or above.

- The minor must include at least 9 credits that are not used to meet any other college or university requirement.
- The same courses may not be applied to two different minors.

Prerequisites: Students must complete prerequisite requirements for courses included in the minor.

Graduate Study

The Food Science and Human Nutrition (FSHN) Department offers coursework for the degrees master of science and doctor of philosophy with majors in food science and technology and in nutritional sciences, and minors in food science and technology and in nutrition. Graduate work in meat science is offered as a co-major in animal science and food science and technology.

Prerequisite to major work is a baccalaureate degree in food science, nutrition, or other physical or biological sciences or engineering that is substantially equivalent to those at Iowa State University.

Students taking major work for the degree doctor of philosophy either in food science and technology or in nutritional sciences may choose minors from other fields including anthropology, biorenewable resources and technology, chemistry, biochemistry, economics, education, journalism, microbiology, psychology, physiology, statistics, toxicology, or other related fields.

The interdepartmental graduate program in nutritional sciences, administered through the Graduate College, under the auspices of the Chairs of FSHN and Animal Science, will provide the structure for coordinating and enhancing interdisciplinary nutrition research and graduate education. Graduate students will be able to select from three specializations: animal nutrition, human nutrition, or molecular/biochemical nutrition. The two main departments are FSHN and Animal Science, whereas other departments (such as Kinesiology; Biochemistry, Biophysics, and Molecular Biology; Agronomy; and Statistics) may also be involved. (See Nutritional Sciences interdepartmental graduate major.)

The department offers an online 12-credit Graduate Certificate in Food Safety and Defense, in conjunction with the University of Nebraska, Lincoln, Kansas State University and the University of Missouri through the Great Plains Interactive Distance Education Alliance. Students eligible for admission to the food science master's degree program may be admitted.

The department participates in an online Master of Family and Consumer Sciences/Dietetics in conjunction with Colorado State University, Kansas State University, North Dakota State University, Oklahoma State University, South Dakota State University, University of Kansas Medical Center, and University of Nebraska through the Great Plains Interactive Distance Education Alliance. Students who are registered dietitians and are eligible for admission to the FSHN Master's degree program may be admitted.

The department offers work for concurrent B.S. and M.S. degree programs that allow students to obtain both the B.S. and M.S. degrees in 5 years. The programs are available to students majoring in nutritional science or pre-diet and exercise, and students progress toward M.S. degrees in nutritional sciences or diet and exercise, respectively. Students interested in these programs should contact the department for details. Application for admission to the Graduate College should be made during the junior year. Students begin research for the M.S. thesis

or creative component during the summer after their junior year and are eligible for research assistantships.

Students graduating with advanced degrees in nutritional sciences and in food science and technology will demonstrate competency in their chosen discipline. Measurable outcomes will include the ability to: 1) design, conduct, and interpret research; 2) apply theoretical information to solve practical problems; 3) prepare and communicate discipline-specific information in written and oral forms to scientific and lay audiences; 4) facilitate learning in the classroom; 5) submit a paper for publication in a peer-reviewed journal; and 6) secure professional-level positions in academia, industry, government, or health care.

Minors - Graduate

The department offers coursework for graduate minors in:

- food science/technology (<http://www.fshn.hs.iastate.edu/graduate-program/food-science-technology/#minor-in-food-science-and-technology>)
- nutritional sciences (<http://www.fshn.hs.iastate.edu/graduate-program/nutritional-sciences/#minor-in-nutritional-sciences>)

Food Science and Technology Graduate Minor students must complete the following:

- 9 to 12 credits. Students without a background in food chemistry, food engineering/processing, and/or food microbiology are required to take FSHN 511, 513, and/or 514, respectively, in which case the graduate minor will constitute up to 12 credits.
- 9 credits of graduate level food science coursework as approved by the POS committee.
- Maximum of 3 credits at the 400 level.

Nutritional Sciences Graduate Minor students must complete the following:

- 9 to 12 credits are required. Students who have not taken FSHN 360 or its equivalent (advanced nutrition with a biochemistry prerequisite) will need to take FSHN 360, in which case the Nutrition Graduate minor will constitute 12 credits.
- 9 credits of graduate level nutrition courses as approved by the POS Committee.
- NUTRS 501

Certificate - Undergraduate

Health Coach (<http://catalog.iastate.edu/previouscatalogs/2016-2017/interdisciplinaryprograms/certificates/healthcoach>)

The undergraduate health coach certificate provides a rigorous academic and theoretical background in three components of health (nutrition, exercise and motivational coaching) required to prepare workers for the challenges of being a health coach.

Certificates - Graduate

Food Safety and Defense (<http://www.fshn.hs.iastate.edu/graduate-program/food-safety-defense>)

The department offers an online 12-13 credit Graduate Certificate in Food Safety and Defense, in conjunction with the University of Nebraska, Lincoln, Kansas State University and the University of Missouri through the Great Plains Interactive Distance Education Alliance. Students may

be admitted if qualified for admission to the food science master's degree program.

Dietetics Internship (<http://www.dietetics.iastate.edu>)

The Iowa State University Dietetics Internship (DI) began as an AP4 program in 1989. It meets the performance requirements for supervised practice programs for students who have completed the academic requirements of the Academy of Nutrition and Dietetics. The internship is administered through the Department of Food Science and Human Nutrition. Interns are admitted to Iowa State University as graduate students seeking a "Graduate Certificate in Dietetics Internship" which will be indicated on the final transcript. Successful completion of this program will result in the receipt of the DI Verification Statement which establishes eligibility to sit for the national standardized exam administered by the Commission on Dietetic Registration (CDR). Successful completion of the exam results in the Registered Dietitian (RD) / Registered Dietitian Nutritionist (RDN) credential. There is a nonrefundable application fee of \$75.

