

FSTE-FOOD SCIENCE & TECHNOLOGY

FSTE 1120. ACES in the Hole Foods I

4 Credits (4)

Food production activities related to operation of ACES in the Hole Foods, a student-run food company that will give FSTE majors hands-on experience in all aspects of developing, producing and marketing food products Restricted to Las Cruces campus only. Students enrolled in this class must possess A Food Handler Card

Learning Outcomes

1. Apply basic scientific principles, procedures, techniques and standards in the production of food products.
2. Apply principles of sanitation and safety to the production of food products.
3. Assist in the development and evaluation of new and/or existing food products made for human consumption.
4. Prepare a resume and portfolio

FSTE 2110G. Food Science I

4 Credits (3+2P)

The scientific study of the principles involved in the preparation and evaluation of foods. May be repeated up to 4 credits.

Learning Outcomes

1. Explain basic scientific principles involved in the preparation of high quality food products.
2. Utilize scientific inquiry in the experimental investigation of factors influencing the chemical, physical and sensory properties of food products.
3. Apply basic scientific principles, procedures, techniques and standards in the preparation of all types of high quality food products.
4. Use basic methods of quantitative analysis to critically evaluate quality characteristics of food.
5. Use sensory science techniques and terminology to critically evaluate acceptability and quality characteristics of food.
6. Describe high quality characteristics of a variety of food products using appropriate terminology.
7. Apply principles of sanitation and safety to food preparation.

FSTE 2120. ACES in the Hole Foods II

4 Credits (8P)

Food production activities related to operation of ACES in the Hole Foods, a student-run food company that will give FSTE majors hands-on experience in all aspects of developing, producing and marketing food products. Student must also have a Food Handler Card to enroll in this course.

Prerequisite(s): FSTE 1120.

Learning Outcomes

1. Apply basic scientific principles, procedures, techniques and standards in the production of food products.
2. Apply principles of sanitation and safety to the production of food products.
3. Assist in the development and evaluation of new and/or existing food products made for human consumption.
4. Prepare a resume and portfolio

FSTE 2130G. Survey of Food and Agricultural Issues

3 Credits (3)

Survey of food and agricultural issues, including: geography of food production and consumption; human-agricultural-natural resource relations; agriculture in the United States and abroad; modern agribusiness; food safety; food, agriculture, and natural resources policy; ethical questions; role and impact of technology. Crosslisted with AEEC 2130G.

Learning Outcomes

1. Understand of global agriculture including production techniques used in various geographical regions, consumption trends, and political and social constraints.
2. Synthesis information about agricultural issues and make informed arguments
3. Articulate modern issues in agriculture
4. Write coherent arguments relative to personal beliefs regarding agricultural issues

FSTE 2996. Special Topics

1-4 Credits

Specific topics and credits to be announced in the Schedule of Classes. Maximum of 4 credits per semester and a grand total of 9 credits.

Learning Outcomes

1. Varies

FSTE 3110. Professional Development in Food Science

1 Credit (1)

Covers essential elements of career management including preparation for a successful internship. Students must have a Food Handler Card.

Restricted to: FSTE majors. Graded S/U.

Prerequisite: FSTE 2120.

Learning Outcomes

1. Describe their Jung Type.
2. Articulate their personal mission.
3. Identify their personal strengths and weaknesses.
4. Establish short and long term career goals.
5. Prepare an effective cover letter.
6. Develop a professional resume.
7. Understand the dos and don'ts of interviewing.
8. Properly dress for interviewing.
9. Understand the factors to consider when deciding what job offer to accept. 1
10. Understand the objectives and requirements of the Food Science internship program.

FSTE 320. Food Microbiology

4 Credits (3+2P)

Detrimental and beneficial microbiological aspects of food products. Methods of quantification and identification of microorganisms associated with food spoilage and preservation. May be repeated up to 4 credits. Prerequisite(s): (BIOL 2610G and BIOL 2610L), or (BIOL 2110G and BIOL 2110L)

FSTE 325. Food Analysis

3 Credits (2+2P)

Basic chemical and physical techniques used in establishing nutritional properties and overall acceptance of food products. May be repeated up to 3 credits.

Prerequisite(s): CHEM 1215G or consent of instructor.

FSTE 331. Food Preservation**3 Credits (2+2P)**

Processes used in home and commercial food preservation, including canning, freezing, drying, and irradiation. May be repeated up to 3 credits.

