

## Food Science and Human Nutrition (AGLS)

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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 curricula include culinary science, dietetics, diet and exercise, food science, and nutritional science. Visit the department web site at: [www.fshn.hs.iastate.edu](http://www.fshn.hs.iastate.edu).

### Undergraduate Study

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. Internships in the food industry and culinary business are required. Culinary science graduates are qualified to work as managers and specialists in food research, product development, culinary applications, and food marketing and sales.

The Didactic Program in Dietetics (DPD) is accredited by the Accreditation Council for Education in Nutrition and Dietetics, and 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/approved 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 (R.D.) and to practice in the field of dietetics. 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. There is a \$30 fee for a statement of verification of completion of the DPD. For information about verification statements provided to non-ISU students or students with degrees from international universities, see the departmental website: [www.fshn.hs.iastate.edu](http://www.fshn.hs.iastate.edu).

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.

Three options are available in food science: food science and technology, food science and industry, and consumer food science. The food science and technology and food science and industry options are approved by the Institute of Food Technologists, the national professional organization of food science. Students interested in quality control/assurance; production supervision; management and sales; or research careers in the food industry, government, or academia should elect either the food science and technology or the food science and industry option. Students who wish to go to graduate or professional schools or who receive Scholarships of Excellence in Agriculture and Life Sciences should elect the food science and technology option. Students who wish to emphasize business, journalism, or special aspects of food science should elect food science and industry. Students interested in food product formulation and recipe development, food promotion and communication, and consumer services in government and industry should elect the consumer food science 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.

Nutritional science offers two options: pre-health professional & research and nutrition & wellness. 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. The pre-health professional & research option can serve as a preprofessional program for medicine, dentistry, veterinary medicine, or for

graduate study in nutrition or other biological sciences. 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 communication of nutrition messages to the public and community agencies and effective program planning and evaluation. Graduates will be prepared for employment opportunities in community and state agencies, nonprofit organizations and health promotion enterprises, public health and related programs and for graduate study.

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.

A combined Bachelor of Science and Master of Science (B.S./M.S.) degree in diet and 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 freshmen in the pre-diet and exercise program. In the fall of the junior year, students apply for admission to the B.S./M.S. program. Students not accepted into the program continue toward completion of a B.S. 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 B.S./M.S. degrees in diet and exercise.

The department offers coursework for minors in culinary science, food science, and nutrition and participates in the interdepartmental minor in food safety. See department office or departmental website for more information about minors: <http://www.fshn.hs.iastate.edu/undergraduate-programs/minors/>.

### Minor - Food Safety

The Interdepartmental food safety minor is designed to provide undergraduate students with exposure to the principles of food safety to complement their current major and offer new opportunities for their future careers. Depending on the student's major, the minor enhances the student's expertise in food safety issues pertinent to the student's major. Student learning outcomes include: awareness of food safety issues as they appear in each step of the food chain; ability to analyze a situation, identify food safety problems, use resources to gain additional information; develop a procedure or solution to identified problems; examine proposed solutions for viability and effectiveness; and to be able to speak and write about food safety issues. Graduates with a food safety minor are better prepared for employment in agricultural, medical, and veterinary medical agencies and with state, national and international businesses.

The food safety minor requires 15 credits of coursework with 9 credits from 3 core courses and elective courses to supplement the training in the minor. See approved list for minor courses from departmental website: <http://www.fshn.hs.iastate.edu/undergraduate-programs/minors/>.

### Postbaccalaureate Program

The Iowa State University Dietetic Internship (DI) began as an AP4 program in 1989. It meets the performance requirements for experience 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) credential. For more information, refer to Special Interest

Programs listed under the College of Human Sciences or visit the website at [www.dietetics.iastate.edu](http://www.dietetics.iastate.edu). There is a nonrefundable application fee of \$75.

## 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.

### 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 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, enhancement of communication skills, and portfolio development. 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, NREM, HORT). (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, NREM, HORT). (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, communication and portfolio development.

#### 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*

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:* 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. S.  
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:* TSM 115, 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. Nonmajor graduate credit.

**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. Nonmajor graduate credit.

**FS HN 314. Foundations of Culinary Science.**

(1-0) Cr. 1. F. *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:* Junior classification  
Introduction to the profession of dietetics and responsibilities associated with dietetic professional practice. Emphasis on development of a pre-professional portfolio, 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 ENV S, AGRON, T SC). (3-0) Cr. 3. F.S. *Prereq:* Junior classification  
Zdorkowski, Ford. 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. Nonmajor graduate credit.  
Meets International Perspectives Requirement.

**FS HN 342H. World Food Issues: Past and Present, Honors.**

(Cross-listed with ENV S, AGRON, T SC). (3-0) Cr. 3. F.S. *Prereq:* Junior classification  
Zdorkowski, Ford. 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. Nonmajor graduate credit.  
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. Nonmajor graduate credit. Only one of 351 or A E 451 and CH E 357 allowed toward graduation. 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. Nonmajor graduate credit.

**FS HN 361. Nutrition and Health Assessment.**

(1-3) Cr. 2. F.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. Nonmajor graduate credit.

**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. Nonmajor graduate credit.

**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.  
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 167 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.S. *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. S. *Prereq:* FS HN 214 or FS HN 471; 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. Nonmajor graduate credit.

**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 NUTRS 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. Nonmajor graduate credit.

**FS HN 410. Food Analysis.**

(2-3) Cr. 3. S. Prereq: FS HN 214 or FS HN 311 or CHEM 211; TSM 115

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. Nonmajor graduate credit.