Courses primarily for undergraduates:

FS HN 101: Food and the Consumer

(3-0) Cr. 3. F.S.

Prereq: High school biology and chemistry or 3 credits each of biology and chemistry

The food system from point of harvest to the consumption of the food by the consumer. Properties of food constituents. Protection of food against deterioration and microbial contamination. Introduction of foods into the marketplace. Processes for making various foods. Government regulations. Use of food additives. Current and controversial topics. Electronic communication from web emphasized for class reports, notes and assignments.

FS HN 102: Nutrition for Sport Performance

(1-0) Cr. 1. F.S.

Analysis of how the body uses nutrients for energy and how to select a balanced diet to meet specific athletic performance needs. Lecture and activities specific to students' interest.

FS HN 104: Introduction to Professional Skills in Culinary Science

(0-6) Cr. 1. S.

Introduction to culinary science. Students will develop fundamental culinary skills by arranged on-campus work experience (100 hours). Sessions with instructor arranged.

FS HN 110: Professional and Educational Preparation

(1-0) Cr. 1. F.S.

Introduction to professional and educational development within the food science and human nutrition disciplines. Focus is on university and career acclimation as well as enhancement of communication skills. Offered on a satisfactory-fail basis only.

FS HN 111: Fundamentals of Food Preparation

(2-0) Cr. 2. F.S.

Prereq: FS HN 101 or FS HN 167; high school chemistry or CHEM 160; concurrent enrollment in FSHN 115.

Principles involved in preparation of food products of standard quality. Influence of composition and techniques on properties of food products.

FS HN 112: Orientation to Learning and Productive Team Membership

(Cross-listed with AER E, CON E, HORT, NREM). (2-0) Cr. 2. F.
Introduction to developing intentional learners and worthy team members. Learning as the foundation of human enterprise; intellectual curiosity; ethics as a personal responsibility; everyday leadership; effective team and community interactions including team learning and the effects on individuals; and growth through understanding self, demonstrating ownership of own learning, and internalizing commitment to helping others. Intentional mental processing as a means of enhancing learning. Interconnectedness of the individual, the community, and the world.

FS HN 114: Developing Responsible Learners and Effective Leaders

(Cross-listed with CON E, HORT, NREM). (2-0) Cr. 2. S.

Prereq: Hort 112 or NREM 112

Focus on team and community. Application of fundamentals of human learning; evidence of development as a responsible learner; intentional mental processing as a habit of mind; planning and facilitating learning opportunities for others; responsibility of the individual to the community and the world; leading from within; holding self and others accountable for growth and development as learners and leaders.

FS HN 115: Food Preparation Laboratory

(0-3) Cr. 1. F.S.

Prereq: Credit or enrollment in FS HN 111 or FS HN 214

Practice standard methods of food preparation with emphasis on quality, nutrient retention, and safety.

FS HN 167: Introduction to Human Nutrition

(3-0) Cr. 3. F.S.SS.

Prereq: High school biology or 3 credits of biology

Understanding and implementing present day knowledge of nutrition. The role of nutrition in the health and well being of the individual and family.

FS HN 203: Contemporary Issues in Food Science and Human Nutrition

(1-0) Cr. 1. F.S.

Introduction to published research and discussion of current issues in food science and human nutrition. Emphasis on sources of credible information, ethics, and communication.

FS HN 214: Scientific Study of Food

(3-0) Cr. 3. F.S.

Prereq: FS HN 167 or FS HN 265; CHEM 231 or CHEM 331; plus concurrent enrollment in FS HN 115 or 215

Composition and structure of foods. Principles of preparation of standard quality food products. Behavior and interactions of food constituents.

FS HN 215: Advanced Food Preparation Laboratory

(0-6) Cr. 2. F.S.

Prereq: Credit or enrollment in FS HN 214

Practice standard methods of food preparation with emphasis on quality, nutrient retention, and safety. Development of culinary skills and advanced food preparation.

FS HN 242: Societal Impacts on Food Systems

(3-0) Cr. 3. S.

Description of food systems from farming practices to global marketing. Exploration of the impacts of food system choices on personal health, the environment and global society.

FS HN 262: Special Topics in Health Professions

(1-0) Cr. 1. F.

Careers and controversies in nutritional science. Discussion of current topics in health professions involving nutrition, such as "low-carb" diets, supplements for athletic performance, "food and mood," interviews with health professionals on how they use nutrition concepts in practice.

FS HN 264: Fundamentals of Nutritional Biochemistry and Metabolism

(3-0) Cr. 3. F.

Prereq: FS HN 167; CHEM 163, CHEM 163L; BIOL 211

Digestion, absorption, metabolism, and biochemical functions of nutrients. Biochemical aspects of nutrient deficiencies.

FS HN 265: Nutrition for Active and Healthy Lifestyles

(3-0) Cr. 3. S.

Prereq: FS HN 167, plus credit or enrollment in BBMB 301 or credit in FS HN 264

Fundamentals of nutrient metabolism and nutrient requirements. Role of macronutrient metabolism in physical performance and disease prevention. Effect of manipulation of macronutrient metabolism on physical performance and disease prevention. Applications of nutrient metabolism principles to dietary recommendations and planning.

