Food Science 301
Introduction to the Science and Technology of Food
Fall 2016

Food Science 301 presents an introduction to the **chemical, physical and microbiological nature of food** and how these factors are manipulated to produce food that is safe and of high quality. A brief **overview of food processing operations** will also be discussed.

Meeting Times and Locations:

Lecture	Tuesday Thursday	12:05 – 12:55 pm	184 Russell Labs
Laboratory	Friday	7:45 – 9:45 am 11:00 – 1:00 pm 1:30 – 3:30 pm	Locations will vary each week (Check the lab manual)

Instructors

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Prerequisites:

Declared major in **Food Science, Nutritional Sciences (Dietetics, International Agriculture and Natural Resources)**, **or Biological Systems Engineering**, AND

- Math through algebra
- 1 semester of general chemistry (Chem 104 or 109)
- 1 semester of college biology (Zoology 101/102, Botany 130, or Bot/Zoo 151)

OR

- Concurrent registration in the courses listed

OR

- Consent of the instructor.

Expected Background:

Because Food Science 301 is a course that bridges basic concepts in science and math and a study of Food Science, students are expected to have a strong background in college-level **chemistry** and **biology**, and **math through algebra**. **Technical writing, quantitative reasoning**, and **critical thinking skills** are also expected.

Course Materials:

Readings will be drawn from various sources, including textbooks and periodicals. Optional textbooks for the course are at Steenbock Library and include:

- *Food Science,* 1995 by Norman N. Potter and Joseph H. Hotchkiss
- *Understanding Food Science and Technology*, 2003 by Peter S. Murano
- *Foods. Experimental Perspectives*, 2008 by Margaret McWilliams
- *Foods. A Scientific Approach*, 1998 by Helen Charley and Connie Weaver

Required readings will be available through the Library's e-Reserves (as .pdf files), which you can access either through Learn@UW or through the Academics tab on MyUW.

For the laboratory component of this course, you will need to purchase the Food Science 301 Lab Manual and a pair of laboratory safety goggles. Standard glasses are not sufficient. The Lab Manual is available through the University Bookstore (711 State Street). Safety goggles are available online and from local bookstores.

Objectives:

Food Science 301 will serve as a bridge between introductory courses in the physical and biological sciences (mathematics, biology, organic and inorganic chemistry, basic biochemistry, and microbiology) and upper-level courses in food science/dietetics.

Food Science 301 will provide students with introductory knowledge of:

- The **components of food** (protein, fat, carbohydrates, water)
- **Functionality of food components** as ingredients in foods
- **Food microbiology** (including food safety)
- **Food processing operations**

Specifically, students will demonstrate their ability to understand various research methodologies used in food science (including the scientific method); to understand basic concepts of food technology; to understand environmental issues related to food and to apply microbiological and chemical considerations to process controls.

Through lab exercises, students will gain hands-on experience with standard techniques in food analysis, basic problem-solving in food system applications, and applied sensory evaluation of food products. Students also will demonstrate their ability to apply food science knowledge to the functions of ingredients in foods and to interpret basic statistical information.

Learning Outcomes

Students will be able to:

- Apply core knowledge in chemistry, physics, mathematics and biology to the understanding of food systems including quantitative problem-solving skills
- Be familiar with the chemical composition of the main components in foods and how composition influences functionality and material properties
- Understand relationships of mass-balance in food processing and be able to do simple mass-balance calculations
- Understand the basic principles of microbiology as applied to food and food processing
- Be familiar with key technical information/terminology related to food science
- Understand that a relationship exists between food and health/wellness
- Understand the way in which food handling and processing operations impact food composition (macronutrients and micronutrients)
- Be aware that regulations and market forces govern our food supply
- Be aware of emerging trends in food production, processing, and handling (i.e. biotechnology, organic, allergens)

Assessment:

The grades in the course will be based on 11 mini lab reports (10%), 2 homework assignments (5%), 2 extended lab reports (15%), 2 midterm exams (40%), and an integrated final exam (30%).

Grading Scale

Based on the percentage of points earned during the semester, letter grades will be assigned. Use the following scale as a guide. The final letter grade will not be based on a stricter scale than what is listed in the syllabus.

