

## University and Course Title & Instructor Information

**Required Text:** Science of Cooking. Understanding the Biology and Chemistry Behind Food and Cooking.  
**ISBN:** 978-1-118-67420-8

**Overview:** The Science of Cooking: Understanding the Biology and Chemistry Behind Food and Cooking aims to serve science instructors and students through a topic that is approachable and relevant to everyone. Through the topic of food and cooking, fundamental principles of biology and chemistry can be taught to and learned by a broad population of undergraduate students. While this textbook is targeted for non-science majors, it can also serve as a resource for a topics course for majors in biology, biochemistry or chemistry programs.

**Course Learning Objectives:** The overall course learning objective for The Science of Cooking: Understanding the Biology and Chemistry Behind Food and Cooking is to enhance student understanding of fundamental scientific principles of biology and chemistry as well as the science of food and cooking. Students will learn and use methods of scientific discovery / inquiry, as well as disciplinary methods of chemistry, biology, and physics, to better understand the molecular basis of and importance of science in food, nutrition and cooking. Students will collect data from their laboratory problems to interpret and report their hypothesis and observations. As students do this, they will understand major scientific theories of biochemistry, chemistry and biology.

### Student learning objectives for the course are:

- To understand basic scientific principles and process in the context of learning biological and chemical content
- To develop knowledge and practice in how science is conducted
- To critically think about science related concepts and their applications
- To identify and use scientific theory and concepts to evaluate claims about the natural world.
- To effectively communicate about scientific concepts and problems with peers
- To critically evaluate the scientific literature and the current state of science

**Laboratory Learning Objectives:** The laboratory component of a course that utilizes The Science of Cooking: Understanding the Biology and Chemistry Behind Food and Cooking will support student learning using guided inquiry and a self-designed scientific approach. Students will gain a deeper knowledge of the biology and chemistry concepts by practicing and applying their understanding of scientific concepts toward experiments that center upon food and cooking.

The student learning objectives for the laboratory are:

- To generate scientific knowledge by examining solutions to a problem.
- To calculate and apply rules of conversion and other dimensional analyses
- To manipulate and analyze observable facts and numerical data to arrive at an evidence-based conclusion
- To use experimental results to explain basic scientific concepts and theories of biology and chemistry.
- To design and conduct an investigation based in the scientific method

**Grading:** The cut offs for grades are A-90%, B-80%, C-70%, D-60% and F-50%. These cut offs are tentative and depending on how the class performs, may be altered.

Grading:	X Exams	xxx pts (200 pts each)
	X POGIL Activities	xx pts (50 pts each)
	X Lab Reports	<u>xx pts (25 pts each)</u>
	Total	xxx pts

**Attendance Policy:** While attendance is not required, it is critical for learning Science of Cooking. There are a number of in-class activities and quizzes that cannot and will not be made up. We will be covering a great deal of material very quickly.

**Suggested Schedule (each block will take 3-5 one hour periods based on instructor and Guided Inquiry):**

Block 1	Chapter 1	The Science of Food and Cooking: Macromolecules Guided Inquiry 1,2,5, 8 and 10 (choose 2-3)
Block 2	Chapter 2	The Science of Flavor and Smell Guided Inquiry 13
Block 3	Chapter 3	Milk and Ice Cream Guided Inquiry 8, 9, 12, & 16 (choose 2-3)
Block 4	Chapter 4	Metabolism of Food Microorganisms and Beyond Guided Inquiry 14, 15
Block 5	Chapter 5	Cheese, Yogurt and Sour Cream Guided Inquiry 7, 6, 10
Block 6	Chapter 6	Browning Guided Inquiry 17
Block 7	Chapter 8	Meat and Fish Guided Inquiry 22 & 23
Block 8	Students Choice –	Chapter 9 Eggs, Custards, and Foams Guided Inquiry 25 & 26 Chapter 10 Bread, Cakes and Pastry Guided Inquiry 12,& 27
Block 9	Chapter 11	Seasonings: Salt, Spices, Herbs and Hot Peppers Guided Inquiries 19 & 20
Block 10	Chapter 12	Beer and Wine Guided Inquiry 29 & 30

**Laboratory:** note for instructors, most labs will require 3-4 hours to complete. Many, with planning can be done at home or in groups in a traditional lab. Institutional care will need to be addressed when working with food in a biology or chemistry laboratory. Some instructors have worked in a classroom to do many of these activities. Using induction heaters, ovens/stoves placed on a wheeled cart, and microwaves can take care of many of these elements.