Prerequisite(s): FSTE 2110G.

FSTE 340. Cereal Technology**3 Credits (2+2P)**

This course provides students with an understanding of chemistry and technology of the cereal grains. The course is structured as a combination of theory, demonstrations, and practical laboratory exercises on the fundamentals of cereal processing. Students will learn about post-harvest processing and utilization of major cereal grains for food and feed, current industrial processes and practices, and the theoretical basis for these operations.

Learning Outcomes

1. Understand principles of cereal chemistry and processing.
2. Understand how cereal grains are produced, stored, marketed, and converted into food products.
3. Describe unit operations and procedures involved in the manufacture of cereal-based food and animal feed products.

FSTE 350. Dairy Technology**3 Credits (2+2P)**

This course provides general knowledge on dairy technology as well as on various processing technologies regarding the science behind a variety of dairy products. It is designed to give a thorough understanding of the composition and properties of milk, and of the physical and chemical changes occurring in milk during processing and storage. These products include fluid milk, fermented dairy products, concentrated and dried dairy products, butter, cream and various frozen dairy desserts. Principles and practices in assembling, receiving, processing, and packaging milk and dairy products, including beverage, frozen, cream, butter, concentrated and fractionated milks, dried milks, casein, and lactose.

Prerequisite: FSTE 2110G.

Learning Outcomes

1. To gain an understanding of dairy processing technologies, unit operation and production of dairy products and ingredients.
2. To understand the principles of processing of dairy products by integrating the concepts of chemistry, biochemistry, microbiology, nutrition, sensory properties, and engineering relevant to dairy processing operations.
3. To gain an ability to think critically on practical problems that occur in the dairy industry and to appreciate the many challenges in dairy research technology and dairy product development.
4. To engage in group discussion on current issues pertinent to culture dairy industry.

FSTE 375. Professional Development in Food Science**1 Credit (1)**

Covers essential elements of career management including preparation for a successful internship. Students must have a Food Handler Card.

Restricted to: FSTE majors. Graded S/U.

Prerequisite: FSTE 2120.

Learning Outcomes

1. Describe their Jung Type.
2. Articulate their personal mission.
3. Identify their personal strengths and weaknesses.
4. Establish short and long term career goals.
5. Prepare an effective cover letter.

6. Develop a professional resume.

7. Understand the dos and don't's of interviewing.

8. Properly dress for interviewing.

9. Understand the factors to consider when deciding what job offer to accept. 1

10. Understand the objectives and requirements of the Food Science internship program.

FSTE 4110. Food Microbiology**4 Credits (3+2P)**

Detrimental and beneficial microbiological aspects of food products. Methods of quantification and identification of microorganisms associated with food spoilage and preservation. May be repeated up to 4 credits. **Prerequisite(s):** (BIOL 2610G and BIOL 2610L), or (BIOL 2110G and BIOL 2110L)

FSTE 4120. Food Chemistry**3 Credits (3)**

Comprehensive study of the chemical and physiochemical properties of food constituents. Chemical changes involved in the production, processing, and storage of food products and basic techniques used to evaluate chemical and physiochemical properties of foods.

Prerequisites: CHEM 1215G, CHEM 1225G, and CHEM 2115, or consent of instructor.

FSTE 4130. Food Preservation**3 Credits (2+2P)**

Processes used in home and commercial food preservation, including canning, freezing, drying, and irradiation. May be repeated up to 3 credits.

Prerequisite(s): FSTE 2110G.

FSTE 4140. Food Analysis**3 Credits (2+2P)**

Basic chemical and physical techniques used in establishing nutritional properties and overall acceptance of food products. May be repeated up to 3 credits.

Prerequisite(s): CHEM 1215G or consent of instructor.

FSTE 4150. Food Safety**3 Credits (3)**

Provide students' knowledge on good manufacturing practices and prerequisite programs, conduct hazard analysis and determine preventive controls, define process, food allergen, sanitation and supply-chain preventive controls and discuss verification validation, recall and recordkeeping requirements with training and educational opportunities related to current best practices and guidance, and future regulatory requirements by establishing the Produce Safety Alliance. Students participate in a Mock Audit. Participants will receive an official FSPCA Preventive Controls Qualified Individual certificate issues by AFDO after attending this training program.