FS HN 308: Dairy Products: Current Issues and Controversies

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

Course will address milk chemistry, microbiology, handling, processing, regulations, organic production, and nutrition; dispel myths about dairy foods; improve critical thinking and communication skills. Students will participate in structured controversies and debate.

FS HN 311: Food Chemistry

(3-0) Cr. 3. F.

Prereq: CHEM 231 and CHEM 231L or CHEM 331 and CHEM 331L; credit or enrollment in BBMB 301

The structure, properties, and chemistry of food constituents and animal and plant commodities.

FS HN 311L: Food Chemistry Laboratory

(0-3) Cr. 1. F.

Prereq: Credit or concurrent enrollment in FSHN 311.

The laboratory practices of structure, properties, and chemistry of food constituents.

FS HN 314: Foundations of Culinary Science

(1-0) Cr. 1. S.

Prereq: FSHN 104 or concurrent enrollment in FSHN 104.

Introduction to the roles culinary scientists hold within industry including product development, research, and quality assurance. Discussions focused on professional and educational development, enhancement of communication skills, ethics and emerging issues and trends in culinary science.

FS HN 340: Foundations of Dietetic Practice

(1-0) Cr. 1. F.

Prereq: DIET or PDEX classification

Introduction to the profession of dietetics and responsibilities associated with dietetic professional practice. Emphasis on exploring career options in dietetics and preparation for a dietetic internship. Leadership and professional career development for the dietitian is addressed through self reflection, creation of materials for post-baccalaureate programs and job shadowing experience. Professional issues related to dietetic practice include Code of Ethics, legal credentialing and standards of professional practice, leadership and future trends in the profession. Offered on a satisfactory-fail basis only.

FS HN 342: World Food Issues: Past and Present

(Cross-listed with AGRON, ENV S, T SC). (3-0) Cr. 3. F.S.

Prereq: Junior classification

Issues in the agricultural and food systems of the developed and developing world. Emphasis on economic, social, historical, ethical and environmental contexts. Causes and consequences of overnutrition/undernutrition, poverty, hunger and access/distribution. Explorations of current issues and ideas for the future. Team projects. Meets International Perspectives Requirement.

FS HN 342H: World Food Issues: Past and Present (Honors)

(3-0) Cr. 3. F.S.

Prereq: Junior classification

Issues in the agricultural and food systems of the developed and developing world. Emphasis on economic, social, historical, ethical and environmental contexts. Causes and consequences of overnutrition/undernutrition, poverty, hunger and access/distribution. Explorations of current issues and ideas for the future. Team projects. Meets International Perspectives Requirement.

FS HN 351: Introduction to Food Engineering Concepts

(3-0) Cr. 3. S.

Prereq: A course in calculus and physics (PHYS 111 or PHYS 115)

Methodology for solving problems in food processing and introduction to food engineering concepts including food properties, material and energy balances, sources of energy, thermodynamics, fluid flow, heat transfer, and mass transfer. Field trip.

FS HN 360: Advanced Human Nutrition and Metabolism

(3-0) Cr. 3. F.

Prereq: FS HN 265, 3 credits in biochemistry; 3 credits in physiology recommended

Physiological and biochemical basis for nutrient needs; assessment of nutrient deficiency and toxicity; examination of nutrient functions and regulation of metabolism; nutrient-gene interactions.

FS HN 361: Nutrition and Health Assessment

(1-3) Cr. 2. S.

Prereq: FS HN 265; 3 credits in statistics; 3 credits in physiology recommended

The assessment of nutritional status in healthy individuals. Laboratory experiences in food composition and assessment of dietary intake, body composition, and biochemical indices of nutritional status.

FS HN 362: Nutrition in Growth and Development

(3-0) Cr. 3. S.

Prereq: FS HN 360; credit or enrollment in a course in physiology

Nutrient needs throughout the life cycle. Interrelationships of genes, gene expression and nutrients with physiological outcomes during human development and aging.

FS HN 364: Nutrition and Prevention of Chronic Disease

(3-0) Cr. 3. F.

Prereq: BIOL 256, BIOL 256L or BIOL 306

Overview of nutrients, their functions, metabolism, food sources and optimal choices for the promotion of health and wellness. Nutrition strategies for the prevention of chronic disease, including cancer, diabetes and obesity, as they apply to individuals or the wider population will be discussed.

FS HN 365: Obesity and Weight Management

(3-0) Cr. 3. S.

Prereq: BIOL 256 and BIOL 256L, or BIOL 306

Multifactorial aspects of obesity, maintenance of healthy weight, and the relationship of weight status and chronic disease prevention. Traditional and novel nutrition and exercise theories as well as current popular diet and exercise trends will be discussed.

FS HN 366: Communicating Nutrition Messages

(3-0) Cr. 3. S.

Prereq: FS HN 264 or FS HN 265

Theory and application of adult learning as it relates to the role of nutrition in health promotion and disease prevention. Discussion of nutrition education and interventions relative to the social-ecological model. Factors to consider in developing the nutrition education/intervention practicum experience using the social-ecological model. Focus on communication strategies for providing nutrition messages to diverse community audiences using various forms of media and outreach (print, radio, TV, newspaper, consumer publications, websites, community venues). Development of nutrition messages using various forms of media for a target population.

FS HN 367: Medical Terminology for Health Professionals

(1-0) Cr. 1. S.

An independent course focused on medical terminology, abbreviations, and simple clinical mathematical calculations.

FS HN 403: Food Laws, Regulations, and the Regulatory Process

(2-0) Cr. 2. S.SS.