Each laboratory is designed to include a two-part format. The first section of each lab includes a more traditional experimental experience. The second section of each laboratory directs students to make a hypothesis based on the exercise component and design their own experiment using the scientific theory. Depending on the instructor and institutional requirements you may want to use each exercise as a two-laboratory experience to allow students to explore and experiment.

Laboratory Exercise 1:	Chemical Composition of Foods.
Laboratory Exercise 2:	Evaluating the Relationship Between Taste and Smell
Laboratory Exercise 3:	Milk, Metabolism and Lactose Intolerance
Laboratory Exercise 4:	Enzymatic Browning in Fruits and Vegetables
Laboratory Exercise 5:	Why Food Brown: Understanding the Maillard Reaction
Laboratory Exercise 6:	Freezing Point Depression and Making Ice Cream
Laboratory Exercise 7:	Bread and Dough
Laboratory Exercise 8:	Cheese – Making Mozzarella
Laboratory Exercise 9:	Baking the Best Cookie (what ever kind you think is best)!
Laboratory Exercise 10:	Spherification: Experimenting with Food Gels, Polymers and Hydrocolloids

## A Guided Inquiry Focused Course Suggested Schedule

	<b><i>Lecture (in class instruction)</i></b>
Week	<b><i>Lecture Topics – all “lectures” are conducted in a “guided inquiry” classroom</i></b>
1	<ul style="list-style-type: none"> <li>• Activity 1: Elements, Compounds and Molecules</li> <li>• Activity 2: Bonding</li> </ul>
2	<ul style="list-style-type: none"> <li>• Activity 3: States of Matter</li> <li>• Activity 4: Water (complete with video)</li> </ul>
3	<ul style="list-style-type: none"> <li>• Activity 5: Amino Acids and Proteins</li> <li>• Activity 27: Gluten and Bread</li> </ul>
4	<ul style="list-style-type: none"> <li>• Activity 14: Cells and Metabolism and Activity 15 – Metabolism, Enzymes and Cofactors (Model 1 only)</li> <li>• Activity 15 – Metabolism (Models 2 and 3) and Activity 28 – Chemical Leavening (Model 1)</li> </ul>
5	<ul style="list-style-type: none"> <li>• Activity 9 – Fats: Structure and Properties</li> </ul>
6	<ul style="list-style-type: none"> <li>• Activity 10 – Fats: Intermolecular Forces and Activity 11 – Fats: Melting, Smoking and Rancidity</li> <li>• Activity 31 – Chocolate Tempering and Activity 12 – Emulsions</li> </ul>
7	<ul style="list-style-type: none"> <li>• Activity 8 – pH and Activity 16 – Milk (Model 2 only)</li> <li>• Activity 25 – Eggs</li> </ul>
8	<ul style="list-style-type: none"> <li>• Activity 6 – Higher Order Protein Structure</li> <li>• Activity 26 – Custards and Egg Foams</li> </ul>
9	<ul style="list-style-type: none"> <li>• Activity 18 – Starch</li> </ul>
10	<ul style="list-style-type: none"> <li>• Activity 19 – Plants</li> <li>• Activity 20 – Fiber and Cell Walls</li> </ul>
11	<ul style="list-style-type: none"> <li>• Activity 21: Plants and Color</li> <li>• Activity 32: Sugar</li> </ul>
12	<ul style="list-style-type: none"> <li>• Activity 17 – Browning</li> <li>• Activity 13 – Flavor</li> </ul>
13	<ul style="list-style-type: none"> <li>• Activity 29 – Alcohol and Beer</li> </ul>
14	<ul style="list-style-type: none"> <li>• Activity 22 – Meat: Structure and Properties</li> <li>• Activity 23: Cooking Meat</li> </ul>
15	<ul style="list-style-type: none"> <li>• Activity 24 – Fish</li> </ul>