Percent	Grade Assigned
90-100%	A
85-89.9%	AB
80-84.9%	B
75-79.9%	BC
70-74.9%	C
60-69.9%	D
<60%	F

Exams

Midterm exams have been scheduled for **October 10 and November 21 at 5:30 PM.** Format of all exams will be short answer and short essay, and may include matching or fill-in-the-blank questions as well. Exams will integrate content from both lecture and laboratory. The **Final exam** is scheduled for **December 23 at 5:05 PM**. Individual exams will be subjected to a complete regrade if students are unsatisfied with their score.

A goal of this course is to present an integrated view of food science. Later material in the course will build on the foundation established in the early part of the semester. Therefore, while the midterms and final exam are not specifically "cumulative", material on the 2nd midterm and Final exam will be comprehensive and will integrate concepts learned over the semester.

Lab Reports

Lab reports will be due AT THE START of lab in the week following the lab exercise. Lab reports will follow the format specified in the lab manual. Lab reports will not be accepted electronically. Unless specified, **all lab reports must be typed**. **Lab reports turned in after the start of lab** (when the instructor begins the pre-lab discussion) **will be penalized 10%, and 10% will be subtracted every additional day thereafter. LAB REPORTS TURNED IN ONE WEEK (OR MORE) LATE WILL NOT BE GRADED.**

A portion of the grade for each lab report will be based on grammar, spelling, and sentence structure. When you submit a piece of your work, it should be a good reflection of yourself. Work that is sloppy and carelessly done reflects poorly on your true abilities. Take the time to read over your lab report before you print it out and submit it. Use the spell-check feature on your word processing program. Your writing should be logical and clear. If it is difficult for your reader to follow your thoughts they may not take the time to actually hear what you have to say. This is important to remember for this course, but is also part of your professional development.

Homework

Homework may be assigned during lectures. The assignment instructions and the due date for the assignment will be given only during lecture. Homework must be submitted at the start of lecture on the due date. Homework that is submitted after the start of lecture (when the bell rings) will receive a late penalty. Unless specified, all homework must be typed.

Laboratory Exercises

Lab exercises have been developed to complement the lecture material. Specific details for the laboratory exercises, including location of labs, lab policies, format of lab reports, and lab handouts are found in the Food Science 301 Lab Manual.

Learn@UW

There is a Learn@UW site associated with this course. All students registered for Food Science 301 have been enrolled as users on the site. You can access this site from your MyUW page or through https://learnuw.wisc.edu/ (For technical problems logging into the site, please contact DoIT at 264-HELP.)

Various features of the Learn@UW site will be used in this course. It is strongly recommended that you regularly log into the site to check for new information.

- The **News** section of the Learn@UW site will be used to post relevant information (changes to the schedule, announcements, notes about assignments, time/place of exams, etc.). Current events related to the course may also be posted on this page.
- The **Calendar** or **Schedule** feature in Learn@UW will reflect the lecture and lab topics each week.
- PowerPoint slides corresponding to lectures will be posted on the **Content** page of the course (provided as .pdf files). Lecture slides will be available on the web site **no later than 10 pm** the day before each lecture. If the lecture slides are not posted by 8 pm the day before lecture, the instructor will typically distribute a printed handout of the lecture slides during class. Following lecture, the handout will also be made available electronically on the course web site. Instructors pace the lectures with the assumption that you have either printed out the lecture slides, or have reviewed the lecture slides in advance. Make sure you check the site before lecture.
- Lab information will be posted on the **Content** page of the course as well. When class data is needed to complete a lab report, the compiled data will appear in this section. A grading rubric for the extended lab reports may also be posted on the Content page. You may find it helpful to review the grading criteria as you prepare your lab reports.
- **FAQs** (Frequently Asked Questions) will be posted as a page for the course. If you have a question, please check the FAQs page first to see if your question has already been answered. Or, you may find it helpful to quickly read through the FAQs page – you may find answers to questions you didn't even thought of just yet. If you have an FAQ that you would like to submit, feel free to email the instructors with your suggestion.

Attendance Policy.