**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. Nonmajor graduate credit.

**FS HN 412. Food Product Development.**

(Dual-listed with FS HN 512). (1-6) Cr. 3. S. Prereq: FS HN 311 or FS HN 411, FSHN 471

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. Nonmajor graduate credit.

**FS HN 419. Foodborne Hazards.**

(Cross-listed with MICRO, TOX). (3-0) Cr. 3. Alt. S., offered 2012. 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. Nonmajor graduate credit. 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. F. 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. Nonmajor graduate credit.

**FS HN 421. Food Microbiology Laboratory.**

(Cross-listed with MICRO). (0-6) Cr. 3. F. 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. Nonmajor graduate credit.

**FS HN 429. Foodborne Toxicants.**

(Dual-listed with FS HN 529). (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 442. Issues in Food and Society.**

(1-0) Cr. 1. S. Prereq: Credit or enrollment in FS HN 101, FS HN 167, FS HN 242, and FS HN 342.

Capstone seminar for Food and Society minor. Discussion and projects about current issues in society related to food and nutrition. Field trip.

**FS HN 461. Medical Nutrition and Disease I.**

(4-0) Cr. 4. F. Prereq: FS HN 360, FS HN 361, FS HN 367, 3 credits in physiology at 300 level or above

(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. Recitation section (1 cr.) will focus on refinement of assessment skills, diagnosis of nutritional problem, nutrition care, and documentation.

**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. Nonmajor graduate credit. 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, 3 credits in physiology at 300 level or above

(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). (Cross-listed with DIET). (2-2) Cr. 3. F.S. Prereq: Graduate student status

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 467. Molecular Basis of Nutrition in Disease Prevention.**

(3-0) Cr. 3. F. 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, HRI, VDPAM). (1-0) Cr. 1. S. Prereq: Credit or enrollment in FS HN 101 or FS HN 272 or HRI 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 494. Service Learning for Human Nutrition.**

(1-0) Cr. 1. Repeatable. F.S.SS. *Prereq: FS HN 360*

Community education programs developed and presented by students around themes of health promotion through diet and exercise. 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.*

Service-learning in community activities. Students will develop, implement and assess a project that engages groups in learning and practicing concepts related to nutrition and wellness.

**FS HN 496. Food Science and Human Nutrition Travel Course.**

(Dual-listed with FS HN 596B). 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 596). 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. Domestic travel.**

(Dual-listed with FS HN 596). 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 503. Advanced Food Science-Processing.**

(1-0) Cr. 1. Alt. S., offered 2012.SS. *Prereq: 3 credits each in physics and mathematics*

Key principles and applications in the processing of food.

**FS HN 505. Short Course in Food Science.**

Cr. arr. F.S.SS. *Prereq: Permission of instructor*

**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. S. *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.

**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.

**FS HN 514. Principles of Food Science-Microbiology.**

(2-0) Cr. 2-1. 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.

**FS HN 515. Regulatory Toxicology.**

(Cross-listed with TOX). (1-0) Cr. 1. Alt. F., offered 2012. Prereq: BBMB 404 or FSHN 403

Survey of approaches used by toxicologists in government and industry for generating, enforcing and complying with laws and regulations. Examine policies from multiple regulatory agencies and how risk-based decisions are made. Perform simple risk assessments and suggest ways of dealing with data gaps. Explore new types of data used in risk assessments. Taught online only.

**FS HN 519. Food Toxicology.**

(Cross-listed with TOX, NUTRS). (3-0) Cr. 3. Alt. F., offered 2012. 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. Only one of FS HN 419 and FS HN 519 may count toward graduation.

**FS HN 521. Microbiology of Food.**

(2-0) Cr. 2. F.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 micro-organisms 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. SS., offered 2013. 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 downstream 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.S.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.S. 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. F.S.SS. 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 542. Introduction to Molecular Biology Techniques.**

(Cross-listed with B M S, EEOB, GDCB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS. Prereq: Graduate classification. 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.**

(Cross-listed with B M S, EEOB, GDCB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS. Prereq: Graduate classification. 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, GDCB, EEOB, GDCB, HORT, NREM, NUTRS). Cr. 1. Repeatable. S.SS. 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.**

(Cross-listed with B M S, EEOB, GDCB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S. Prereq: Graduate classification. 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, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S. Prereq: Graduate classification. 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. Proteomics. Includes two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. (F.)**

(Cross-listed with BBMB, B M S, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS. Prereq: Graduate classification. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**FS HN 542F. Techniques in Metabolomics. metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects.**

(Cross-listed with BBMB, B M S, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS. Prereq: Graduate classification. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

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

(Cross-listed with B M S, EEOB, GDCB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S. Prereq: Graduate classification. 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.S.S. *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 575. Processed Foods.**

(3-0) Cr. 3. Alt. F., offered 2012. *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 and related disciplines. 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. 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 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. F., offered 2012. *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 2012. *Prereq: FS HN 311 or FS HN 411 or FS HN 502 or BBMB 404*

Properties of enzymes important in food processing including flavor, texture and color and in biofuels & bioprocessing. Quantitative evaluation of substrates, enzyme inhibitors, pH, pressure and temperature on enzyme activity. Experimental determination of specificity and mechanisms important to food and bioprocessing biochemistry. Techniques to purify food and bioprocessing enzymes.

**FS HN 612. Lipid Chemistry and Applications.**

(3-0) Cr. 3. Alt. F., offered 2014. *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 2011. *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 2013. *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 2013. *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 2012. *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.

Active listening and critical thinking activities related to research seminars in food science and human nutrition. Required each semester for all FSHN graduate students except when presenting thesis or dissertation research seminar. 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.