

SPU 27x

Science and Cooking: From Haute Cuisine to Soft Matter Science

This course will discuss concepts from the physical sciences that underpin both everyday cooking and haute cuisine. Each week we will visit a world-famous chef, who will show us the secrets of some of their remarkable creations. We will use these as inspiration to delve into the basic fundamental science behind food and cooking. The chefs include Joan Roca (*El Cellar de Can Roca*), Bill Yosses (White House Pastry Chef), Enric Rovira (Master Chocolatier), Carme Ruscalleda (*Sant Pau*), José Andrés (*ThinkFoodGroup, Minibar, Jaleo*), Wylie Dufresne (*wd-50*), Joanne Chang (*Flour Bakery, Myers and Chang*), David Chang (*Momofuku*), Carles Tejedor (*Restaurante Via Veneto*), Dan Barber (*Blue Hill*) and Ferran Adrià (*El Bulli*). There will also be demos and lectures by other leaders in the field, including America's Test Kitchen, authors Harold McGee (*On Food and Cooking, Keys to Good Cooking*) and Nathan Myhrvold (*Modernist Cuisine*), and food scientist Dave Arnold (*Cooking Issues*).

At the end of the course, students will be able to explain how a range of cooking techniques and recipes work, in terms of the physical and chemical transformations of food.

Instructors

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Prerequisites

Knowledge of high school physics and chemistry will be useful, but not required. We want everyone to be able to start and successfully complete this course without prior knowledge. Background material will be supplied in the form of review videos and practice problems—though the course will be more challenging without a high school level knowledge of chemistry.

Course Overview

The course is divided into weeks—each of which focuses on a single scientific topic related to cooking, and each of which involves a visit to the restaurant of a great chef. Every week includes interactive video sequences, as well as a problem set, and a lab. To complete the course you have to complete the problem sets and labs by the due dates. In addition, you will have to carry out a final project in which you conduct your own scientific study of some recipe or aspect of cooking. You will do both the labs and final project in your own kitchen. After carrying out the required experiments on a dish, you can eat the results of your lab and share them with your friends and family. This class has no exams.

Interactive Lectures

Each week we present two lectures as an interactive video sequence, interspersed with online exercises to help you test your learning as you watch the videos. Participation in these online exercises does not contribute to your grade.

Textbook

The textbook for this course is:

On Food and Cooking, Harold McGee, Scribner, 2004 (2nd edition)

Each week, **recommended, but not required**, readings will be drawn from this book—which will significantly enhance your understanding of this subject and serve as a truly invaluable resource and reference, both for this class and beyond. Harold McGee will join us throughout the class and give his insight into the subjects that we are studying.

Another book that we will often refer to is:

The Science of Good Cooking, The Editors of America's Test Kitchen and Guy Crosby, 2012

Homework

This class has 10 homeworks that will be posted every Tuesday over the course of 10 weeks. We encourage you to work through one homework every week since this is the pace at which new lectures are being released. However, the first due date does not occur until six weeks into the semester, ie Tuesday Nov 19th, to give everyone a chance to submit their work for credit despite busy schedules or having enrolled in the class late. Starting Nov 19th, the homeworks are then due on Tuesdays every week. You can drop your lowest homework when calculating your final grade.

Labs

We will post a new lab exercise every Tuesday for the first 8 weeks of the semester, allowing you to experiment with the scientific concept of the week in your own kitchen. As part of the lab you will make measurements and observations, and you will then be asked to submit these for credit. We will often also ask you to take a picture of your lab, submit it for credit and share it with your peers. Similarly to the homeworks, the labs will not start being due

until Nov 19th, six weeks into the semester. Since the labs are illustrating concepts discussed in the lecture materials of each week though, we encourage you to work through them in conjunction with watching the lectures. For more information about the labs please see the right panel on the Course Updates page.

Final Projects

The last two weeks of the course will have no labs, but will instead be devoted to final projects. You will carry out your own scientific study of some recipe or aspect of cooking in your own kitchen. You will have until the very end of the course, March 15th, to complete your final project. Guidelines and further information about the final projects will become available on the Course Updates page a few weeks into the course.

Discussion Forum

We encourage students to actively participate in the discussion forum offered on the SPU27x website. You should use the discussion forum to ask questions about concepts from lectures, lecture exercises and labs—but should not directly discuss answers to homeworks. The course staff moderates the forum but we encourage students to answer each other's questions and upvote helpful answers. For some useful tips on how to navigate the discussion forum, please see the Forum Guidelines on the Course Updates page.

Grading

A passing grade in this class corresponds to successful **completion of 60%** of the material. The grade break down is as follows:

<i>Homework (10 total, drop lowest score)</i>	35%
<i>Lab (10 total, drop lowest score)</i>	35%
<i>Final project</i>	30%

Certification

Online learners who demonstrate mastery of SPU27x course materials with a passing grade may earn a certificate of completion. EdX will issue the certificate under the name of HarvardX for free. The certificates will not include a final grade.

Other books and resources

The following books cover various aspects of the science contained in the course:

The Science of Good Cooking, America's Test Kitchen

The Science of Cooking, Peter Barham

The Science of Chocolate, Stephen T. Beckett

The Science of Ice Cream, C. Clarke

Cookwise, Shirley Corriher

Keys to Good Cooking, Harold McGee

The Curious Cook, Harold McGee

Modernist Cuisine, Nathan Myhrvold, Chris Young, and Maxime Billet

Ratio, Michael Ruhlman

Several of the guest lecturers have written cookbooks, which may be of interest:

A Day at El Bulli, Ferran Adrià

Sous vide Cuisine, Joan Roca

Made in Spain, José Andrés

A Perfect Finish, Bill Yosses

CR20: 20 Years of Sant Pau, Carme Ruscalleda

Flour: Spectacular Recipes from Boston's Flour Bakery + Café, Joanne Chang

Momofuku, David Chang

For a more advanced discussion of the scientific topics in the course:

Physical Chemistry of Foods, Pieter Walstra