TAFTCOLLEGE

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Date Reviewed: Fall 2022
C&GE Approved: October 14, 2022
Board Approved: November 9, 2022
Semester Effective:

Biology (BIOL) 1520 The Biology of Food and Cooking (4 Units) CSU

Advisory: Eligibility for English 1500 or 1501 strongly recommended

Total Hours: 48 hours lecture (96 hours outside of class); 48 hours lab (192hours total)

Catalog description: This course consists of both lecture and laboratory components that will introduce foundational biological concepts as applied to food and cooking methods. Concepts such as macromolecules, biochemistry, protein structure, flavor/texture, metabolism, and genetic differences in diet. In this course the students will use their own kitchens to perform laboratory exercises and experiments to learn the scientific method and practice critical thinking skills.

Type of Class/Course: Degree Credit

Text: Provost, Joseph J., et. al. The Science of Cooking: Understanding the Biology and Chemistry Behind Food and Cooking, Wiley, 2016.

Additional Required Materials: None.

Course Objectives:

At the conclusion of this course, the student should be able to:

1. **Recognize the macromolecules that comprise our food and how they determine a food's characteristics,**
2. **Develop an understanding of the chemical structures of food and how these are affected by various cooking processes,**
3. **Develop knowledge of the cellular structure of plants and animals as they relate to food sources,**
4. **Develop knowledge about the biology involved in gustation and olfaction,**
5. **Apply the scientific method to food and cooking, and**
6. **Apply the science of food and cooking to your daily lives.**

Course Scope and Content:

1. **The Science of Food and Cooking: Macromolecules**
    a. **Fundamentals of Food and Cooking**
    b. **Atomic Structure and Chemical Bonds**
    c. **Water**
    d. **Acids/Bases/pH**
    e. **Proteins/Carbohydrates/Fats**

2. **The Science of Taste and Smell**
    a. **Physiology of Taste, Smell, and Flavor**
    b. **Gustation**
    c. **Receptor Signaling**
    d. **Olfaction**
    e. **Texture, Temperature, and Pain**
3. **Milk and Ice Cream**
    a. **Biology and Chemistry of Milk**
    b. **Ice Cream**
4. **Metabolism of Food**
    a. **Basics of the Cell**
    b. **Glycolysis**
    c. **Aerobic Respiration**
    d. **Fermentation**
    e. **Fat and Protein Metabolism**
5. **Cheese and Yogurt**
    a. **Milk Curdling and Coagulation**
    b. **Lactobacteria and Fermentation**
    c. **Cheese Chemistry**
6. **Browning**
    a. **Chemical Reaction Kinetics**
    b. **Maillard Reaction**
    c. **Caramelization**
7. **Fruits and Vegetables**
    a. **Plant Parts and their Molecules**
    b. **Harvesting, Cooking, and Eating Plants**
8. **Meat and Fish**
    a. **How Muscles Work**
    b. **Connective Tissues**
    c. **Red vs White Meat**
    d. **Death and Becoming Meat**
    e. **Flavor**
    f. **Marinating, Brining, Smoking, and Curing**
9. **Eggs, Custards, and Foams**
    a. **Anatomy of an Egg**
    b. **Science of Cooking Eggs**
    c. **Custards and Foams**
10. **Bread, Cakes, and Pastry**
    a. **Wheat-based Flour**
    b. **Yeast-raised Bread**
    c. **Baking**
    d. **Muffins and Batter Breads**
    e. **Chemical Leavening Agents**
    f. **Cakes and Pastries**
11. **Seasonings: Salt, Spices, Herbs, and Hot Peppers**
    a. **Salt: Flavor Enhancer and a Driving Force of History!**
    b. **Herbs and Spices**
    c. **Medicinal Uses**
12. **Beer and Wine**
    a. **Yeast Fermentation**
    b. **Alcohol and the Body**

   c. **Beer!**
   d. **Oenology**
   e. **Aging and Reactions**
13. **Sweets: Chocolates and Candies**
   a. **Sugars and Sweeteners**
   b. **Chocolate**
   c. **Candies**

Course Scope and Content: Laboratory

1. **Basic Chemistry**
   a. **Measurement**
   b. **Chemicals in Food**
2. **Protein Denaturation**
   a. **Egg**
   b. **Milk**
   c. **Fish/Meat**
3. **Super Taster**
   a. **Taste Bud Count**
   b. **Tastants**
   c. **Can you taste that smell?**
   d. **Bringing da heat**
4. **Milk**
   a. **Lactose Tolerance**
   b. **Ice Cream**
5. **Fermentation**
   a. **Yeast**
   b. **Yogurt**
   c. **Sourdough**
6. **Cheese**
   a. **Mozzarella**
   b. **Ricotta**
7. **Browning/Maillard**
   a. **Potatoes/Apples**
   b. **Bruising**
   c. **Chicken**
   d. **Caramel**
8. **Fruits and Vegetables**
   a. **Ripening**
   b. **Blanching**
   c. **Spherification**
9. **Meat!**
   a. **Meat Temperature**
   b. **Marinades and Brining**
   c. **Searing**
10. **Eggs**
   a. **Green Eggs?**
   b. **Custards**
   c. **Foam**
   d. **Crème Brulee**
11. **Bread/Cake/Cookies**

   a. Deconstruction of Bread
   b. Cakes – Tall and Light vs Tender and Moist
   c. Make-it-your-best Cookies
12. Seasonings
   a. Flavor profiles
   b. Regional Spice Blends
13. Chocolate and Candies
   a. Types of Chocolate
   b. Chocolate tempering
   c. Rock Candy

Learning Activities Required Outside of Class:

The students in this class will spend a minimum of 6 hours per week outside of the regular class time doing the following:

1. Studying text, chapter handouts, and learning objectives,
2. Answering questions,
3. Completing required reading,
4. Problem solving activity or exercise,
5. Participation in on-line discussions,
6. Performing laboratory experiments, and
7. Completing written lecture and lab assignments.

Methods of Instruction:

1. Lectures,
2. Class discussions,
3. Multimedia presentations,
4. Hands-on biology laboratory techniques, and
5. Critical analysis of results.

Methods of Evaluation:

1. Examinations including
   a. Multiple choice questions
   b. True/false items
   c. Matching items
   d. Labeling items
   e. Identification of structures
2. Weekly chapter quizzes
3. Analysis and evaluation write-ups of laboratory exercises
4. Video/Photographic demonstration of techniques and results
5. Writing assignments

Supplemental Data:

TOP Code:	**040100: Biology, General**

SAM Priority Code:	**E: Non-Occupational**
Distance Education:	**Not Applicable**
Funding Agency:	**Y: Not Applicable(funds not used)**
Program Status:	**1: Program Applicable**
Noncredit Category:	**Y: Not Applicable, Credit Course**
Special Class Status:	**N: Course is not a special class**
Basic Skills Status:	**N: Course is not a basic skills course**
Prior to College Level:	**Y: Not applicable**
Cooperative Work Experience:	**N: Is not part of a cooperative work experience education program**
Eligible for Credit by Exam:	**E: Credit by Exam**
Eligible for Pass/No Pass:	**C: Pass/No Pass**
Taft College General Education:	**CSB2: CSU Area B2** **CSB3: CSU Area B3** **IG5B: IGETC Area 5B** **IG5C: IGETC Area 5C** **LNS: Local GE Natural Science**
Discipline	**Biological Sciences**