GSCI-FSST 325: The Science of Italian Food

Course Syllabus

Instructor: FSE instructor
Credits: 3
Contact Hours: 45
Prerequisites: None
Class Hours: Tuesdays and Thursdays, 12:30 p.m.-14:00 p.m.
Office Hours: Online via Zoom, Wednesdays 9:30-10:30
Course Type: Standard Course
Email:
Lab Fee: $80

Course Description

Students will learn and test basic scientific concepts through the broad lens of food. Scientific concepts will be derived from various scientific fields such as biology, microbiology, and chemistry. Students will examine various processes for preparing and storing food, such as fermentation and preserving, in historical contexts. The course has both a classroom and a lab component. Students will alternate between learning scientific processes in a classroom setting and by applying the scientific method by doing experiments in the didactic kitchen. Improving the sustainability of food production and food systems will be discussed throughout the course. In this course, students will engage with peer-reviewed literature and will analyze and disseminate the results of scientific studies. The overall goal is to learn about the interconnectivity of science, culture and the environment through the exploration of basic food processes. No prior scientific knowledge is necessary for this course.

Learning Outcomes and Assessment Measures

By the end of the course, students will be able to:

Learning Outcomes	**Assessment Measures** *Course requirements that will be used to assess students' achievement for each learning outcome*
Define basic chemical, biochemical, and microbiological transformations important for food production	The effects of basic chemical and biochemical principles will be explored in food lab such as: fruit preserves, brewing, and bread making.
Apply knowledge of food processes to food science experiments.	Students will engage with the scientific literature and apply learnings to experimentations in the lab/kitchen.
Examine the overlap of chemistry and sustainability in food systems vis-á-vis ingredient substitutions.	Students will compare learn about and experiment with vegan and foraged substitutes in the certain food labs.

Articulate the historical and cultural contexts for food processes in Italy.	Through comparative learning, students will examine the culture of food in Italy as it relates to other food cultures.
Engage in experiential learning activities and practice systematic research and ethical scholarship.	

Course Materials

Readings

All assigned readings are in the course reader. This includes articles from various peer-reviewed journals as well as selections from *On Food and Cooking: The Science and Lore of the Kitchen* (Harold McGee), *Food Science, An Ecological Approach* (Sari Edelstein), and *The Oxford Companion to Italian Food* (Gillian Riley).

Other

Students are required to maintain a lab notebook during the semester.

Assessment

Participation	20%
Food Labs	30%
Food lab notebook	20%
Mid-term Exam	10%
Peer Teaching and final report	20%

Grading

Letter grades for student work are based on the following percentage scale:

Letter Grade Range	Numerical Score Equivalent	Student Performance
A	93% - 100%	Exceptional
A-	90% - 92%	Excellent
B+	87% -89%	
B	83% - 86%	Superior
B-	80% - 82%	
C+	77% - 79%	
C	73% - 76%	Satisfactory
C-	70% - 72%	
D+	67% - 69%	
D	63% - 66%	Low Pass
D-	60% - 62%	
F	59% or less	Fail (no credit)

Course Requirements

Grades are based on a combination of participation, in-class assessments, service learning, and exams.

Participation (20%)

Class participation grades are based on oral contributions to the collective learning experience of the class. Participation means active engagement in the course: being consistently prepared for class by having carefully read the assigned readings, asking questions, responding to questions both in class

and through assignments on the course Moodle, listening attentively to others, and offering your own insights and opinions through think-pair-share activities. Students will also be required to attend at least one two in-person office hours during the semester (each one will be worth 2.5% of the course grade). Weekly online quizzes will be assigned on the course Moodle focused on both lecture materials and the weekly assigned readings.

Food Labs (30%)
Food labs account for a large percentage of the total grade. During some labs, students will be responsible for maintaining the health of their cultures and reporting their observations. For the lab activities that include an experimental aspect (Week 2, Week 4 and Week 8) students will be asked to give a brief presentation on their hypotheses, predictions and observations, following the scientific method. Such assessments serve to reiterate the objectives of the course and are important for the overall development of the students.

Food lab notebook (20%)
Students will be required to keep a food lab notebook during the semester. Students must keep accurate notes during the food labs. In addition, students must record progress of their food cultures and variables impacting these cultures. A rubric will be provided during the first class.

Mid-Term Exam (10%)
In lieu of a mid-term exam, you will be evaluated based on two assignments:
1) You will present on and be graded on the health and record keeping of your cultures (Kombucha and pasta madre) during the lab section of Week 5;
2) You will turn in a detailed outline of the topic you will focus on for the final exam/peer teaching project.