Prerequisite(s): FSTE 4110 or BIOL 311, or consent of instructor.

FSTE 421. Food Chemistry**3 Credits (3)**

Comprehensive study of the chemical and physiochemical properties of food constituents. Chemical changes involved in the production, processing, and storage of food products and basic techniques used to evaluate chemical and physiochemical properties of foods.

Prerequisites: CHEM 1215G, CHEM 1225G, and CHEM 2115, or consent of instructor.

FSTE 4210. Cereal Technology**3 Credits (2+2P)**

This course provides students with an understanding of chemistry and technology of the cereal grains. The course is structured as a

combination of theory, demonstrations, and practical laboratory exercises on the fundamentals of cereal processing. Students will learn about post-harvest processing and utilization of major cereal grains for food and feed, current industrial processes and practices, and the theoretical basis for these operations.

Learning Outcomes

1. Understand principles of cereal chemistry and processing.
2. Understand how cereal grains are produced, stored, marketed, and converted into food products.
3. Describe unit operations and procedures involved in the manufacture of cereal-based food and animal feed products.

FSTE 4220. Dairy Technology

3 Credits (2+2P)

This course provides general knowledge on dairy technology as well as on various processing technologies regarding the science behind a variety of dairy products. It is designed to give a thorough understanding of the composition and properties of milk, and of the physical and chemical changes occurring in milk during processing and storage. These products include fluid milk, fermented dairy products, concentrated and dried dairy products, butter, cream and various frozen dairy desserts. Principles and practices in assembling, receiving, processing, and packaging milk and dairy products, including beverage, frozen, cream, butter, concentrated and fractionated milks, dried milks, casein, and lactose.

Prerequisite: FSTE 2110G.

Learning Outcomes

1. To gain an understanding of dairy processing technologies, unit operation and production of dairy products and ingredients.
2. To understand the principles of processing of dairy products by integrating the concepts of chemistry, biochemistry, microbiology, nutrition, sensory properties, and engineering relevant to dairy processing operations.
3. To gain an ability to think critically on practical problems that occur in the dairy industry and to appreciate the many challenges in dairy research technology and dairy product development.
4. To engage in group discussion on current issues pertinent to culture dairy industry.

FSTE 423. Food Processing Technologies

4 Credits (3+2P)

Common food processing unit operations such as raw material preparation, separation, concentration, fermentation, pasteurization, sterilization, extrusion, dehydration, baking, frying, chilling, freezing, controlled atmosphere storage, water, waste and energy management, packaging, materials handling and storage and process control. Application of principles to processing food in a laboratory setting.

Prerequisite(s): FSTE 328.

FSTE 4230. Food Processing Technologies

4 Credits (3+2P)

Common food processing unit operations such as raw material preparation, separation, concentration, fermentation, pasteurization, sterilization, extrusion, dehydration, baking, frying, chilling, freezing, controlled atmosphere storage, water, waste and energy management, packaging, materials handling and storage and process control. Application of principles to processing food in a laboratory setting.

FSTE 4240. Processed Meats

3 Credits (2+2P)

This course provides students with an understanding of physical, chemical and functional characteristics of meat raw materials. Modern

meat processing industry and its use of science and technology. The fabrication, processing, preservation, sanitation, food safety, ethnic involvement, and utilization of manufactured and processed meat. Regulatory compliance and quality assurance in commercial processed meat operations.

Learning Outcomes

1. The theory and chemistry of meat processing.
2. Processing techniques and basic formulations of different categories of processed meats.
3. The effect of type and composition of raw materials and added ingredients on processed meat quality and safety.
4. To evaluate products for consumer and analytical quality and composition.
5. To evaluate and assess defective products and propose processing/ingredient solutions.

FSTE 425. Sensory Evaluation of Foods and Product Development

3 Credits (2+2P)

Application of affective sensory tests, chemical, physical, and experimental methods to the development and evaluation of a food product. Sensory test methods and procedures used to evaluate the flavor, color and texture of foods. Relationships between sensory and instrumental measurements quality parameters. The course will present the parametric and non-parametric tests that are used in sensory evaluation. May be repeated up to 3 credits.

Prerequisite: FSTE 2110G and (A ST 311 or MATH 1350G).

Learning Outcomes

1. Describe the chemical senses and the receptors that mediate the basic taste modalities.
2. Match sensory tests to research questions and to use the suitable statistical tests.
3. Design and develop a food product and conduct a basic research project.
4. Communicate research results using written, oral, and visual communication techniques.