Attendance in lecture is strongly encouraged, but not mandatory. Based on feedback from students in prior semesters, it is very difficult to keep up with material without attending class. Most students have commented that PowerPoint slides do not contain enough detail to serve as a substitute for attending lecture and taking notes. Typically, attendance at lecture is directly related to student performance in the course.

Attendance at lab exercises and exams is mandatory. If a student anticipates missing a lab exercise or exam because of a religious conflict or because of an athletic or academic competition, the student should notify the instructor within the first two weeks of class, or as soon as possible, to make appropriate arrangements.

Academic misconduct

According to UWS 14.03, academic misconduct is an act in which a student misrepresents its own academic efforts or impedes or damages the academic work of others. Examples of academic misconduct include, but are not limited to: cheating on an examination; collaborating with others in work to be presented, contrary to the stated rules of the course; submitting a paper or assignment as one's own work when a part or all of the paper or assignment is the work of another; submitting a paper or assignment that contains ideas or research of others without appropriately identifying the sources of those ideas; or knowingly and intentionally assisting another student in any of the above. Students who engage in activities of academic misconduct will be sanctioned as described in UWS 14. (http://www.wisc.edu/students/saja/pdf/UWS14.pdf)

In this course, you will submit weekly lab reports. Lab reports should be prepared and submitted individually. However, learning often comes through collaborative discussions. It IS appropriate to discuss your data with the instructors, your lab partner, or other students – but you must complete the lab reports on your own. Each student must prepare their own data (tables or graphs), compose answers to the questions, and write a lab report. Electronically sharing lab data or lab reports is unacceptable.

Calculating your grade

Directions: For each assignment, complete the table below with Points earned / Points possible. Then use the grading scale above to convert your percentage to a letter grade.

Mini-lab reports (10% toward final grade)

Lab 1. _____/_____ Lab 2. _____/_____ Lab 3. _____/_____

Lab 4. _____/_____ Lab 5. _____/_____ Lab 6. _____/_____

Lab 7. _____/_____ Lab 8. _____/_____ Lab 9. _____/_____

Lab 10. _____/_____ Lab 11. _____/_____ Lab 12. _____/_____

_____ Total Pts. Earned ÷ _____ Total Pts. Possible × 10 = _____ Percentage Pts.

Homework (5% toward final grade)

HW. 1. _____/_____ HW. 2. _____/_____

_____ Total Pts. Earned ÷_____ Total Pts. Possible × 5 = _____ Percentage Pts.

Long-lab reports (15% toward final grade)

Report 1. _____/_____ Report 2. _____/_____

_____ Total Pts. Earned ÷ _____ Total Pts. Possible × 15 = _____ Percentage Pts.

Mid-Term Exams (40% toward final grade)

Exam 1. _____/_____ Exam 2. _____/_____

_____ Total Pts. Earned ÷ _____ Total Pts. Possible × 40 = _____ Percentage Pts.

Final Exam (30% toward final grade)

_____ Total Pts. Earned ÷ _____ Total Pts. Possible × 30 = _____ Percentage Pts.

Percentage Points from Mini-Lab Reports = _____

Percentage Points from Long Lab Reports = _____

Percentage Points from Mid-Term Exams = _____

Percentage Points from Final Exam = _____

TOTAL PERCENTAGE POINTS = _____% = _____ (Letter)

Semester Schedule for Food Science 301 (Fall 2016)

Date	Lecture Topic	Lecturer	Lab Exercise	Assigned Readings[1]
09/06	#1. Course Introduction.	Lopez		Syllabus
09/08	#2. Water, water activity, Acids in foods			"Typical pH values of biological materials and foods" (CRC Handbook) **PH:** Ch 3 (p 43-44) **Mu:** p 102-111
09/09		Lopez	#1. Introductory computer skills Sources of Information	Intro to Lab Manual (p 1-10) See Lab Handout
09/13	#3. Carbohydrates. Part 1	Lopez		**PH:** Ch 3 (p 24-30)
09/16	#4. Carbohydrates. Part 2	Lopez		**PH:** Ch 3 (p 24-30)
09/15		Lopez	#2. pH and Dilutions Lab	See Lab Handout
09/20	#5. Proteins. Part 1	Lopez		**CW:** p 295-306 **PH:** Ch 3 (p 30-33)
09/22	#6. Proteins. Part 2. Enzymes	Lopez		"Enzymes" (Decelles) **PH:** Ch 3 (p 37-39)
09/23		Lopez	#3. Carbohydrate analysis	See Lab Handout