Peer Teaching and final report (20%)
In lieu of a final exam, students will choose from a list of suggested foods or ingredient that are relevant to Italian culture (or an individually chosen food or ingredient following a conversation with the instructor) and submit both a written report and 10-minute presentation to the class on the history, ecology, and chemical processes that are involved in the preparation of their chosen food. Presentations will happen during the Tuesday and Thursday class sessions during Week 10. This is the only time presentations will be allowed. A list of possible topics will be listed on the course Moodle.

Additional Course Information
This course involves weekly labs which account for a large percentage of the overall grade. Make up labs will **not** be offered.

Attendance Policy
Absences for Covid-related circumstances: in order to keep the entire Umbra community healthy and to comply with local laws, you may not enter the Umbra premises if you have a temperature of 37.5 °C (99.5 °F) or higher. For all students who display any relevant symptoms, the procedure will be the following:

1. avoid going to class;
2. immediately notify the Student Services staff;
3. be prepared to get tested for COVID at a local pharmacy within the day.

The following additional conditions apply:

- Students may attend classes remotely and without academic penalty via Zoom or Skype *but only* if they are waiting for the test to be scheduled or performed.
- Students with a positive test result (or who have been in close contact with someone who tested positive) must follow all applicable quarantine or isolation requirements and may attend classes remotely, *without academic penalty*.
- Students with a negative test result are allowed to attend class in person.

It is Institute policy that students with symptoms be tested. Any student refusing testing will not be admitted to the Institute under any circumstances and any absences will not be considered eligible for an extra absence for any classes missed. In other words, refusing a test and staying in one's apartment is considered an unexcused absence.

Class attendance (in person or through live connection) is mandatory. Students are allowed two "free" absences, which do not need to be justified. However, it is considered common courtesy to inform the instructor of your absence when possible. It is the students' responsibility to keep them in case of real necessity (sickness or any other unforeseen inconvenience that may prevent students from being in class).

Additional absences relating to illness may be approved by the Academic Director but only if a medical certification is provided.

Each additional absence, unless for a very serious reason, will lower the students' grade by one grade level (i.e., a final grade of a B+ would be lowered to a B). If students miss class, they are responsible for obtaining class notes from other students and/or for meeting the professor during office hours. It is also the policy of the Institute that any student who has eight or more absences automatically fails the class.

Except in the case of medical emergencies, absences are not accepted when tests are scheduled; tests cannot be made up. Furthermore, scheduled times and dates indicated for exams, quizzes, oral presentations, and any other graded assignments cannot be changed for any reason. Even if more sections of the same class are activated, students may only take exams during the scheduled times and dates for the section they are enrolled in.

Academic Integrity

All forms of *cheating* (i.e., copying during exam either from a fellow student or making unauthorized use of notes) and *plagiarism* (i.e., presenting the ideas or words of another person for academic evaluation without acknowledging the source) will be handled according to the Institute Academic Policy, which can be found in the Umbra Institute Academic Policies and Conduct Guidelines.

Classroom Policy

Students are expected to follow the policy of the Institute and demonstrate the appropriate **respect** for the historical premises that the school occupies. Please note that **cell phones** must be turned off before the beginning of each class. **Computers and other electronic devices** cannot be used during class lectures and discussions.

Schedule of Topics, Readings, and Assignments

Week 1

Tuesday	*Course Introduction*

	Readings (in class) Edelstein, S. (2013). *Food Science: An Ecological Approach.* 2nd edition, pp. 4-17 [Food Science Background: Food Systems in Relation to Climate Change].
Thursday	*Lab introduction: Equipment, Cultures and the Garden* *Food lab: Lievito madre* Students will prepare their individual lievito madre and receive instructions for its long-term care and use. We will use a portion of this lievito madre to prepare dough in Week 2. **Optional activity:** If you are traveling this semester, consider creating a lievito madre in another city and following that as you would the lievito madre made together in class, making observations of smell, taste and differences in activity, if any. Readings McGee, H. (2004). *On Food and Cooking: The Science and Lore of the Kitchen*, pp. 531-534. Arora K, Ameur H, Polo A, Di Cagno R, Rizzello CG, Gobbetti M. (2021) Thirty years of knowledge on sourdough fermentation: A systematic review. *Trends in Food Science and Technology* **108**: 71-83 Reese AT, Madden AA, Joossens M, Lacaze G, Dunn RR. (2020) Influences of ingredients and bakers on the bacteria and fungi in sourdough starters and bread. *American Society for Microbiology* **5**: e00950-19