FSTE 4250. Sensory Evaluation of Foods and Product Development

3 Credits (2+2P)

Application of affective sensory tests, chemical, physical, and experimental methods to the development and evaluation of a food product. Sensory test methods and procedures used to evaluate the flavor, color and texture of foods. Relationships between sensory and instrumental measurements quality parameters. The course will present the parametric and non-parametric tests that are used in sensory evaluation. May be repeated up to 3 credits.

Prerequisite: FSTE 2110G and (A ST 311 or MATH 1350G).

Learning Outcomes

1. Describe the chemical senses and the receptors that mediate the basic taste modalities.
2. Match sensory tests to research questions and to use the suitable statistical tests.
3. Design and develop a food product and conduct a basic research project.
4. Communicate research results using written, oral, and visual communication techniques.

FSTE 430. Brewing Science & Engineering

3 Credits (3)

Details of beer production, fermentation science, brewery operation, and process design & economics. Engineering considerations including

process safety, fermentation kinetics, unit operations, and economies of scale. Beer styles, recipe formulation, product quantification for tax purposes, and brew analytical methods will also be discussed. Students must be 21 years old to enroll. Crosslisted with: FSTE 430.

Learning Outcomes

1. To provide the undergraduate student with a broad perspective of beer and the brewing industry as well as technical knowledge about the brewing process.

FSTE 450. Special Topics

1-4 Credits

Specific subjects and credits to be announced in the Schedule of Classes. Maximum of 4 credits per semester and a grand total of 9 credits towards a degree. Consent of instructor required.

FSTE 475. ACES Foods at NMSU-Experiential Learning

1 Credit (2-8P)

Professional work experience for FSTE majors only.

Prerequisite: FSTE 375.

Learning Outcomes

1. Students will collect a minimum of four hundred hours.

FSTE 476. FSTE Internship Seminar

1 Credit (1)

A case based approach to analyzing internship experiences. Students will write case studies about specific business issues they countered during FSTE 475 (Internship) and analyze them. Restricted to Food Science Technology majors.

Prerequisite: FSTE 475.

Learning Outcomes

1. Analyze business practices as experienced during an internship.
2. Deliver a presentation effectively communicating operations of ACES Foods at NMSU.
3. Assess use of state and federal food regulation agencies within ACES Foods at NMSU.
4. Present in written form the history, business operations, job descriptions, organizational structure, and human resource policies of ACES Foods at NMSU.

FSTE 480. Food Safety

3 Credits (3)

Provide students' knowledge on good manufacturing practices and prerequisite programs, conduct hazard analysis and determine preventive controls, define process, food allergen, sanitation and supply-chain preventive controls and discuss verification validation, recall and recordkeeping requirements with training and educational opportunities related to current best practices and guidance, and future regulatory requirements by establishing the Produce Safety Alliance. Students participate in a Mock Audit. Participants will receive an official FSPCA Preventive Controls Qualified Individual certificate issues by AFDO after attending this training program.

Prerequisite(s): FSTE 320 or BIOL 311, or consent of instructor.

FSTE 4815. FSTE Internship Seminar

1 Credit (1)

A case based approach to analyzing internship experiences. Students will write case studies about specific business issues they countered during FSTE 4998 (Internship) and analyze them. Restricted to Food Science Technology majors.

Prerequisite: FSTE 4998.

Learning Outcomes

1. Analyze business practices as experienced during an internship.
2. Deliver a presentation effectively communicating operations of ACES Foods at NMSU.
3. Assess use of state and federal food regulation agencies within ACES Foods at NMSU.
4. Present in written form the history, business operations, job descriptions, organizational structure, and human resource policies of ACES Foods at NMSU.

FSTE 490. Processed Meats

3 Credits (2+2P)

This course provides students with an understanding of physical, chemical and functional characteristics of meat raw materials. Modern meat processing industry and its use of science and technology. The fabrication, processing, preservation, sanitation, food safety, ethnic involvement, and utilization of manufactured and processed meat. Regulatory compliance and quality assurance in commercial processed meat operations.