Prereq: 3 credits in food science coursework at 200 level or above

Review of federal legislative and regulatory processes and documents related to food and food ingredients. Discussion of federal food safety programs, food distribution programs, related programs, and key agencies. Exploration of analogous State of Iowa processes, programs, and agencies.

FS HN 405: Food Quality Assurance

(2-2) Cr. 3.

Prereq: FS HN 214 or FS HN 311; STAT 101 or STAT 104

Basis of food quality control/assurance programs and establishment of decision-making processes using official (government and industry) instrumental, chemical, and sensory procedures. Statistical process and quality control procedures and their applications to various food systems. Development of hazard analysis procedures, specifications, grades, and standards.

FS HN 406: Sensory Evaluation of Food

(Dual-listed with FS HN 506). (2-3) Cr. 3. F.

Prereq: FS HN 214 or FS HN 311 or AN S 360; 3 credits in statistics

Sensory test methods and procedures used to evaluate the flavor, color and texture of foods. Relationships between sensory and instrumental measurements of color and texture. Acceptance and preference testing.

FS HN 407: Microbiological Safety of Foods of Animal Origins

(Dual-listed with FS HN 507). (Cross-listed with MICRO). (3-0) Cr. 3. S.

Prereq: MICRO 420

Examination of the various factors in the production of foods of animal origin, from animal production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. The two modules of this course will be 1) the procedures and processes which can affect the overall microbiological safety of the food, and 2) the Hazard Analysis Critical Control Point (HACCP) system.

FS HN 408: Dairy Products Evaluation

(0-3) Cr. 1. F.

Prereq: Permission of instructor

Experience in identifying quality defects in dairy products including milk, cottage cheese, cheddar cheese, strawberry yogurt, butter, and vanilla ice cream. Intensive training for the National Collegiate Dairy Products Evaluation competition and for dairy product evaluation in the food industry.

FS HN 410: Food Analysis

(2-3) Cr. 3.

Prereq: FS HN 214 or FS HN 311 or CHEM 211

An introduction to the theory and application of physical and chemical methods for determining the constituents of food. Modern separation and instrumental analysis. Use of food composition data bases.

FS HN 411: Food Ingredient Interactions and Formulations

(1-3) Cr. 2. F.S.

Prereq: FSHN 214 or FS HN 311 and FS HN 115, FS HN 215 or FS HN 311L.

Application of food science principles to ingredient substitutions in food products. Laboratory procedures for standard formulations and instrumental evaluation, with emphasis on problem-solving and critical thinking.

FS HN 412: Food Product Development

(Dual-listed with FS HN 512). (1-6) Cr. 3. F.S.

Prereq: FS HN 311 or FS HN 411

Principles of developing consumer packaged food products. Application of skills gained in food chemistry, formulation, microbiology, and processing. Some pilot plant experiences. Electronic communication from web emphasized for class reports, notes and assignments.

FS HN 419: Foodborne Hazards

(Cross-listed with MICRO, TOX). (3-0) Cr. 3. Alt. S., offered even-numbered years.

Prereq: MICRO 201 or MICRO 302, a course in biochemistry

Pathogenesis of human microbiological foodborne infections and intoxications, principles of toxicology, major classes of toxicants in the food supply, governmental regulation of foodborne hazards. Assessed service learning component. Only one of FS HN 419 and FS HN 519 may count toward graduation.

FS HN 420: Food Microbiology

(Cross-listed with MICRO, TOX). (3-0) Cr. 3.

Prereq: MICRO 201 or MICRO 302

Effects of microbial growth in foods. Methods to control, detect, and enumerate microorganisms in food and water. Foodborne infections and intoxications.

FS HN 421: Food Microbiology Laboratory

(Cross-listed with MICRO). (0-6) Cr. 3.

Prereq: MICRO 201 or MICRO 302; MICRO 201L or MICRO 302L. Credit or enrollment in FS HN/MICRO 420

Standard techniques used for the microbiological examination of foods. Independent and group projects on student-generated questions in food microbiology. Emphasis on oral and written communication and group interaction.

FS HN 440: Bioprocessing and Bioproducts

(Dual-listed with FS HN 540). (Cross-listed with C E). (3-0) Cr. 3. F.

Prereq: C E 326 or equivalent, MATH 160 or MATH 165, CHEM 167 or higher, BIOL 173 or BIOL 211 or higher, senior or graduate classification

Sustainability, cleaner production. Taxonomy, kinetics, metabolism, microbial cultivation, aerobic and anaerobic fermentation. Antibiotics, food supplements, fermented foods, vitamin production. Biofuels, bioenergy and coproducts. Mass/energy balances, process integration, pretreatment, separation. Membrane reactors, bioelectrolysis, microbial fuel cells, nanotechnology, genetic engineering, mutagenesis.

FS HN 442: Issues in Food and Society

(2-0) Cr. 2. F.

Prereq: FS HN 242, FS HN 342

In-depth discussion, synthesis, and analysis of domestic and international food issues including: food systems from farm to fork, poverty and world hunger, overnutrition, population, agriculture and the environment, ethics, biotechnology, and policy.

FS HN 461: Medical Nutrition and Disease I

(4-0) Cr. 4. F.

Prereq: FS HN 360, FS HN 361, FS HN 367; plus BIOL 256 and 256L or BIOL 306 or BIOL 335

(Dual-listed with NutrS 561) Pathophysiology of selected chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state.

FS HN 463: Community Nutrition

(3-0) Cr. 3. F.

