

BAK 200 : KITCHEN CHEMISTRY: THE SCIENCE OF COOKING AND BAKING

Transcript title

Science of Cooking and Baking

Credits

4

Grading mode

Standard letter grades

Total contact hours

80

Other hours

80

Prerequisites

CUL 170 or BAK 170.

Course Description

Explores the physical and chemical principles that underpin baking and culinary techniques. Students will investigate the functions of key ingredients—such as flour, fats, sugars, leavening agents, eggs, dairy, and acids—and examine how variables like temperature, time, humidity, and mixing methods affect structure, texture, and flavor. Through hands-on application and critical analysis, students will compare mixing methods, evaluate gluten and egg functionality, identify types of leavening, and apply scientific reasoning to troubleshoot common baking issues. Designed for baking and culinary students seeking a deeper understanding of ingredient behavior, this course bridges kitchen practice with food science to improve consistency, creativity, and problem-solving in professional baking.

Course learning outcomes

1. Describe the functional roles of ingredients in both savory and sweet recipes.
2. Understand the impact of ingredient ratios, cooking methods, and mixing techniques on final products.
3. Apply concepts of heat transfer, protein denaturation, starch gelatinization, and emulsification to analyze food structure and texture.
4. Analyze, modify, and develop formulas or recipes based on scientific principles.
5. Troubleshoot failures and make adjustments to improve product quality in both culinary and baking applications.

Content outline

1. Describe and explain the physical and chemical functions of key baking ingredients, including flour, fats, sugars, leavening agents, eggs, dairy, and chocolate.
2. Demonstrate knowledge of ingredient behavior under various baking conditions, including the effects of temperature, time, humidity, and mixing methods on structure and texture.

3. Compare and evaluate mixing methods (e.g., creaming, muffin, biscuit, sponge, and egg foam methods) and determine their appropriate application to specific baked goods.
4. Analyze the role of gluten development in product structure and apply techniques to manipulate gluten formation for desired outcomes in both yeasted and quick breads.
5. Evaluate the function and structure-building properties of eggs, including emulsification, aeration, coagulation, and binding in baked goods.
6. Identify and explain the differences between mechanical, biological, and chemical leavening, and apply appropriate leavening strategies to various product types.
7. Understand mechanical vs. chemical stabilization of emulsions.
8. Understand the Maillard reaction and caramelization.

Required materials

Cascade Culinary Institute toolkit and required uniform.