Culinology I

Developed by Michael Silver, CRC, CCS, CEC, CEPC, CCE

Culinology® is the blending of culinary arts and the science of food. This area of study is vital for commercial food production as well as for restaurants and other hospitality services. Culinology I is a 40-hour, self-paced course for culinologists, food scientists, developers, food professionals, or anyone who wants to gain a better understanding of working with food, especially in a commercial production environment, whether a restaurant or a food manufacturing company.

It covers many areas, including food molecules, ingredients, formulations, shelf life, flavor balance and flavor enhancers, heat transfer, water activity, phase transitions, microbial activity management, chemical reactions, food processing and preservation, advanced processing and cooking technologies, food safety and packaging, and scaling production.

Culinology I was designed in collaboration with both the American Culinary Federation (ACF) and the Research Chefs Association (RCA), and it is part of a three-course series: Food Science, Culinology I (this course), and Culinology II.

Note: While the Food Science certification course is not a prerequisite for the Culinology course, it will give you a much stronger foundation in the fundamental food science that culinology is built upon. Together these courses provide you with a very deep foundation and understanding of the many key concepts you'll need if you want to make a career in product development, testing, food safety, and/or sensory science.

Course Structure

This course has ten in-depth modules covering the major content areas, and each module each divided into logical sections. There is also a final capstone module that allows you to synthesize your learning with three real-world challenges.

Each module begins with a pre-test and ends with a self-test and a reflection to help solidify key concepts. There is no minimum score for the pre-test, and your score is not counted. It is there for you to gauge your own knowledge coming in to the module.

The self-test and reflection exercises at the end are designed to be difficult and thought-provoking. These are there to help you synthesize your learning and apply it practical problems. If you take the time to go through all of these, you will end up with a much deeper understanding of real-world food science and culinology.

At the conclusion of each module there is a graded quiz. You must earn a minimum score of 70 percent on each quiz to continue to the next section.

At the end of the course there is a final exam, and you must earn 80 points out of 100 to complete the course and earn the **ACF Culinology I Certificate** (certificate and online badge) and 40 continuing education hours.

Important Info

There are two symbols used periodically in the text to highlight important areas:

- 🍎 An apple icon denotes really important information.
- 🌶️ The chili icon represents advanced information. This material is not required for the class, but you may find interesting and useful.

About the Course Developer

Michael Silver is a professional food scientist, chef, baker, and culinologist. He is a Certified Research Chef, Certified Executive Chef, Certified Executive Pastry Chef, Certified Culinary Scientist, Certified Culinary Educator, and a certified food safety instructor (ServSafe). He received his culinary training from the Culinary Institute of America and his baking and pastry training from Seattle Culinary Academy. He sits on the Board of Directors of the Washington State Chefs Association and serves the Board of Directors of the Research Chefs Association on the higher education committee and the certification commission.

A published author, Michael started his career as a technology manager and architect at Apple Computer, later founding his own technology company which has done major projects for Google (including building the YouTube studio), LucasFilm/Skywalker Sound, Hewlett-Packard, EA, Tesla, and many other companies. He has consulted to and built technology for the founders and CEOs of many of the top companies in the world along with many famous directors, actors, musicians, and athletes.

He is also a former EMT who did volunteer work in emergency medicine and dive medicine and taught for the Red Cross for many years.

Michael consulted for NASA for four years, including working on the space program and writing the code to send the first email from space. He also supported the astronauts during this mission from the Flight Control Room. For his work with NASA on this and other projects, Michael was made an honorary Air Force Captain.

He studied molecular biology, genetics, and organic chemistry and did molecular biology research at Stanford University for two years.

Michael teaches food science, cooking, baking, chocolate-making (bean-to-bar), coffee, and other subjects at several colleges, primarily in Seattle. He co-founded an active chocolate manufacturing company, and he co-owns and co-operates a café/bakery that makes its own bean-to-bar chocolate in-house.

He spends much of his time in the development of Chefs Village, a 501(c)(3) non-profit that teaches food science, cooking, baking, nutrition, sustainability, and related areas. All of his proceeds for this course are donated to his non-profit organization to help advance the quality of food science at colleges and universities and in culinary programs across the country.

Glossary and Resources

Appendix A: Words that are Big (glossary)

Technical terms in the text are highlighted in light blue. These are typically defined in the text and can also be found in the extensive glossary included in this introductory section (Section 0.2).

Appendix B: Things that are Small (microbes and such)

In Appendix B (Section 0.3) you'll find common bacteria, fungi, viruses, and other small but important things.

Appendix C: Things that Burn (glossary related to how things break down from heat)

In Appendix C (Section 0.4) you'll learn to distinguish between words like pyrolysis, thermolysis, and combustion.

Additional interviews and resources can also be found at chefsvillage.org.

Course Objectives

By the end of this course, you will understand:

- The foundations and importance of Culinology
- Kitchen math and quantitative problem-solving in food systems
- The product lifecycle from concept to commercialization
- Food molecules
- Acids and bases
- Emulsions and foams
- Browning reactions
- Fermentation
- Water activity and the role of humectants and water binders
- Sweeteners, sugar alternatives, and taste-modifying ingredients
- The science of key ingredients (meat, poultry, seafood, plants, eggs, and dairy)
- Ingredients as functional tools (thickeners, gelling agents, emulsifiers, stabilizers, and leavening systems)
- Leavening agents and gas-generation systems in foods
- Food formulation
- Shelf life and preservation
- Fundamentals of food microbiology and its role in safety, spoilage, and fermentation
- Flavor
- The physics of heat transfer and mass transfer
- Sensory and perception science

Accuracy and Errors

I have done my best to balance accuracy and clarity in this course. In a few areas I leave out advanced or controversial details that beyond what most food scientists and culinologists will need to understand (such as advanced chemistry and physics).

It is also possible that, while this course has been carefully edited, there are technical errors and/or typos. In addition, our understanding of science changes over time. If you find any mistakes or areas that are unclear, please email errors@chefsvillage.org.

Copyright