Prereq: FS HN 265 or FS HN 360; FS HN 366 recommended

Dual-listed with NutrS 563. Survey of current public health nutrition problems among nutritionally vulnerable individuals and groups. Discussion of the multidimensional nature of those problems and of community programs addressing them. Grant writing as a means for funding community nutrition program development. Significant emphasis on written and oral communication at the lay and professional level. Field trip.

Meets U.S. Diversity Requirement

FS HN 464: Medical Nutrition and Disease II

(3-0) Cr. 3. S.

Prereq: FS HN 360, FS HN 461; plus BIOL 256 and BIOL 256L or BIOL 306 or BIOL 335

(Dual-listed with NutrS 564) Pathophysiology of selected acute and chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state.

FS HN 466: Nutrition Counseling and Education Methods

(Dual-listed with FS HN 566). (2-2) Cr. 3. F.S.

Prereq: FS HN 361, FS HN 362

Application of counseling and learning theories with individuals and groups in community and clinical settings. Includes discussion and experience in building rapport, assessment, diagnosis, intervention, monitoring, evaluation, and documentation.

FS HN 467: Molecular Basis of Nutrition in Disease Prevention

(3-0) Cr. 3. S.

Prereq: FS HN 360 or equivalent

Understanding the molecular basis for the role of diet in the development and prevention of common diseases such as diabetes, cancer, and vascular diseases. Translating this understanding into practical approaches for improving the health of individuals and populations.

FS HN 471: Food Processing I

(Dual-listed with FS HN 571). (2-3) Cr. 3. F.

Prereq: FS HN 351 or A E 451 or CH E 357; MICRO 201 or MICRO 302; CHEM 163 or CHEM 177.

Principles and applications of food processing by application of heat (blanching, pasteurization, canning, extrusion, evaporation and distillation, extrusion and dehydration) and by removal of heat (refrigeration and freezing). Emphasis on solving problems in laboratory and recitation sessions.

FS HN 472: Food Processing II

(Dual-listed with FS HN 572). (2-3) Cr. 3. S.

Prereq: FS HN 351 or A E 451 or CH E 357.

Principles and applications of food processing by biological (fermentation, enzymes) and nontraditional (high pressure, irradiation, pulsed electric field) preservation methods. Includes packaging, waste water treatment, and sanitation. Emphasis on solving problems in laboratory and recitation sessions.

FS HN 480: Professional Communication in Food Science and Human Nutrition

(1-0) Cr. 1. F.S.

Prereq: FS HN 203, senior classification in the department

Presentation of current topics using written and oral communication to a lay audience. Emphasis on communication skills for the profession.

FS HN 489: Issues in Food Safety

(Cross-listed with AN S, HSP M, VDPAM). (1-0) Cr. 1. S.

Prereq: Credit or enrollment in FS HN 101 or FS HN 272 or HSP M 233; FS HN 419 or FS HN 420; FS HN 403

Capstone seminar for the food safety minor. Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective.

FS HN 490: Independent Study

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

Prereq: Permission of instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

FS HN 490A: Independent Study: Dietetics

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

Prereq: Permission of instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

FS HN 490B: Independent Study: Food Science

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

Prereq: Permission of instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

FS HN 490C: Independent Study: Nutrition

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

Prereq: Permission of instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

FS HN 490D: Independent Study: International Experience

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

Prereq: Permission of instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

FS HN 490E: Independent Study: Entrepreneurship

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

Prereq: Permission of instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

FS HN 490H: Independent Study: Honors

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

Prereq: Permission of instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

FS HN 491: Supervised Work Experience

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

Prereq: Advance approval of instructor and adviser

Supervised off-campus work experience relevant to the academic major. Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

FS HN 491A: Supervised Work Experience: Dietetics

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

Prereq: Advance approval of instructor and adviser

Supervised off-campus work experience relevant to the academic major. Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

FS HN 491B: Supervised Work Experience: Food Science

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

Prereq: Advance approval of instructor and adviser

Supervised off-campus work experience relevant to the academic major. Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

FS HN 491C: Supervised Work Experience: Nutrition

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

Prereq: Advance approval of instructor and adviser

Supervised off-campus work experience relevant to the academic major. Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

FS HN 491D: Supervised Work Experience: Culinary Science

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

Prereq: Advance approval of instructor and adviser

Supervised off-campus work experience relevant to the academic major. Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

FS HN 492: Research Concepts in Human Nutrition

(1-3) Cr. 2. F.

Prereq: senior classification or permission of instructor; FS HN 360

Students will develop and implement research projects with faculty supervision, based on knowledge gained from nutrition, biology and chemistry courses. Students will prepare a research proposal, conduct research and report results. Students will gain appreciation for independent research and experience creative and innovative aspects of nutrition research.

FS HN 493: Food Preparation Workshop

(1-3) Cr. 1-3.

Selected topics in food preparation including scientific principles, culture and culinary techniques. Variable format may include laboratory, recitation, and lecture. Offered on a satisfactory-fail basis only.

FS HN 495: Practicum

(1-3) Cr. 2. F.S.

Prereq: Senior classification in Nutritional Science-Nutrition and Wellness option or permission of instructor; FS HN 366; credit or enrollment in FS HN 463.

Students will develop, implement and assess a community-based project that engages groups in learning and practicing concepts related to nutrition and wellness. Assessed service learning component.

FS HN 496: Food Science and Human Nutrition Travel Course

(Dual-listed with FS HN 596). Cr. 1-4. Repeatable. F.S.SS.

Prereq: Permission of instructor

(One credit per week traveled and 1 credit for pre-departure class, if offered.) Limited enrollment. Tour and study of food industry, culinary science, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students.