Week 2

Tuesday	*Gluten and leavening: Factors controlling the structure and texture of bread; gluten, flours, leavening agents* *Activity: Practical evaluation of the different characteristics of bread* Readings Borghi, B., Corbellini, M., Minoia, C., Palumbo, M., Di Fonzo, N., & Perenzin. M. (1997) Effects of Mediterranean Climate on Wheat Bread-Making Quality. *European Journal of Agronomy* **6** (3): 145–54. McGee, H. (2004). *On Food and Cooking*, pp.536-539, 778 [gluten, bread rising, Maillard reactions]. Riley, Gillian. *The Oxford Companion to Italian Food.* Oxford: Oxford University Press, 2007, pp. 65-69 [bread]. Edelstein, S. (2013). *Food Science: An Ecological Approach.* 2nd edition, pp. 373-374 [Going Green with Grains].
Thursday	*Food Lab: Introduction to Bread making* Techniques – yeast breads versus quick breads, kneading Alternative flours – the importance of gluten Leavening agents – natural yeasts, fresh yeast, dried yeast, baking soda/baking powder *Lab activity:* Students will prepare 2 different types of bread dough - one using a portion of their lievito madre prepared in Week 1, and one variation, and making observations in their lab notebooks on the relevant characters. Several different flours and yeast types will be available to choose from.

Week 3

Tuesday	*Primary Fermentation and foraging culture in Italy* Readings Jayabalan R, Marimuthu S, Swaminathan K. (2007) Changes in Content of Organic Acids and Tea Polyphenols during Kombucha Tea Fermentation. *Food Chemistry* **102** (1): 392–398. Marsh AJ, O'Sullivan O, Hill C, Ross RP, Cotter PD. (2014) Sequence-based analysis of the bacterial and fungal compositions of multiple kombucha (tea fungus) samples. *Food Microbiology* **38**: 171-178.
Thursday	*Food lab: Making Fermented Italian Herbal Tea* Students will choose from a variety of plant based ingredients to create a tea mix. A steeped herbal tea will be used to brew kombucha to begin the primary fermentation.

Week 4

Tuesday	*Energy and Temperature* The physical and chemical aspects of food preparation will be introduced, with specific reference to gelato. The instructor will lead a discussion on the culture of gelato in Italy and with students compare and contrast that with ice cream in the US. Readings Thompson K, Delores R, Chambers H, Chambers E. (2009) Sensory Characteristics of Ice Cream Produced in the U.S.A. and Italy. *Journal of Sensory Studies* **24**: (3) 396–414. Riley, G. (2007). *The Oxford Companion to Italian Food*, pp. 255-260 [ice cream]. McGee, (2004). *On Food and Cooking*, pp. 39-44 [ice cream; atoms, energy, chemical bonds].
Thursday	*Food lab: Gelato* We will explore the factors that affect the texture of gelato – fat content and stabilizers making gelato following three different recipes.

Week 5

Tuesday	*Ethyl Alcoholic Fermentation; hops and preservation* We will discuss the chemical principles behind ethyl alcohol fermentation, with specific reference to the preparation of beer, and the antibacterial and distinct flavor properties of hops. The role of beer in Italian culture will also be briefly explored in juxtaposition with wine production and consumption. Readings De Keukeleire, D. (2000). Fundamentals of Beer and Hop Chemistry. ***Química Nova***, 23, (1), 108–12. McGee, H. (2004). *On Food and Cooking*, pp. 739-753 [beer]

	Riley, G. (2007). *The Oxford Companion to Italian Food*, pp. 262-263 [wild hops] ***Optional reading*** Bocquet L, Sahpaz S, Hilbert JL, Rambaud C, Rivière C. (2018) *Humulus Lupulus* L., a very popular beer ingredient and medicinal plant: Overview of its phytochemistry, its bioactivity, and its biotechnology. *Phytochemistry Reviews* **17** (5): 1047–90.
Thursday	*Food Lab: Beer Primary Ferment* *Lab activity:* Working in groups, students will prepare the primary fermentation of individual beer samples. There will be ample time to discuss the properties of the principal ingredients and to perform the initial measurements of specific gravity and pH that will be used at the end to fully understand the fermentation process. *Midterm presentations of cultures and lab notebooks - Lievito madre and Kombucha SCOBY show -and-tell!*

