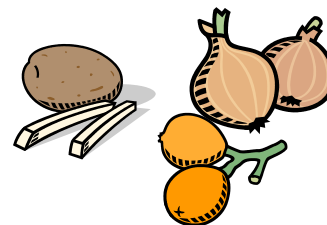




**FOOD SCIENCE AND TECHNOLOGY 5410**  
**FRUIT AND VEGETABLE PROCESSING**  
 Or Fun with pigments and enzymes



Autumn semester. The lectures are in 118 Parker Hall, 12:40-1:35 Monday and Wednesday. Labs are in the pilot plant in the basement of Howlett Hall room 59, 12:40-3:30 Friday, with exceptions as shown on the last page. 3 Units

**Course Goals:**

1. Students understand the basic steps involved in commercially processing typical fruits and vegetables.
2. Students understand how different processing steps affect quality and safety.
3. Students understand the chemistry of fruits and vegetables, especially pigments and enzymes.
4. Students know how to operate common processing and analytical equipment.

**Lab topics:**

<b>Lab topics:</b>	<b>Date</b>	<b>Report Due</b>
1. Canning salsa and tomato juice	September 4	September 11
2. Enzymes and Pigments- shifts in 124/136 Parker**	September 11	September 18
3. Peeling beets, apples, potatoes and carrots	September 18	September 25
4. Canning green beans: effect on color and texture	October 2	October 9
5. Jelly/Start Freezing	October 9	October 16/Nov 6
6. Potato chips	October 23	October 30
7. Finish Freezing/Start Drying	October 30	Nov 6/Nov 13
8. Finish Dehydration	November 6	November 13
9. Cider	November 6	November 30

**The required lab format is explained in the course packet.**

**Required reading:**

- There is a packet of lab handouts that needs to be printed out and brought to every lab
- Readings are listed by page number on the last page of the syllabus. Some of the readings include more detail than is needed for this class. The readings are posted on Carmen or you can buy the book.
- Fellows, Peter. 2009. Food processing technology: Principles and Practice. 3<sup>rd</sup> Edition. Woodhead publishing Ltd. Woodhead ISBN 978-1-84569-216-2. CRC ISBN 978-1-4398-0821-4. CRC order # N10075. Most of this textbook is posted on Carmen.

**Carmen:**

Information is posted under Grades and Modules. Some class notes and useful files are posted under Modules.

<u>Instructors:</u>	<u>Assistants:</u>	<u>Pilot Plant Supervisor:</u>
Dr. Sheryl Barringer 688-3642 110G Parker Hall <a href="mailto:barringer.11@osu.edu">barringer.11@osu.edu</a>	Dr. Hardy Castada 335G Howlett <a href="mailto:castada.1@osu.edu">castada.1@osu.edu</a>	Megan Booth Fenfen Tang booth.310 tang.1263
		Matt Papic 292-4045 Pilot Plant, Howlett <a href="mailto:papic.1@osu.edu">papic.1@osu.edu</a>

Office hours: after class we can talk or set up a meeting time, or you can make an appointment through Julie Townsend.57

## Laboratory Exercises:

Laboratories will be done in the pilot plant of Howlett Hall. We will be using real processing equipment, so remember that accidents can happen. Report ALL accidents to the instructor, pilot plant supervisor or Assistant immediately. No high heels, open toed shoes or shoes with slippery soles are allowed in the pilot plant. You must wear long pants that go to your ankles. No loose, dangly jewelry or sleeves. Do not wear nice clothes to the lab. Laboratory aprons will be provided but you may still get wet or dirty. Hair and beard (if appropriate) nets are required. Exercise caution when working around equipment that is in motion. For the Pigments and Enzyme lab you will need to bring a lab coat and we will be in 124 or 136, and you will be in shifts.