FS HN 496A: Food Science and Human Nutrition Travel Course: International travel

(Dual-listed with FS HN 596A). Cr. 1-4. Repeatable. F.S.SS.

Prereq: Permission of instructor

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students. Meets International Perspectives Requirement.

FS HN 496B: Food Science and Human Nutrition Travel Course: Domestic travel

(Dual-listed with FS HN 596B). Cr. 1-4. Repeatable. F.S.SS.

Prereq: Permission of instructor

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students.

FS HN 498: Cooperative Education

Cr. R. Repeatable, maximum of 2 times. F.S.SS.

Prereq: Permission of department chair.

Required for students completing professional work periods in a cooperative education program. Students must register prior to commencing each work period. Offered on a satisfactory-fail basis only.

FS HN 499: Undergraduate Research

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

Prereq: Permission of staff member with whom student proposes to work
Research under staff guidance. A maximum of 6 credits of FS HN 499 may be used toward graduation.

Courses primarily for graduate students, open to qualified undergraduates:**FS HN 505: Short Course in Food Science**

Cr. arr. F.S.SS.

*Prereq: Permission of instructor***FS HN 506: Sensory Evaluation of Food**

(Dual-listed with FS HN 406). (2-3) Cr. 3. F.

Prereq: FS HN 214 or FS HN 311 or AN S 360; 3 credits in statistics

Sensory test methods and procedures used to evaluate the flavor, color and texture of foods. Relationships between sensory and instrumental measurements of color and texture. Acceptance and preference testing.

FS HN 507: Microbiological Safety of Foods of Animal Origins

(Dual-listed with FS HN 407). (Cross-listed with MICRO). (3-0) Cr. 3. S.

Prereq: MICRO 420

Examination of the various factors in the production of foods of animal origin, from animal production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. The two modules of this course will be 1) the procedures and processes which can affect the overall microbiological safety of the food, and 2) the Hazard Analysis Critical Control Point (HACCP) system.

FS HN 511: Principles of Food Science-Chemistry

(2-0) Cr. 2. F.

Prereq: 3 credits in organic chemistry

Key principles and applications in the chemistry of food. This course is designed for graduate students with no previous food chemistry background. (offered online only).

FS HN 512: Food Product Development

(Dual-listed with FS HN 412). (1-6) Cr. 3. F.S.

Prereq: FS HN 311 or FS HN 411

Principles of developing consumer packaged food products. Application of skills gained in food chemistry, formulation, microbiology, and processing. Some pilot plant experiences. Electronic communication from web emphasized for class reports, notes and assignments.

FS HN 513: Principles of Food Science-Processing

(2-0) Cr. 2. S.

Prereq: 3 credits each in physics and mathematics.

Key principles and applications in the processing of food. This course is designed for graduate students with no previous food processing background. Offered online only.

FS HN 514: Principles of Food Science-Microbiology

(2-0) Cr. 2. S.

Prereq: 3 credits each in microbiology and organic chemistry

Key principles and applications in the microbiology of food. This course is designed for graduate students with no previous food microbiology background. Offered online only.

FS HN 519: Food Toxicology

(Cross-listed with NUTRS, TOX). (3-0) Cr. 3. Alt. F., offered even-numbered years.

Prereq: A course in biochemistry

Basic principles of toxicology. Toxicants in the food supply: modes of action, toxicant defense systems, toxicant and nutrient interactions, risk assessment. Assessed service learning component. Only one of FS HN 419 and FS HN 519 may count toward graduation.

FS HN 521: Microbiology of Food

(2-0) Cr. 2. S.SS.

Prereq: A course in microbiology with laboratory; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.

This course deals with the identification, enumeration, and characterization of bacteria, yeasts, and mold associated with foods and food processing. Effects of physical and chemical agents on microorganisms will be studied. Microbiological problems in food spoilage, food preservation, food fermentation, and food-borne disease will be discussed. Offered online only.

FS HN 522: Advanced Food Microbiology and Biotechnology

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

Prereq: Food microbiology, a course in biochemistry; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.

This course will cover basic principles in biotechnology and applied food microbiology, including current topics of interest in food biotechnology. Students will be introduced to recombinant DNA techniques and how they are applied to genetically modify microorganisms, the use of nucleic acids as tools of rapid detection of microorganisms in foods, basic enzyme immobilization and down-stream processing techniques, and regulatory aspects of food biotechnology. Offered online only.

FS HN 523: A Multidisciplinary Overview of Food Safety and Security

(2-0) Cr. 2. F.SS.

Prereq: A course in biology or chemistry; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.

Multidisciplinary food safety and security perspectives provided by numerous subject matter experts. Topics include food safety policy, ag bioterrorism, border security, animal ID, food defense and site security, risk analysis, crisis communication, epidemiology, HACCP, and more. Offered online only.

FS HN 524: Food Microbiology

(3-0) Cr. 3. F.

Prereq: A course in microbiology with laboratory; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.

Food Microbiology looks at the nature, physiology, and interactions of microorganisms in foods. The course is an introduction to food-borne diseases, the effect of food processing systems on the microflora of foods, principles of food preservation, food spoilage, and foods produced by microorganisms. Additionally, the course looks at food plant sanitation and criteria for establishing microbial standards for food products. Offered online only.

FS HN 525: Principles of HACCP

(2-0) Cr. 2. F.

Prereq: Undergraduate biology and chemistry courses; enrollment in GP-IDEA Food Safety and Defense Certificate or permission of instructor.

