

FSS Detailed Course Description

Unit 1 Introduction to Food Science

Lesson 1.1 Exploring Food Science

1. Sensory properties of food influence consumer preference and acceptance.
 - Observe and identify three common foods using the five senses.
 - Determine acceptability and preference of foods using sensory evaluation.
2. Organization and record keeping are important to success in food science.
 - Develop and keep an Agriscience Notebook to record and store information.
 - Develop a Laboratory Notebook to record observations and protocols.
3. Discoveries about food have driven advances in food processing and preservation.
 - Work collaboratively to develop a timeline of food science discoveries.
 - Determine the date and significance of a food science discovery, scientist, organization, and/or event.

Lesson 1.2 Science, Safety, and Inquiry

1. Good laboratory procedures and safety ensure the quality and integrity of laboratory data.
 - Diagram and describe where emergency equipment and safety hazards in the food science laboratory are located.
2. Sanitation and cleanliness are critical for safety in food handling and preparation.
 - Compare different methods of washing hands, workspace, and utensils, and determine which method is best.
3. Foods are chemical systems comprised of lipids, simple and complex carbohydrates, proteins, vitamins and other molecules.
 - Research the main nutrients from food needed in the human body.
 - Detect nutrients, such as protein, starch, sugar, fat, and vitamin C, using indicator solutions.
4. Rigorous, scientific research methods, including qualitative and quantitative analysis are standard in the food industry.
 - Investigate the presence of nutrients in unknown food sources using scientific inquiry and the scientific method.

Unit 2 Chemistry of Food

Lesson 2.1 Influence of Nutrients in Food

1. The amounts of lipids, carbohydrates, proteins, and water in a food product influence sensory characteristics.
 - Conduct sensory evaluations to ascertain how the amount of lipid, carbohydrates, proteins, and water affect sensory characteristics of food.
 - Examine properties and sensory characteristics of various starches for the ability to withstand time and temperature changes.
 - Render fat from assorted meat products to determine the amount of lipids present.

- Dehydrate hotdogs and deli ham to determine the percentage of water in each food product.
 - Examine elasticity of gluten in different flours.
2. Ingredients have varying functionalities in food products.
 - Research and determine the functions of ingredients in a basic cake recipe.
 3. Different ingredients can be used to produce the same product.
 - Substitute ingredients in a recipe and use sensory analysis to determine acceptance of substitute ingredients.

Lesson 2.2 Food Chemists

1. Food is constantly reacting with its environment.
 - Observe foods of various ages to determine changes that have occurred over time.
2. Foods change over time due to chemical reactions, physical changes, microbiological growth and/or enzymatic activity.
 - Culture swabs taken from food samples to determine the presence of microorganisms.
 - Prepare a bread recipe and observe changes to the ingredients that occur during the mixing and baking of the bread.
3. pH is an essential solution property that influences chemical reactions, properties, quality, and safety of food.
 - Determine the pH of common pantry ingredients and the functions of those ingredients in foods.

OPTIONAL Lesson 2.3 Factors of Change

1. Physical changes can cause foods to crystallize, gel, and otherwise change over time.
 - Research and present findings on common physical changes in food.
 - Demonstrate how to produce common physical changes in food.
2. Chemical reactions, such as Maillard browning and oxidation, can change food over time because food is a non-equilibrium system.
 - Evaluate effects of storage of food products on Maillard browning.
 - Conduct a sensory evaluation to determine the amount of change in a food product over time.
3. pH influences the way a food reacts chemically as well as the sensory characteristics.
 - Measure the amount of CO₂ gas produced in a chemical reaction with varying pH levels.
 - Conduct a sensory evaluation difference test to determine if there is a difference in the taste of low acid orange juice compared to regular orange juice.

Unit 3 The Safety of Our Food

Lesson 3.1 Good Manufacturing Practices

1. Personal hygiene is a critical GMP that is easily controlled.
 - Develop a sign, for display, outlining proper protocols for a personal hygiene topic and present information to class.
2. Good manufacturing practices can promote safe preparation and handling of food.
 - Observe photographs of food science situations to determine what GMPs are being followed and identify those that are not.

3. Allergens are food safety concerns and need to be addressed with proper food preparation and handling.
 - Prepare foods using different sanitation methods and test for cross contamination.

Lesson 3.2 ABCs of Food Safety

1. HACCP utilizes seven basic principles to assure potentially hazardous products do not reach the consumer.
 - Research the principles of a HACCP plan and develop a Prezi presentation and handout to be used as an informational resource for other students.
2. HACCP concepts are used in all phases of food production and processing.
 - Determine the HACCP principle explained in a scenario and justify the reasoning for that choice.
3. HACCP is a framework for assessing and/or preventing risks associated with physical, chemical, and biological hazards in food design and manufacturing systems.
 - Collaborate as a team and follow steps to develop a HACCP plan for ham and cheese sandwiches.

Lesson 3.3 Pathogen Pathways

1. Microbiological organisms can have positive and negative effects on foods and people.
 - Research bacteria, mold, and yeast and record growth factors, appearance, and inhibiting methods.
2. Microbial growth can be manipulated using temperature, pH, water activity, competitive exclusion, and chemical agents.
 - Prepare agar for microbial growth and inoculate the agar with yeast.
 - Develop and conduct a protocol testing factors affecting microbial growth.
 - Write a laboratory report discussing findings and analyzing results of tests conducted.
3. Pathogens can cause illness or death when present in food.
 - Research foodborne pathogens to discover diseases pathogens can cause and prevention methods to control pathogens.
 - Develop a comic strip depicting the information discovered about an assigned pathogen.
 - Collaborate with peers to determine possible pathogens that caused sickness in a role-play activity.