Be certain you read the lab (all labs we are doing that week) before coming to class and turn in the answers to the prelab questions before lab (for all labs we are doing that week). For each laboratory exercise, a written lab report is required. This report is due a week later, at the beginning of the class. If you are late to lab, your report will be counted late. Reports must be neat and readable or they will not be graded. Late lab reports will lose 10 pts if up to one day late, 20 pts if up to two days late and will not be accepted after a week. There are no make-up labs. If you miss the lab, you cannot get points for turning in the lab report. If you have a medical emergency, you need to contact me so we can talk about it. The information needed to answer the questions should have been given in lecture, but ask if you need more information.

Remember to clean up after each lab exercise. This includes hosing down all equipment, taking apart and cleaning equipment where necessary, discarding any garbage and wiping down all surfaces. Any students who leave before the entire area is clean, or do not help with the cleaning, will have points taken off of their lab reports.

At the beginning of each lab, students will first wash their hands and put on their hair nets, then divide into groups and choose a leader. The leader will be in charge of making sure all of the work is done, results are reported to the rest of the class, and everything is clean before leaving. Everyone must lead a group at least once. Make sure you understand what the other groups did. Ask questions at the end of the lab if you are unsure.

**Exams:** There will be two in person exams and a cumulative take home final. You are not allowed to use any notes on the in person exams. Once you leave the exam, you cannot return unless you have made special arrangements with me before the exam starts. That includes going to the bathroom. Exam hints: If you are asked for 4 reasons, give at least 5. You can get full credit for using excellent logic but coming to the wrong final answer. However, if you don't explain your reasons you can't get partial credit.

## Grading:

The grading breakdown is:

Lab reports, homework, applications and quizzes	30%	
Exams	20%, 20% and 30%	
Attendance- photos will be taken each period for contact tracing		(-1%)

With each exam you will be given a list of the questions. You have 24 hours (due at 2pm the next day) to return the list with the correct answer for any question you feel you answered incorrectly on the exam. Correct answers on the original exam will not be regraded down. Submit these answers by email. You will receive 1/3 credit for each question answered correctly, that was previously wrong.

The class is graded on a straight scale: 100-93 = A, 92-90 = A-, 89-87 = B+, 86-83 = B, 82-80 = B-, 79-77 = C+, etc. It is acceptable (and desirable) for the entire class to receive As, if you earn them.

## Homework and Lab Reports:

Every Friday there is a homework assignment or lab report due. If we don't meet on Friday, then it is due in lecture. See the course packet for more instructions on what is expected in the lab reports.

## Possibly useful texts and websites.

### Canning, retorting:

Lopez, A. A Complete course in canning. The Canning Trade. Ch 9 and 12

The Almanac of the canning, freezing and preserving industry. TX599. Contains part of the CFR

### General fruits and vegetables:

Food chemistry [computer file] / edited by Owen R. Fennema. Available through the library as hard copy and electronically. There are 4 editions, but the third (1996) is the best. <http://library.ohio-state.edu/search~S7?/afennema%2C+owen/afennema+owen/1%2C1%2C12%2CB/frameset&FF=afennema+owen+r&5%2C%2C12>

Somogyi, L.P., Ramaswamy, H. S. and Hui, Y.H., eds. 1996. Processing Fruits: Science and Technology. Vol. 1. Biology, Principles and Applications. Technomic Publishing Co., Lancaster PA.

Woodruff and Luh. Commercial Fruit Processing. AVI Publishing

### Government regulations:

CFR 21 (Code of Federal Regulations). Available in the reference section of the main library, or at [/www.access.gpo.gov/nara/cfr/cfr-table-search.html#page1](http://www.access.gpo.gov/nara/cfr/cfr-table-search.html#page1) then title 21, current year, section 130-169.