Learning Outcomes

1. The theory and chemistry of meat processing.
2. Processing techniques and basic formulations of different categories of processed meats.
3. The effect of type and composition of raw materials and added ingredients on processed meat quality and safety.
4. To evaluate products for consumer and analytical quality and composition.
5. To evaluate and assess defective products and propose processing/ingredient solutions.

FSTE 492. Special Problems

1-4 Credits

Individual research study in a selected subject of Family and Consumer Sciences. Maximum of 4 credits per semester and a grand total of 8 credits towards a degree. Consent of instructor required.

FSTE 4996. Special Topics

1-4 Credits

Specific subjects and credits to be announced in the Schedule of Classes. Maximum of 4 credits per semester and a grand total of 9 credits towards a degree. Consent of instructor required.

FSTE 4997. Special Problems

1-4 Credits

Individual research study in a selected subject of Family and Consumer Sciences. Maximum of 4 credits per semester and a grand total of 8 credits towards a degree. Consent of instructor required.

FSTE 4998. ACES Foods at NMSU-Experiential Learning

1 Credit (2-8P)

Professional work experience for FSTE majors only.

Prerequisite: FSTE 3110.

Learning Outcomes

1. Students will collect a minimum of four hundred hours.

FSTE 5110. Food Microbiology

3 Credits (2+3P)

Detrimental and beneficial microbiological aspects of food products. Methods of quantification and identification of microorganisms associated with food spoilage and preservation. Additional work required at the graduate level.

Learning Outcomes

1. Understand the principles behind growth of microorganisms in foods.
2. Identify factors associated with growth, prevalence, and survival of microorganisms.
3. Use proper microbiological techniques for detection, isolation, and enumeration of microbial contaminants.
4. Understand the principles of food preservation.

FSTE 5120. Food Chemistry**3 Credits (3)**

Comprehensive study of the chemical and physiochemical properties of food constituents. Chemical changes involved in the production, processing and storage of food products and basic techniques used to evaluate chemical and physiochemical properties of foods. Additional work required at the graduate level.

Learning Outcomes

1. Describe the major components, including water, carbohydrates, lipids, and proteins, of foods (edible plant products, milk, and eggs) in chemical and biochemical terms.
2. Relate the chemical nature of foods to the techniques used in and the changes occurring processing of foods.
3. Describe the chemical and biochemical basis of food quality problems.
4. Select ingredients and processes necessary to the composition of specific foods.
5. Select and apply techniques appropriate for producing specific food characteristics.
6. Evaluate food products to determine their quality and safety.
7. Apply chemical and biochemical principles in the design and creation of various food products.

FSTE 5130. Food Preservation**3 Credits (3)**

Processes used in home and commercial food preservation, including canning, freezing, drying, and irradiation. Same as FSTE 4130 with additional work required at the graduate level.

FSTE 5140. Food Analysis**3 Credits (2+3P)**

Covers basic chemical and physical techniques used in establishing nutritional properties and overall acceptance of food products. Additional work required at the graduate level.

Learning Outcomes

1. Explain the principles behind the analytical techniques used in the chemical and physical analyses of food.
2. Understand food constituents and functional properties important in quality control and research laboratories.
3. Acquire laboratory skills required for performing a range of chemical analyses of food.
4. Acquire writing skills related to food composition and analyses.

FSTE 5150. Rumen Microbiology (so)**3 Credits (3)**

Same as ANSC 560.

FSTE 520. Graduate Study in Food Microbiology**3 Credits (2+3P)**

Detrimental and beneficial microbiological aspects of food products. Methods of quantification and identification of microorganisms associated with food spoilage and preservation. Additional work required at the graduate level.

Prerequisites: BIOL 2610G/2610L, or BIOL 2110G/2110L, or consent of instructor.

FSTE 521. Graduate Study in Food Chemistry**3 Credits (3)**

Comprehensive study of the chemical and physiochemical properties of food constituents. Chemical changes involved in the production, processing and storage of food products and basic techniques used to evaluate chemical and physiochemical properties of foods. Additional work required at the graduate level.

Prerequisites: CHEM 1215G, CHEM 1225G, and CHEM 2115, or consent of instructor.

FSTE 5210. Cereal Technology**3 Credits (2+2P)**

This course provides students with an understanding of chemistry and technology of the cereal grains. The course is structured as a combination of theory, demonstrations, and practical laboratory exercises on the fundamentals of cereal processing. Students will learn about post-harvest processing and utilization of major cereal grains for food and feed, current industrial processes and practices, and the theoretical basis for these operations.