Week 6

Tuesday	*Food Preservation Part 1: Salt, Acidity and pectins* We will look at the chemical processes behind the preparation of three common foods in Italian culture that epitomize the long-term preservation of seasonal food resources: prosciutto (salt), pomodori pelati (acidity) and marmellata (pectins) The 15-20 minutes of this lecture will be dedicated to the primary fermentation of the kombucha. <u>Readings</u> McGee, H. (2004). *On Food & Cooking*, pp. 296-98 Edelstein, S. (2013). *Food Science*, pp. 336-338 [Going Green with Fruits & Vegetables]. Riley, G. (2007). *The Oxford Companion to Italian Food*, pp. 263 [jam and jelly]).
Thursday	*Food Lab: Jams & Preserves (seasonal fruit)* We will explore different sources of the thickening agent pectin on the texture and preparation of jam.

SEMESTER BREAK (MARCH 18-27)

Week 7

Tuesday	*Food Preservation Part 2: Drying and milling* Throughout Italian history, up until the Second World War, working class families relied heavily on alternative carbohydrate sources, sometimes with detrimental effects to their health. The lecture will focus on the processing and nutritional properties of chestnut and corn (polenta), two foods that were important to the culture of Tuscany and Northern Italy, respectively. <u>Readings</u>

	Conedera M, Krebs P. (2008) History, Present Situation and Perspective of Chestnut Cultivation in Europe. *Acta Hortic*, **784**: 23–28. Ginnaio M. (2011) Pellagra in late nineteenth century Italy: Effects of a deficiency disease. P*opulation*-E **66** (3-4): 583-610
Thursday	*Food Lab: Secondary Ferment of Kombucha and beer*

Week 8

Tuesday	*Fermentation of lactose: cheese production cheese production and the factors that affect it; regional differences in a historical context* We will explore the chemical process that governs the production of cheese and the various factors that can affect the texture and flavor. We will also discuss on the enormous variety of cheeses that exist in Italy and the regional differences in a historical context. <u>Readings</u> Giobetti M, Neviani E, Fox P. (2018a) The history and culture of Italian Cheeses in the Middle Ages. In: The Cheeses of Italy: Science and Technology; pp 13-37 Giobetti M, Neviani E, Fox P. (2018b) Classification of Cheese. In: The Cheeses of Italy: Science and Technology; pp 55-60 Lovarelli D, Bava L, Zucali M, D'Imporzano G, Adani F, Tamburini A, Sandrucci A. (2019) Improvements to dairy farms for environmental sustainability in Grana Padano and Parmigiano Reggiano production systems. *Italian Journal of Animal Science* **18**: 1035-1048
Thursday	*Food Lab: Milk fats, rennet and citric acid* Mozzarella! <u>Readings</u> Sales DC, Urbano SA, Lima Júnior DM, Galvão Júnior JGB, Brito AF, Cipolat-Gotet C, Borba LHF, Rangel AHN. (2020) Factors affecting buffalo Mozzarella cheese yield: a study using regression analysis. *Food Science and Technology* pp 1-4

Week 9

Tuesday	*Coffee culture in Italy* Italy is known for its coffee breaks and the quick espresso while standing at the bar. However coffee is not grown in Italy. This lecture will look at the complex cultivation and sourcing of coffee, and the roasting process. We will also address the current push towards ethical sourcing, the term 'fair trade', and environmental concerns related to coffee cultivation. <u>Readings</u> Cosmina M, Gallenti G, Marangon F, Troiano S. (2016) Consumers' preferences for ethical attributes of coffee: a choice experiment in the Italian market. *Rivista di Economia Agraria* n. 1 (Supplemento)

	Becchetti L, Constantino M (2010) Fair Trade in Italy: Too Much 'Movement' in the Shop? *Journal of Business Ethics* **92:** 181-203
Thursday	*Food Lab: Coffee cupping - panel test* Sensorial lab on the different processing steps; Cupping: scent/flavor profiles; panel test trial <u>Reading:</u> Lingle TR, Menon SN (2017) Chapter 8: Cupping and Grading—Discovering Character and Quality. In: *The Craft and Science of Coffee* pp. 181-203

Week 10

Tuesday	*Peer teaching – Food reports*
Thursday	*Peer teaching – Food reports*

FINAL EXAMS (April 25-28)

April 28	**Final exam assignment:** A written report on the history, ecology, and chemical processes that are involved in the preparation of their chosen food. This final assignment needs to be submitted online by April 28 by midnight.