USDA grading standards: <http://www.ams.usda.gov/standards/standpfv.htm>

### Composition, pH, production websites:

Food composition: <https://fdc.nal.usda.gov/>

Agricultural production: Agricultural Statistics (HD1751 in the reference section of the Agricultural library) or [www.usda.gov](http://www.usda.gov) or [www.census.gov/compendia/statab/](http://www.census.gov/compendia/statab/)

Worldwide agricultural production: <http://faostat.fao.org/>

Chemical structures and characteristic aroma: <http://www.flavornet.org/flavornet.html> then enter the name. <http://library.ohio-state.edu/screens/databases.html> then to Food Science and Technology Abstracts (FSTA) for flavors and pigments

### Postharvest physiology, respiration, etc:

Kays SJ. 1991. Postharvest physiology of perishable plant products. Avi Books. New York.

Wills, R.B.H., W.B. McGlasson, D. Graham, T.H. Lee and E.G. Hall. 1989. Postharvest. BSP Professional Books. Carlton, Australia ISBN 0442439432.

You are required to read the **University Policies** which are posted on the Carmen site and are considered to be part of this syllabus. I have highlighted two of the items below:

## Academic Misconduct:

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/esc/>.

Students are allowed to work on their lab reports together, but each student must write their own report in their own words.

**Health and safety requirements:** All students, faculty and staff are required to comply with and stay up to date on all university safety and health guidance (<https://safeandhealthy.osu.edu>), which includes wearing a face mask and maintaining a safe physical distance at all times. Non-compliance will result in a warning first, and disciplinary actions will be taken for repeated offenses.

		<b>Lecture (Mon, Wednesday)</b>	<b>Due in lecture</b>	<b>Lab (Friday)</b>	<b>Due in Lab</b>
<b>Aug</b>	26-28 w1	Syllabus. F vs. V. Water and CHO.	11-32 composition		
<b>Sep</b>	31-4 w2	Minor components. Tomato intro for the lab. Enzymes.	99-100, 103-122 raw materials	Tomato salsa	
	9-11 w3	(Labor day) Tomato review. Pigments.		<b>Enzymes Pigments In 124 and 136**</b>	Tomato lab
	14-18 w4	Steps in processing. Low acid foods.	369-378 blanching. 359-360 microbial death.	Peeling	Enzyme lab
	21-25 w5	Cans and retorts.	396-401 retort theory; 408-415 retorts.	<b>Cumulative Quiz in Carmen</b>	Peeling lab
<b>Oct</b>	28-2 w6	Retorts. Freezing. <b>EXAM WEDNESDAY.</b>		Canning green beans	Homework 1
	5-9 w7	Jam. Aseptics.	650-652, 659-667, 676-682 Freezing.	Jelly/Freezing	Green bean lab
	12-16 w8	Freezing.		<b>Cumulative Problem Solving in Zoom</b>	Jelly lab.
	19-23 w9	Potato chip processing.	40-44 water activity.	Potato Chips	Homework 2
	26-30 w10	Water activity. Drying		Freezing/Drying	Potato chip lab.
<b>Nov</b>	1-6 w11	Drying. Juice.	485-489 drying theory 516-521 drying equip.	Drying/ Cider	Freezing lab
	9-13 w12	Postharvest physiology. (Veteran's Day)	623-624, 635-636 CA.	<b>Cumulative Quiz in Carmen</b>	Drying lab
	16-20 w13	CA/MA. <b>EXAM WEDNESDAY</b>		<b>Cumulative Problem Solving in Zoom</b>	Homework 3
	23-25 w14	Grades & standards. Refrigeration. Humidity. Defenders.		(Thanksgiving)	Cider lab
<b>Dec</b>	30-4 w15 in <b>Zoom</b>	<b>Zoom classes: Waste and water. Tomato tour. Irradiation. Review</b>	Review questions and answers by email.	<b>Zoom review</b>	Homework 4
	11	Take Home Final Exam: Due Friday Dec 11 2:00pm			

\*\*For the Enzyme and Pigments lab, there will be two pre-assigned shifts in lab rooms 124 and 136. 1st shift is 12:40 to 2:00 and the 2nd shift is 2:10 to 3:30 pm. See the lab packet to find your shift.