Learning Outcomes

1. Understand principles of cereal chemistry and processing.
2. Understand how cereal grains are produced, stored, marketed, and converted into food products.
3. Describe unit operations and procedures involved in the manufacture of cereal-based food and animal feed products.

FSTE 523. Food Processing Technologies**4 Credits (3+2P)**

Common food processing unit operations such as raw material preparation, separation, concentration, fermentation, pasteurization, sterilization, extrusion, dehydration, baking, frying, chilling, freezing, controlled atmosphere storage, water, waste and energy management, packaging, materials handling and storage and process control. Application of principles to processing food in a laboratory setting. Additional work beyond that for FSTE 423 required at the graduate level.

Prerequisite(s): FSTE 528.

FSTE 5230. Food Processing Technologies**4 Credits (3+2P)**

Common food processing unit operations such as raw material preparation, separation, concentration, fermentation, pasteurization, sterilization, extrusion, dehydration, baking, frying, chilling, freezing, controlled atmosphere storage, water, waste and energy management, packaging, materials handling and storage and process control. Application of principles to processing food in a laboratory setting. Additional work beyond that for FSTE 4230 required at the graduate level.

Learning Outcomes

1. Manage safety considerations and engineering controls for food processing operations.
2. Describe the effects of heat, cold, and pressure on microorganisms, particularly spoilage microorganisms.
3. Describe the effects of heat, cold, and pressure on foods, specifically on texture, flavor, and nutrition.
4. Choose heat, cold, and/or pressure treatment for foods based on desired characteristics of the product.
5. Evaluate and/or troubleshoot finished food products using sensory evaluation terminology and tools.

6. Create, and subsequently modify, a multi-step food processing regimen based desired outcomes, such as preservation, stylistic guidelines, production costs, and shelf-life.
7. Size and cost food processing operations, processes, ingredients, and utilities.
8. Create a food processing business plan for a food production facility, incorporating regulatory considerations.

FSTE 524. Sensory Evaluation of Foods**3 Credits (2+3P)**

Principles and procedures involved in the sensory evaluation of foods. Physiological, psychological and environmental factors affecting the evaluation of sensory properties. Analysis and interpretation of sensory data.

Prerequisite(s): FSTE 2110G and A ST 311 or MATH 1350G.

FSTE 5241. Processed Meats**3 Credits (2+2P)**

This course provides students with an understanding of physical, chemical and functional characteristics of meat raw materials. Modern meat processing industry and its use of science and technology. The fabrication, processing, preservation, sanitation, food safety, ethnic involvement, and utilization of manufactured and processed meat. Regulatory compliance and quality assurance in commercial processed meat operations.

Learning Outcomes

1. Upon successful completion of this course, the student will learn the theory and chemistry of meat processing.
2. Upon successful completion of this course, the student will learn processing techniques and basic formulations of different categories of processed meats.
3. Upon successful completion of this course, the student will learn the effect of type and composition of raw materials and added ingredients on processed meat quality and safety.
4. Upon successful completion of this course, the student will learn to evaluate products for consumer and analytical quality and composition.

FSTE 525. Graduate Study in Food Analysis**3 Credits (2+3P)**

Covers basic chemical and physical techniques used in establishing nutritional properties and overall acceptance of food products. Additional work required at the graduate level.

Prerequisite(s): CHEM 1215G or consent of instructor.

FSTE 5250. Sensory Evaluation of Foods**3 Credits (2+3P)**

Principles and procedures involved in the sensory evaluation of foods. Physiological, psychological and environmental factors affecting the evaluation of sensory properties. Analysis and interpretation of sensory data.

Learning Outcomes

1. Describe the chemical senses and the receptors that mediate the basic taste modalities.
2. Understand the capabilities and limitations of sensory tests.
3. Develop a food-based product.
4. Match sensory tests to research questions and use suitable statistical tests.
5. Design and conduct a basic research project.
6. Communicate research results using written, oral, and visual communication techniques.

FSTE 531. Food Preservation**3 Credits (3)**

Processes used in home and commercial food preservation, including canning, freezing, drying, and irradiation. Same as FSTE 331 with additional work required at the graduate level.