09/27	#7. Lipids. Part 1	Lopez		**PH:** Ch 3 (p 33-36) and Ch 16 (p 359-365)
09/29	#8. Lipids Part 2. Standards of Identity	Lopez		**Mu:** p 183-187
09/30		Theis	#4. Proteins. Gluten Functionality	See Lab Handout
10/04	#9. Food Additives	Lopez		**Mu:** p 179-183
10/06	#10 Believability Index, Food Toxicology	Steele		How to read a medical study? Searching for clarity
10/07		Lopez Steele	#5. Effect of fat on sensory properties of cheese	See Lab Handout
10/10	**Midterm Exam #1 (5:30 – 7:00 pm)**			
10/11	#11. Food Science and Public Policy	Theis		TBA
10/13	#12. Introduction to Food Microbiology	Steele		**Mu:** 283-291 **Mu:** "Hurdle Technology"
10/14		Steele	#6. Quantifying microorganisms in food samples.	See Lab Handout
10/18	#13. Introduction to Foodborne illnesses	Steele		"Salmonellosis" (CDC) "*Campylobacter*" (CDC) "Listeriosis" (CDC)

10/20	#14. Foodborne Pathogens 1	Steele		"*Escherichia coli*" (CDC) "Botulism" (CDC) "*Norovirus*" (CDC)
10/21		Steele	#7. Biofilms and Sanitation	
10/25	#15. Foodborne Pathogens 2	Steele		
10/27	#16. Case Study #1	Steele		
10/28		Steele	#8. Factors affecting microbial growth **(Long lab report)**	See Learn@UW
11/01	#17. Control of Foodborne Illnesses and Food Spoilage	Steele		**Mu:** p 291-297
11/03	#18. HACCP, Allergens	Theis		TBA
11/04		Steele	#9. Foodborne illnesses (Case studies).	See Lab Handout
11/08	#19. Food Safety at Home	Theis		TBA (See Learn@UW)
11/10	#20. Gut Microbiota and Health	Steele		"Say hello to the bugs in your gut" (Newsweek)
11/11		Lopez	#10 Sensory Lab	
11/15	#21. Prebiotics and Probiotics	Steele		"Probiotics: Their potential to Impact Human Health" (CAST)

11/17	#22. Intro to Food Processing and Unit Operations	Lopez		**PH:** p 69-89 **Mu:** p 211-219
11/18		Theis	#11. Quality of Homemade and Processed Foods	TBA
11/21	**Midterm Exam #2 (5:30 – 7:00 pm)**			
11/22	#23. Flow diagrams and Mass balances	Lopez		Lab Manual Appendix A See Lab Handout
11/24	NO LECTURE (THANKSGIVING)			
11/25	NO LAB (THANKSGIVING)			
11/29	#24. Removal of water	Lopez		**PH:** Ch 10 (p 200-205, 232-239)
12/01	#25. Addition of thermal energy	Lopez		**PH:** p 77-82, 146-147, 152-161
12/02		Lopez	#12. Factors affecting potato chip quality	See Lab Handout
12/06	#26. Thermal processing	Lopez		**PH:** p 138-152
12/08	#27. Removal of thermal energy	Lopez		**PH:** Ch 9 (p 174-179)
12/09		Lopez	#13. Ice Cream Lab	TBA
12/13	#28. Food biotechnology	Steele		**Mu:** p 193-195 **CP:** p 85-92, 102-111

12/15	#29. Food fermentations	Steele		**Mu:** p 292-297
12/23	**Final Exam (5:05 – 7:05 pm)**			

Note: As with any schedule of topics, this is only a guide and is subject to change without notice.

[1] Assigned readings will be available on Learn@UW. Texts are also available on reserve at Steenbock.

PH: Potter and Hotchkiss, Food Science

CW: Charley and Weaver, Foods: A Scientific Approach

Mu: Murano, Understanding Food Science and Technology

CP: Campbell-Platt, Food Science and Technology