

## **COURSE OUTLINE**

### **Introduction to Food Science**

#### **Course Description**

AG 213. Introduction to Food Science. 3 hours credit. This course will enable the student to apply biological, chemical and physical principles to the study of converting raw agricultural products into food products suitable for human consumption. The student will recognize the nutritional and chemical properties and reactions of food components, identify pathogens and microorganisms related to food spoilage, and describe the principles that make food safe for human consumption.

#### **Course Relevance**

Food science includes aspects of the agricultural sciences, human physiology, health and nutrition, food chemistry, agricultural products processing, food additives, preparation, packaging, storage and shipment of food products. The study of food science will enrich the students' appreciation of the edible world and help them better understand the principles underlying the production of the food they eat. The principles learned in this course will allow the student to apply the concepts of food science to everyday life.

#### **Required Materials**

Parker, R. (2003). *Introduction to food science*. (2<sup>nd</sup> ed.). Albany, NY: Delmar/Thompson Learning, Inc.

#### **Learning Outcomes**

The intention is for the student to be able to:

1. Demonstrate a basic understanding of biological, chemical and agricultural sciences related to food products.
2. Explore the chemistry underlying the properties and reactions of food components.
3. Identify pathogens and spoilage microorganisms in food.
4. Identify the conditions under which pathogens will grow and are rendered harmless.
5. Describe the principles that make food safe for human consumption.

#### **Learning PACT Skills that will be developed and documented in this course**

Through involvement in this course, the student will develop ability in the following PACT skill area(s):

##### **Analytical Thinking Skills**

1. Critical thinking
  - Through discussion and research the student will develop the ability to think critically regarding food science related issues.

#### **Major Summative Assessment Task(s)**

These learning outcome(s) and the Learning PACT skill(s) will be demonstrated by:

1. Evaluating caloric intake data using electronic-facilitated research that incorporates food science principles.

### **Course Content**

- I. Skills or Competencies – Actions that are essential to achieve the course outcomes:
  - A. Understand of food science principles
  - B. Understand of the food pyramid
  - C. Read, communicate and understand scientific materials related to food science
  - D. Apply scientific reasoning to real world problems
  - E. Apply electronic-facilitated research

### **Learning Units**

- I. Introduction and background
  - A. Overview of food science
    1. Parts of food industry
    2. Trends in food science
  - B. Chemistry review
    1. Elements, bonds and molecules
    2. Reactions
    3. Metabolism
    4. Organic chemistry
  - C. Chemistry of foods
    1. Carbohydrates
    2. Proteins
    3. Lipids
    4. Macronutrients
    5. Micronutrients
  - D. Nutrition and digestion
    1. Nutritional needs
    2. Water
    3. Food pyramid
    4. Digestive processes
    5. Vegetarian diets
    6. Bioavailability of nutrients
    7. Stability of nutrients
    8. Diet and chronic disease
  - E. Food composition
    1. Composition of foods
    2. Energy in foods
  - F. Quality factors in foods
    1. Appearance
    2. Texture
    3. Flavor
    4. Quality standards
    5. Quality control
  - G. Unit operations in food processing

1. Materials handling
  2. Cleaning
  3. Separating
  4. Mixing
  5. Heat exchanging
  6. Forming
  7. Packaging
  8. Controlling
  9. New processes
- H. Food deterioration
1. Types
  2. Shelf life
  3. Causes
  4. Principles of food preservation

## II. Preservation

- A. Heat
1. Degrees of preservation
  2. Heat treatment selection
  3. Heat resistant microorganisms
  4. Home canning
- B. Cold
1. Refrigeration vs freezing
  2. Cool storage
  3. Frozen storage
  4. Home freezing
- C. Drying and dehydration
1. Dehydration
  2. Food concentration
  3. Home drying
- D. Radiant and electrical energy
1. Irradiation
  2. Microwave heating
  3. Electrical heating
- E. Fermentation, microorganisms and biotechnology
1. Fermentation and uses
  2. Microorganisms as food
  3. Biotechnology
- F. Chemicals
1. Preservatives
  2. Additives
- G. Packaging
1. Types of containers
  2. Testing
  3. Environmental concerns

### III. Foods and food products

#### A. Milk

1. Milk products and by-products
2. Substitutes

#### B. Meat, poultry and eggs

1. Meat and meat products
2. Meat substitutes
3. Poultry
4. Eggs

#### C. Fish and shellfish

1. Salt and freshwater fish and shellfish
2. Fishing vs culture
3. Spoilage
4. Preservation
5. By-products
6. Storage

#### D. Cereal grains, legumes and oilseeds

1. Cereal grains
2. Milling and refining
3. Breakfast cereals
4. Baking
5. Legumes
6. Soybeans

#### E. Fruits and vegetables

1. General composition and structural features
2. Harvesting
3. Processing
4. By-products

#### F. Fats and oils

1. Composition and functional properties
2. Sources
3. Production and processing methods
4. Structure
5. Fat substitutes

#### G. Candy and confections

1. Sugar-based products
2. Chocolate and cocoa products
3. Sugar substitutes

#### H. Beverages

1. Carbonated beverages
2. Bottled water
3. Alcoholic beverages
4. Coffee and substitutes
5. Teas

### IV. Food safety

- A. Safety, hazards and risks
- B. Microorganisms
- C. Rodents, birds and insects
- D. HACCP (What does this stand for?) Hazard Analysis and Critical Control Points
- E. Quality assurance
- F. Labeling

### **Learning Activities**

Independent and collaborative learning activities will be assigned within and outside the classroom to achieve the intended course outcomes. Classroom discussion, lecture, online research and textbook reading assignments will also contribute to the learning process.

### **Grade Determination**

The final grade will be based on exams, homework assignments, research assignments, and development of nutritional journals. Other methods such as quizzes may be used at the discretion of the instructor.