A comprehensive study of the Hazard Analysis and Critical Control Point System and its application in the food industry. Offered online only.

FS HN 526: Ethnic Foods: Food Safety, Food Protection and Defense

(2-0) Cr. 2. SS.

Prereq: Graduate standing; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.

Understanding of the various factors that impact safety of ethnic and imported ethnic foods; knowledge about the handling, preparation, processing and storage of ethnic and imported foods and food products; science-based characterization of representative ethnic foods. Offered online only.

FS HN 527: Microbiology of Fermented Foods

(2-0) Cr. 2. SS.

Prereq: Food microbiology; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.

Microbiology of fermented foods covers the physiology, biochemistry, and genetics of microorganisms important in food fermentations. The course looks at how microorganisms are used in fermentations and the effects of processing and manufacturing conditions on production of fermented foods. Offered online only.

FS HN 528: Food Protection and Defense-Essential Concepts

(2-0) Cr. 2. S.

Prereq: Enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.

This course will provide students with an understanding of the principles required in a food defense program for a food manufacturing, warehousing or distribution center. The topics covered include: defining threats and aggressors; the Bioterrorism Act; food defense teams; vulnerability assessments; security programs; recall and traceability basics; security inspections; crisis management; emergency preparedness; and workplace violence. Offered online only.

FS HN 529: Foodborne Toxicants

(Cross-listed with TOX). (2-0) Cr. 2. F.

Prereq: A course in biochemistry; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.

Mechanisms of action, metabolism, sources, remediation/detoxification, risk assessment of major foodborne toxicants of current interest, design of HACCP plans for use in food industries targeting foodborne toxicants, discussion of toxicants from a food defense perspective. Offered online only.

FS HN 540: Bioprocessing and Bioproducts

(Dual-listed with FS HN 440). (Cross-listed with BRT, C E). (3-0) Cr. 3. F.

Prereq: C E 326 or equivalent, MATH 160 or MATH 165, CHEM 167 or higher, BIOL 173 or BIOL 211 or higher, senior or graduate classification

Sustainability, cleaner production. Taxonomy, kinetics, metabolism, microbial cultivation, aerobic and anaerobic fermentation. Antibiotics, food supplements, fermented foods, vitamin production. Biofuels, bioenergy and coproducts. Mass/energy balances, process integration, pretreatment, separation. Membrane reactors, bioelectrolysis, microbial fuel cells, nanotechnology, genetic engineering, mutagenesis.

FS HN 542: Introduction to Molecular Biology Techniques

(Cross-listed with B M S, EE0B, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

FS HN 542A: Introduction to Molecular Biology Techniques: DNA Techniques

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

FS HN 542B: Introduction to Molecular Biology Techniques: Protein

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. S.S.

Prereq: Graduate classification

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

FS HN 542C: Introduction to Molecular Biology Techniques: Cell Techniques

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

FS HN 542D: Introduction to Molecular Biology Techniques: Plant Transformation

(Cross-listed with B M S, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

FS HN 542E: Introduction to Molecular Biology Techniques: Proteomics

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

FS HN 542F: Introduction to Molecular Biology Techniques: Metabolomics

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

FS HN 542G: Introduction to Molecular Biology Techniques: Genomic

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

FS HN 554: Dietetic Internship I

(0-22) Cr. 5. S.SS.

For students enrolled in the Dietetic Internship program only. Supervised practice experience in operational management, medical nutrition therapy and community nutrition. Experiences and activities designed to meet accreditation standards.

FS HN 555: Dietetic Internship II

(0-18) Cr. 4. F.S.

Prereq: Concurrent enrollment or successful completion of FS HN 554

For students enrolled in the Dietetic Internship program only. Supervised practice experience in operational management, medical nutrition therapy and community nutrition. Experiences and activities designed to meet accreditation standards.

FS HN 556: Dietetic Internship III

(0-22) Cr. 5. F.SS.

Prereq: Concurrent enrollment or successful completion of FS HN 554 and FS HN 555

For students enrolled in the Dietetic Internship program only. Supervised practice experience in operational management, medical nutrition therapy and community nutrition. Experiences and activities designed to meet accreditation standards.

FS HN 566: Nutrition Counseling and Education Methods

(Dual-listed with FS HN 466). (Cross-listed with DIET). (2-2) Cr. 3. F.

Prereq: FS HN 361 and FS HN 362

Application of counseling and learning theories with individuals and groups in community and clinical settings. Includes discussion and experience in building rapport, assessment, diagnosis, intervention, monitoring, evaluation, and documentation. Literature review of specific counseling and learning theories.

FS HN 571: Food Processing I

(Dual-listed with FS HN 471). (2-3) Cr. 3. F.

Prereq: FS HN 351 or A E 451 or CH E 357; MICRO 201 or MICRO 302; CHEM 163 or CHEM 177.

Principles and applications of food processing by application of heat (blanching, pasteurization, canning, extrusion, evaporation and distillation, extrusion and dehydration) and by removal of heat (refrigeration and freezing). Emphasis on solving problems in laboratory and recitation sessions.

FS HN 572: Food Processing II

(Dual-listed with FS HN 472). (2-3) Cr. 3. S.

Prereq: FS HN 351 or A E 451 or CH E 357.

Principles and applications of food processing by biological (fermentation, enzymes) and nontraditional (high pressure, irradiation, pulsed electric field) preservation methods. Includes packaging, waste water treatment, and sanitation. Emphasis on solving problems in laboratory and recitation sessions.

FS HN 575: Processed Foods

(3-0) Cr. 3. Alt. F., offered even-numbered years.

