

MONTGOMERY COUNTY COMMUNITY COLLEGE  
 BIO 117 / CUL 117 Introduction to Food Science  
 4-3-3

**COURSE DESCRIPTION:**

Food Science integrates an interdisciplinary scientific approach to food and its components. Relationships between the chemical composition of food and sensory properties are delineated. In this course students evaluate the effects of processing, preparation, and storage on the quality, safety, and nutritive value of various food categories. Further, this course examines the application of technology to both improve and expand the food supply. Food science applies concepts from nutrition, health, biology, and chemistry to discern how the various ingredients in foods interact. Laboratory testing and food science techniques specific to the science of food are explored.

**REQUISITES:**

Previous Course Requirements

- ENG 011 Basic Writing II
- MAT 080 Fundamentals of Mathematics
- REA 011 Fundamentals of College Reading

*Previous or Concurrent Course Requirements*

None

LEARNING OUTCOMES Upon successful completion of this course, the student will be able to:	LEARNING ACTIVITIES	EVALUATION METHODS
Investigate the chemical & physical properties of foods using the scientific method.	Lecture Laboratory Experiments Demonstrations Group Discussion	Written assignments Written exam Laboratory reports and observations
Analyze the physical, chemical, and microbial forms of food preservation and deterioration, including various forms of food processing used for food preservation, their effect on food quality and nutritive value.	Lecture Laboratory Experiments Group Discussion	Laboratory reports Written exam Laboratory observations
Explain the interdisciplinary nature of food science by stating connections between chemical,	Written assignments Field Trip Lecture Laboratory Experiments	Written assignments Written Exam

biological, and physical reactions of foods, food systems, health, and global sustainability.		
Design and execute a unique food science experiment that demonstrates or utilizes concepts of food science while meeting food safety guidelines.	Laboratory Experiments Product research Readings Design planning stages	Observation Design and implementation report Report of outcomes

At the conclusion of each semester/session, assessment of the learning outcomes will be completed by course faculty using the listed evaluation method(s). Aggregated results will be submitted to the Director of Educational Effectiveness. The benchmark for each learning outcome is that *70% of students will meet or exceed outcome criteria.*

#### SEQUENCE OF TOPICS:

1. Evaluation of Food Quality
  - A. Aspects of food quality - flavor, taste, appearance
  - B. Sensory evaluation of food – testing procedures and sensory tests
  - C. Chemistry of water, role of water in food preservation and shelf life
2. Carbohydrates in Food
  - A. Properties, functions, and chemical actions of carbohydrate
  - B. Starches: gelatinization, syneresis, cooking, maintaining safety of starches
  - C. Pectin and Gums: gel formations, functions, uses in food systems
  - D. Grains: definition of cereal grains, nutritional value, common and uncommon cereal grains, effects of cooking.
3. Vegetables and Fruits (VF)
  - A. Structure and chemical composition of cell tissue and plant materials
  - B. Classifications of VF
  - C. VF pigments and effects of additional substances
  - D. Flavor compounds
  - E. Ripening, enzymatic oxidative browning, cooking effects, and principles
  - F. Grading VF, organically grown VF, safety of VF, nutritional value of VF
4. Proteins in Food
  - A. Amino acids and protein structures, nutritive value
  - B. Properties, reactions, effects of heating of proteins, denaturing protein structures
  - C. Meats/Poultry
  - D. Fish
  - E. Dry beans and nuts
  - F. Protein food safety, inspections, USDA
  - G. Eggs and egg products

- H. Milk and milk products
- I. Protein foods safety risks and safe practices
- 5. Fats and Lipids in Food
  - A. Structure, composition, and nutritive qualities of fats
  - B. Properties of fats, nutritive value
  - C. Modifications of fat: hydrogenation, esterification, winterization
  - D. Deterioration of fats, effects of high heating temperatures, rancidity
- 6. Food Foams and Emulsions
  - A. Foam structures, properties and uses in food systems
  - B. Emulsion structures, properties and uses in food systems
- 7. Sugars, Sweeteners and Confections
  - A. Sources, roles, types, and nutritive value of sugars
  - B. Properties of sucrose and confections
  - C. Sugar substitutes – uses in food systems
- 8. Baked Products
  - A. Batters and doughs
  - B. Leavening agents – function and sources
  - C. Mixing methods and effects of heat
  - D. Nutritive value, storage of baked items and safety issues
- 9. Food Preservation
  - A. Preserving foods – heat, refrigeration, freezing, dehydration, irradiation
  - B. Additives – definitions and functions, legislation and testing, nutrient and major additives
- 10. Food Packaging
  - A. Types, varieties, and materials used
  - B. Aseptic and thermal packaging
  - C. Packaging concern and packaging as a marketing tool
- 11. Food safety
  - A. Foodborne illness
  - B. Biologic, chemical and physical hazards to food
  - C. Food protection systems: FDA, HACCP, USDA, Pa. Dept. of Health,
  - D. Allergen-free labeling and control, cooling systems monitoring, sanitizing
- 12. Government regulations
  - A. Government regulation: FDA, GRAS, USDA, state and local governmental requirements and inspections, adulterated, and mislabeled foods
  - B. Standards for inter-state transport of food
  - C. Food labeling: general regulations, nutrient and health claims, ingredient lists

## SEQUENCE OF LABORATORY EXPERIMENTS

1. Weighing, measuring, kitchen safety
2. Starches and grains
3. Fruits/vegetables
4. Food protein
5. Foams and air

6. Fats: lipids and oils in foods
7. Sugars and sweeteners
8. Baked products
9. Food preservation techniques
10. Food packaging techniques
11. Food safety
12. Regulations governing food systems
13. Student presentations/experiments

#### LEARNING MATERIALS:

Campbell, T., Christian, E., Vaclavik, V. (2021) Essentials of Food Science, (5<sup>th</sup> ed.). New York, NY: Springer Publishers

#### Lab Manual:

Devin, M., Hayes, A., Vaclavik, V. (2018) Dimensions of Food, (8<sup>th</sup> ed.). Boca Raton, FL: CRC Press

Other learning materials may be required and made available directly to the student and/or via the College's Libraries and/or course management system.

#### COURSE APPROVAL:

Prepared by: Jennifer Fewster, Georgette Howell, Joseph Jacques,  
Claire Kratz

Date: 3/31/2023

VPAA or designee Compliance Verification:

Date: 4/1/2024



*This course is consistent with Montgomery County Community College's mission. It was developed, approved and will be delivered in full compliance with the policies and procedures established by the College*