Unit 4 Food Processing and Preservation

Lesson 4.1 Processing for Consumption

1. Processing is a system that physically or chemically changes the inherent characteristics of agricultural products prior to consumption.
 - Identify chemical and physical changes of strawberries, cream, and other ingredients while processing raw products into food products for consumption.
2. Specific unit operations are dependent upon the chemical and physical properties of the raw food commodity.
 - Generate a list of chemical and physical properties of apples and apple products.
 - Identify unit operations used to process apples.
 - Determine how physical and chemical properties of food affect unit operations.

3. Processing methods are dependent upon the end uses of the agricultural products.
 - Evaluate how processing methods affect the quality of strawberries and test which processed strawberry would better replace fresh strawberries in a recipe.
4. Agricultural commodities are processed and separated into components used for further processing or for consumption.
 - Investigate methods used in processing poultry and determine what products can be derived from a raw commodity.
 - Process a chicken into as many different food products as possible.

Lesson 4.2 Processing for Preservation

1. The five basic food-processing principles that achieve preservation are moisture removal, heat treatment, low-temperature treatment, acidity control, and non-thermal processes.
 - Evaluate microbial growth of buttermilk and heat-treated buttermilk.
 - Manipulate pH levels of apples to inactivate enzymatic reactions and extend shelf life.
 - Remove water from fruit to study the effects of water on microbes.
 - Observe rate of deterioration of food products at room temperature, refrigeration, and freezing.
 - Assess sensory characteristics of food products after processing.
 - Examine non-thermal processing methods in the food science industry and write a technical research paper on non-thermal processing methods.
2. Food preservation controls microbial growth and enzymatic reactions, extending the shelf life of a food while changing its quality and usability.
 - Evaluate differences of minimally processed food products to processed food products and develop a conclusion statement on the effects of processing on food products.

Lesson 4.3 Processing for Quality and Safety

1. A variety of federal, state, and local agencies govern the manufacture and sale of food.
 - Research regulatory agencies and the laws that they regulate.
 - Determine which agency is responsible for regulating specific food products.
2. Agricultural commodities are graded based on their quality and usability, triggering some food products to have quality grading standards.
 - Grade tomato catsup in accordance to USDA quality grading standards.
3. Certain food products must meet legal standards of identity.
 - Evaluate milk samples to determine if the product has been adulterated and types of adulterants.

Unit 5 Food Health and Security

Lesson 5.1 Nourishing Nutrition Labels

1. Food labels provide required and useful information such as, ingredients, nutrition, claims, traceability, warnings, and proper food handling for consumers.
 - Dissect a nutrition label and examine each part to learn how to use a label to help consume a balanced diet.
 - Investigate a food label to determine how to find required information and consumer warnings.
2. Recommended dietary allowances provide guidelines for proper intake of macromolecules for health, depending upon gender and different life stages.

- Determine recommended dietary guidelines for a specific set of individuals and develop a menu that contains the necessary nutrients for a healthy diet.
 - Recommend alternative foods for individuals with dietary restrictions.
3. Foods are analyzed and labeled based on their composition of various molecules.
 - Research ingredients in a recipe to determine nutrient contents of each ingredient and develop a nutrition panel for the food product produced by the recipe

Lesson 5.2 Safe, Secure, and Accessible

1. Safe and nutritious food, necessary to maintain health, is not equally accessible to everyone.
 - Analyze statistics about food insecurity in the United States and their community.
 - Develop solutions to possible situations of food insecurity in their community.
2. U.S. food supply needs protection from intentional adulteration.
 - Evaluate vulnerabilities toward intentional adulteration of a packing plant in the United States.
 - Develop a food defense plan.
 - Consider possible ways to attack the food supply.

Unit 6 Preference and Product Availability

Lesson 6.1 Consumer Preferences

1. Consumers choose food based on lifestyle factors including price, availability, convenience, culture, and nutrition.
 - Evaluate a menu and consider choices based on nutrition, price, convenience, and culture.
 - Choose food products based on lifestyle.
2. Sensory evaluations must be carefully constructed and executed to reduce factors or biases that are not relevant to the test objective.
 - Participate in sensory evaluation modeling factors to identify biases.
 - Discuss how non-relevant factors can manipulate the perception of panelists.
3. Different sensory evaluation techniques determine consumer preference and acceptance.
 - Construct and conduct a specific sensory evaluation and collect data to analyze the outcome of the evaluation.
 - Develop an instructional guide explaining the steps and key points of a specific sensory evaluation.

Lesson 6.2 To Protect and Sell

1. Food marketing uses technology and media to influence consumer behavior.
 - Compare different advertisements and determine how the marketer addressed product, price, place, and promotion.
2. Food packaging both protects food and attracts consumers.
 - Develop a food package to withstand a crush test, a drop test, and a water test while identifying the product and attracting consumers.
3. Food retailers position products based on shopping behaviors and consumer trends.
 - Evaluate a store or market selling an assigned food product and evaluate the planogram and how the retailer marketed the product.

Unit 7 Food Product Development

Lesson 7.1 Decide, Design, and Develop

1. Food product development moves through a series of processes to transform from an idea to a tangible food product.
 - Choose a new food product to develop.
 - Apply food processes necessary to develop a tangible food product from an idea.
2. Finished food products must be validated against the original concept.
 - Justify that a developed product meets consumer needs.
 - Develop a display to highlight new food product.