FSTE 5310. Designing and Brewing Great Beers of the World**3 Credits (2+2P)**

The science and technology of brewing unit operations and the ingredients used in beer brewing. That knowledge is then applied to designing and brewing classic world beer styles. Styles investigated change every semester but typically include India Pale Ale, Pale Ale, Stout, Porter, Hefeweisen, Scottish Ale, and Black IPA. Comprehensive evaluation of the product relative to style guidelines completes the design-brew-evaluate cycle. Students must be at least 21 years of age on the first day of class.

FSTE 532. Designing and Brewing Great Beers of the World**3 Credits (2+2P)**

The science and technology of brewing unit operations and the ingredients used in beer brewing. That knowledge is then applied to designing and brewing classic world beer styles. Styles investigated change every semester but typically include India Pale Ale, Pale Ale, Stout, Porter, Hefeweisen, Scottish Ale, and Black IPA. Comprehensive evaluation of the product relative to style guidelines completes the design-brew-evaluate cycle. Students must be at least 21 years of age on the first day of class.

FSTE 540. Cereal Technology**3 Credits (2+2P)**

This course provides students with an understanding of chemistry and technology of the cereal grains. The course is structured as a combination of theory, demonstrations, and practical laboratory exercises on the fundamentals of cereal processing. Students will learn about post-harvest processing and utilization of major cereal grains for food and feed, current industrial processes and practices, and the theoretical basis for these operations.

Learning Outcomes

1. Understand principles of cereal chemistry and processing.
2. Understand how cereal grains are produced, stored, marketed, and converted into food products.
3. Describe unit operations and procedures involved in the manufacture of cereal-based food and animal feed products.

FSTE 560. Rumen Microbiology (so)**3 Credits (3)**

Same as ANSC 560.

FSTE 598. Special Research Programs**1-4 Credits**

Individual investigations either analytical or experimental. Maximum of 4 credits per semester and no more than 6 credits towards a degree. Consent of instructor required.

FSTE 5997. Special Research Programs**1-4 Credits**

Individual investigations either analytical or experimental. Maximum of 4 credits per semester and no more than 6 credits towards a degree. Consent of instructor required.

FSTE 600. Special Research Program**1-6 Credits (1-6)**

Special research for doctoral students May be repeated up to 6 credits. Consent of Instructor required.

Prerequisite(s): Consent of instructor.

FSTE 601. Cooperative Extension Service Field Experience**1-3 Credits (1-3)**

This course will provide students with knowledge and experience in community outreach through the cooperative extension service. This course is required for students pursuing a Ph.D. in FSHN. Students will work collaboratively with extension faculty on applied projects. May be repeated up to 3 credits. Consent of Instructor required. Restricted to: FSHN majors.

FSTE 605. Doctoral Seminar**1 Credit (1)**

Current topics and research in Food Science and Human Nutrition. Course will include experts from the field as guest speakers. Students will have the opportunity to present their doctoral proposals and/or research findings.

FSTE 6910. Doctoral Seminar**1 Credit (1)**

Current topics and research in Food Science and Human Nutrition. Course will include experts from the field as guest speakers. Students will have the opportunity to present their doctoral proposals and/or research findings.

FSTE 698. Doctoral Research**1-6 Credits (1-6)**

Research May be repeated up to 6 credits. Consent of Instructor required.

FSTE 6991. Doctoral Research**1-6 Credits (1-6)**

Research May be repeated up to 6 credits. Consent of Instructor required.

FSTE 6997. Special Research Program**1-6 Credits (1-6)**

Special research for doctoral students May be repeated up to 6 credits. Consent of Instructor required.

Prerequisite(s): Consent of instructor.

FSTE 6998. Cooperative Extension Service Field Experience**1-3 Credits (1-3)**

This course will provide students with knowledge and experience in community outreach through the cooperative extension service. This course is required for students pursuing a Ph.D. in FSHN. Students will work collaboratively with extension faculty on applied projects. May be repeated up to 3 credits. Consent of Instructor required. Restricted to: FSHN majors.

FSTE 700. Doctoral Dissertation**1-12 Credits (1-12)**

Dissertation May be repeated up to 18 credits. Consent of Instructor required.

Prerequisite(s): Passed the qualifying exam and comprehensive exam.

FSTE 7000. Doctoral Dissertation**1-12 Credits (1-12)**

Dissertation May be repeated up to 18 credits. Consent of Instructor required.

Prerequisite(s): Passed the qualifying exam and comprehensive exam.