

## **AG 550 FOOD SCIENCE/AG APPLICATIONS**

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**COURSE DESCRIPTION:** Food Science is an applied science of food production, processing, transporting, storage, toxicology and quality control. Students apply the scientific method of discovery as they study the biological and chemical basis of food preparation, processing and preservation. Students develop writing and critical thinking skills through data collection, laboratory procedures, science-based experimentation, and written lab reports. This course focuses primarily on the food processing industry and may be used as a companion course to the Family and Consumer Sciences course in Food Science.

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<b>UNITS OF INSTRUCTION</b>	<b>MINUTES OF INSTRUCTION</b>
Introduction to Food Science	470
Scientific Evaluation of Food	705
Science of Food Processing	705
Processing Practices	470
Food Safety/Quality Control	705
Toxicology	705
Food Engineering/ResearchBiotechnology	470
<b>TOTAL MINUTES</b>	<b>4230</b>

**A. Introduction to Food Science**

1. Analyze the size and scope of the U.S. food industry.
2. Compare food expenditures in different countries as a percent of income.
3. Compare food expenditures of different income groups in the U.S. and other countries.
4. Explain how the supply of food affects the Consumer Price Index.
5. Define the term "value added" as it relates to food.
6. Describe the food industry system from farm to retail. 7. Understand basic components of Foods.

**B. Scientific Evaluation of Food**

1. Explain and apply the steps in the scientific method of discovery.
2. Identify and use the basic units of measurement: standard/metric.
3. Determine area, weight, volume, mass and density.
4. Demonstrate the ability to use symbols, formulas and equations.
5. Write accurate, complete laboratory reports.
6. Identify scientific equipment used in the food science laboratory.

7. Demonstrate proper use and care of scientific equipment.
8. Describe and demonstrate safe practices in the laboratory.
9. Explore sensory evaluation of food.
10. Determine the factors that affect food preferences.
11. Examine the structures of atoms and molecules.
12. Distinguish between elements, compounds and mixtures.
13. Explain the differences between ionic and covalent bonds, and ionic and covalent compounds.
14. Differentiate between physical and chemical changes in foods.
15. Demonstrate physical and chemical changes in foods.
16. Explain how the process of ionization is related to the formation of acids and bases.
17. Discuss the importance of pH in the process of digestion.
18. Determine the pH of common foods.
19. Explore relationships among energy, physical changes and chemical reactions.
20. Examine the relationship between molecular motion and temperature.

### **C. Science of Food Processing**

1. Describe scientific practices that are used to protect food crops from diseases and pests.
2. Explain how organic farming practices are different from traditional farming practices.
3. Name advantages and disadvantages for both organic and traditional food production methods.
4. List some food production practices that protect food products against spoilage and damage in the field.
5. Discuss the role of chemicals in protecting crops from damage.
6. Explain how the use of "integrated pest management" practices affects food production.
7. Identify some quality problems with food crops that are the result of poor harvesting practices.
8. Describe some science based practices that will protect crops during the harvesting process.
9. List some science based storage practices, and describe how the practices prevent food spoilage.
10. Identify science based methods of transporting food products to avoid damage and/or spoilage.

### **D. Processing Practices**

1. Analyze the food processing procedures used in the U.S. to maintain and preserve foods.
2. Describe the conditions necessary for microbial growth.
3. Explain the role that food processing plays in retarding the growth of microbes.

4. Identify five specific food items and determine the most appropriate processing method for each.
5. Define the terminology associated with food processing.
6. Explain the process for making a cultured dairy product.
7. Describe the roles of food additives in food processing.
8. Compare and contrast "good" and "harmful" bacteria as they relate to food processing and food quality.
9. Describe the types of thermal processes used to preserve foods and compare their relative effectiveness.
10. Compare different canning methods using heat processing.
11. Discuss the pros and cons of irradiation as a method of food preservation.
12. Cite some advantages of food dehydration as a processing method.
13. Calculate the amount of dehydration, on a weight basis that has occurred in a dehydrated food.
14. Compare the three basic commercial methods of freezing foods.
15. Explain the importance of proper packaging for preserving foods.
16. Calculate the BTUs that are required to maintain a given amount of frozen meat for a given period of time.
17. Explain the relationship between temperature and microbial growth of foods.
18. Explain the value of packaging in the marketing of foods.
19. Contrast the effects of different kinds of packaging materials.

#### **E. Food Safety/Quality Control**

1. Define the terminology related to food safety.
2. Name the agencies that are responsible for assuring that food is safe.
3. Analyze the seven steps of the HACCP system for maintaining safe food during processing.
4. Evaluate the process of inspecting a food facility for safe sanitation practices.
5. Identify procedures and controls that will prevent contamination of food products during processing.
6. Describe ways to prevent contamination of food products by processing personnel.
7. Explain how quality control procedures are used to maintain products that are uniform and consistent in both quantity and quality.

#### **F. Toxicology**

1. Discuss the legal uses and restrictions of pesticides on food crops.
2. Explain why restrictions on the use of pesticides are necessary.
3. Describe how plants and animals are used to evaluate the amount of pesticide residue on food crops.
4. Explain how risk is assessed when animals are used to test for carcinogenic substances.

5. Describe the steps that are taken to ensure that food crops are protected from harmful levels of chemical residues.
6. Explain toxicity and address the role that moderation can play in avoiding potentially adverse effects of toxins in foods.
7. Identify some natural substances found in foods that are toxic to humans.
8. Examine some common food allergies that affect some members of the human population.
9. Explain the negative consequences of natural toxins in plants.

**G. Food Engineering/Research/Biotechnology**

1. Describe ways that science is used to develop new food products.
2. Identify packaging materials for food products that have been developed by engineers and food scientists.
3. Identify kinds of research activities that are conducted by food scientists.
4. Identify some food products that have been developed using bio-technology methods and techniques.