Prereq: FS HN 214 or FS HN 311; a course in nutrition

This course will examine effect of industrial and domestic food processing on the nutrient content of food and risk of developing chronic disease.

FS HN 580: Orientation to Food Science and Nutrition Research

(1-0) Cr. 1. F.

Orientation to and discussion of research interests in food science and nutrition. Discussion of policy and ethical issues in the conduct of research. Intended for entering students in FS HN. Offered on a satisfactory-fail basis only.

FS HN 581: Seminar

(1-0) Cr. 1. S.

Discussion and practice of oral presentation of scientific data in a professional setting. Discussion of issues related to data presentation. Intended for graduate students in their first or second semester in FS HN. Offered on a satisfactory-fail basis only.

FS HN 590: Special Topics

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

FS HN 590A: Special Topics: Nutrition

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

FS HN 590B: Special Topics: Food Science

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

FS HN 590C: Special Topics: Teaching

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

FS HN 596: Food Science and Human Nutrition Travel Course

Cr. 1-4. Repeatable. F.S.SS.

Prereq: Permission of instructor

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students.

FS HN 596A: Food Science and Human Nutrition Travel Course: International travel

(Dual-listed with FS HN 496A). Cr. 1-4. Repeatable. F.S.SS.

Prereq: Permission of instructor

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students. Meets International Perspectives Requirement.

FS HN 596B: Food Science and Human Nutrition Travel Course: Domestic travel

(Dual-listed with FS HN 496B). Cr. 1-4. Repeatable. F.S.SS.

Prereq: Permission of instructor

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students.

FS HN 599: Creative Component

Cr. arr.

Nonthesis option only.

Courses for graduate students:**FS HN 606: Instrumental Measurement of Food Quality**

(2-3) Cr. 3. Alt. S., offered odd-numbered years.

Prereq: FS HN 311 or FS HN 411 or FS HN 502 or BBMB 404

Principles of instrumental measurements of color, aroma, flavor, texture, and rheology. Techniques and instrumentation for measuring the quality of foods; relationship of these methods to food color, taste, flavor, texture, and rheological quality. Application of methods to various foods and biorenewable materials.

FS HN 610: Food & Bioprocessing Enzymology

(Cross-listed with BRT). (2-3) Cr. 3. Alt. F., offered even-numbered years.

Prereq: FS HN 311 or FS HN 411 or FS HN 502 or BBMB 404

Properties and applications of industrial enzymes important in food, feed, and bioprocessing, including biofuels and bioproducts. Characterization of enzyme catalytic mechanisms, kinetics, isolation, mutagenesis, and operating conditions, including evaluation of substrates, products, immobilization, enzyme inhibitors, pH, pressure, and temperature.

FS HN 612: Lipid Chemistry and Applications

(3-0) Cr. 3.

Prereq: FS HN 311 or FS HN 411 or FS HN 502 or BBMB 404

Structure and analysis of lipids; glyceride structure; crystal form and texture; autoxidation and chemical modification; extraction, refining and processing; applications of fats and oils in food, biofuel and biobased products.

FS HN 613: Food Proteins

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

Prereq: FS HN 311 or FS HN 411 or FS HN 502 or BBMB 404

Properties of proteins found in milk, eggs, meat, legumes, and cereal grains. Effect of processing on food proteins.

FS HN 614: Carbohydrates: Structures, Properties, and Applications

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

Prereq: FS HN 311 or FS HN 411 or FS HN 502 or BBMB 404

Study of chemical structures and physical properties of carbohydrates, applications of carbohydrates in foods and as biomaterial, and changes they undergo during processing and storage.

FS HN 626: Advanced Food Microbiology

(Cross-listed with MICRO, TOX). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

Prereq: FS HN 420 or FS HN 421 or FS HN 504

Topics of current interest in food microbiology, including new foodborne pathogens, rapid identification methods, effect of food properties and new preservation techniques on microbial growth, and mode of action of antimicrobials.

FS HN 627: Rapid Methods in Food Microbiology

(Cross-listed with MICRO, TOX). (2-0) Cr. 2. Alt. S., offered even-numbered years.

Prereq: FS HN 420 or FS HN 421 or FS HN 504

Provides an overview of rapid microbial detection methods for use in foods. Topics include historical aspects of rapid microbial detection, basic categories of rapid tests (phenotypic, genotypic, whole cell, etc.), existing commercial test formats and kits, automation in testing, sample preparation and "next generation" testing formats now in development.

FS HN 681: Seminar

(1-0) Cr. 1. F.S.SS.

Presentation of thesis or dissertation research. May be taken once for M.S. program and twice for the Ph.D. program.

FS HN 682: Seminar Reflection

Cr. R. Repeatable. F.S.

Active listening and critical thinking activities related to research seminars in food science and human nutrition. Required each semester for all FSHN graduate students. Electronic documentation.

FS HN 690: Special Problems

Cr. arr. Repeatable. F.S.SS.

Prereq: FS HN 502 or FS HN 503 or FS HN 504 or FS HN 553 or FS HN 554

FS HN 695: Grant Proposal Writing

(Cross-listed with NUTRS). (1-0) Cr. 1. F.

Prereq: 3 credits of graduate course work in food science and/or nutrition

Grant proposal preparation experiences including writing and critiquing of proposals and budget planning. Formation of grant writing teams in food science and/or nutrition. Offered on a satisfactory-fail basis only.

FS HN 699: Research in Food Science and Technology

Cr. arr. Repeatable. F.S.SS.

Offered on a satisfactory-fail basis only.