

**FDSC 413: SCIENCE & TECHNOLOGY OF PLANT FOODS
– FALL 2016 –**

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Office Hours: Friday 2:30p – 3:30p
Wednesday 11:30a – 12:30p

We are happy to provide additional meeting times upon request. Please contact a TA directly in order to make arrangements.

MEETING TIMES Lecture: Tuesday & Thursday 9:05 – 10:20a
Room 102, Chemistry Building
Laboratory: Section 1 (A/B) Tuesday 11:15a – 2:15p
Section 2 (A/B) Tuesday 2:30p – 5:30p
Wet Pilot Plant (Room 135), Food Science Building

SOCIAL MEDIA Instagram: psu_plantfoods
Twitter: psu_plantfoods

OVERVIEW FDSC 413 is a capstone course in food science which builds upon its prerequisite courses (FDSC 400, 405, 408, 410), integrating fundamentals of organic chemistry, biochemistry, microbiology and food chemistry and engineering in order to analyze, control and evaluate factors associated with the preservation of and addition of value to plants and plant-based food products. Scientific approaches will be explored for means to control to biochemical and microbiological deterioration of fresh and minimally processed foods with particular respect to postharvest handling methods, fermentation and thermal processing technologies to produce safe, high quality and self-stable foods.

LECTURE AND LABORATORY SCHEDULE

As a 3-credit course, we will meet for two lectures per week and one lab period every other week. This schedule will be updated regularly for you to access.

	Meeting	Lab	Day	Date	Topic	
Unit 1 – Plants as Foods	1		T	8/23	Introduction to Course	
		1	T	8/23	Pilot Plant Safety & Practical	
	2		Th	8/25	Composition of Edible Plants (1)	
	3		T	8/30	<i>Guest Lecture: Sensory Analysis of Plant Foods</i>	
		2 – A	T	8/30	Postharvest Handling	
	4		Th	9/01	Composition of Plant Foods (2)	
	5		T	9/06	Postharvest Processing & Changes (1)	
		2 – B	T	9/06	Postharvest Handling	
	6		Th	9/08	Postharvest Processing & Changes (2)	
	7		T	9/13	Preservation – Heating Methods	
		3 – A	T	9/13	Postharvest Processing	
	8		Th	9/15	Preservation – Cooling Methods	
	9		T	9/20	Bioactives	
		3 – B	T	9/20	Postharvest Processing	
	10		Th	9/22	Review	
	Exam I		T	9/27	Meetings 1 – 10	
Unit 2 – Adding Value to Plant Foods		4 – A	T	9/27	Preservation Methods	
	11		Th	9/29	Wine Production	
	12		T	10/04	Wine Production	
		4 – B	T	10/04	Preservation Methods	
	13		Th	10/06	Wine Chemistry (SO ₂ Calculations)	
	14		T	10/11	Wine Microbiology	
		5 – A	T	10/11	Wine Production	
	15		Th	10/13	Sparkling Wine, Special Wine	
	16		T	10/18	Distillates and Beer Production (1)	
		5 – B	T	10/18	Wine Production	
	17		Th	10/20	Beer Production (2) and Beer Micro, Chemistry	
	18		T	10/25	Bread Production and Microbiology	
		6 – A	T	10/25	Ale Production	
	19		Th	10/27	Bread Chemistry	
20		T	11/01	Review/Overflow		
	6 – B	T	11/01	Ale Production		
	Exam II		Th	11/03	Meetings 11-20	
Unit 3 – Plant Products as Ingredients	21		T	11/08	Plant Oils	
		7	T	11/08	Bread Production	
	22		Th	11/10	Plant Oil Processing	
	23		T	11/15	Proteins	
		8 – A	T	11/15	Plant Oils	
	24		Th	11/17	Plant Protein Functionality	
	<i>Thanksgiving Break (11/21 – 11/25)</i>					
	25		T	11/29	Sustainability	
		8 – B	T	11/29	Plant Oils	
	26		Th	12/01	Final Presentations	
	27		T	12/06	Final Presentations	
		9	T	12/06	Sensory Evaluation / Pilot Plant Cleanup	
28		Th	12/08	Final Presentations		
Final Exam			M	12/12 12:20-2:10pm	Cumulative (Meetings 1-28)	

LAB GROUPS AND SUB GROUPS Due to high levels of enrollment lab sections 1 (morning) and 2 (afternoon) have been further split into sections 1A/1B and 2A/2B.

Sections 1A and 2A will meet on the following days:

- 8/23** Pilot Plant Safety & Practical
- 8/30** Postharvest Handling
- 9/13** Postharvest Processing
- 9/27** Preservation Methods
- 10/11** Wine Production
- 10/25** Beer Production
- 11/08** Bread Production
- 11/15** Plant Oils
- 12/06** Pilot Plant Cleanup

Sections 1B and 2B will meet on the following days:

- 8/23** Pilot Plant Safety & Practical
- 9/06** Postharvest Handling
- 9/20** Postharvest Processing
- 10/04** Preservation Methods
- 10/18** Wine Production
- 11/01** Beer Production
- 11/08** Bread Production
- 11/29** Plant Oils
- 12/06** Pilot Plant Cleanup

COURSE RESOURCES We will rely heavily on the Canvas course management system throughout the semester for communication of course content as well as any important announcements regarding assignments and answers to questions about lecture material. Please note that there is no textbook required for this course.

Lecture information is organized according to Unit and Topic. You will be able to access PDF versions of lecture slides, as well as optional/supplementary readings which will help enhance your understanding of the course content.

Lab materials are also organized by topic. In each Module folder, you will be able to access Lab Handouts, the Pre-Lab Quiz and the Lab Report questions for the given lab.

Please send all email questions to me and the TAs exclusively through Canvas.

GRADING POLICY

Your final grade for the course will be determined by the following:

- Two (2) non-cumulative midterm exams
 - *Exam I (Meetings 1 – 10)* 15%
 - *Exam II (Meetings 11 – 20)* 15%
- One (1) cumulative final exam 20%
- In-class activities (assignments & quizzes) 10%
- Laboratory
 - *Pre-Lab Quizzes* 5%
 - *Reports* 15%
 - *Participation* 5%
- Final Project
 - *Paper* 10%
 - *Presentation* 5%

Total 100%

Exams must be taken at the times specified on the course syllabus unless prior arrangements have been made in accordance to the Office for Disability Services or instances such as severe illness or extenuating familial circumstances (i.e. weddings, funerals). *Please note that any information shared with me regarding these circumstances will remain completely confidential.* In the event that you are not able to take an exam

with the rest of the course due to any of the aforementioned circumstances, it is your responsibility to schedule a time with me to make up the exam within the following week after the original exam date.

KEEPING TRACK OF PROGRESS

We have a very large class this year, with over 50 students! Because there are so many of you and so few of us, it is in your best interests to keep track of your own progress in the course. You can do this using the gradebook feature in Canvas. At the end of the semester, your final average will be converted to the standard University plus/minus grading system.

LAB REPORTS

In lieu of formal lab reports for this class, you will be responsible for answering questions about the concepts and findings of performed experiments from each lab exercise in the form of short technical briefs. These assignments will be available on Canvas under the Laboratory Materials module and will be due exactly one (1) week after the completion of the lab exercise.

For example, section 1A will submit reports by the time section 2A's lab session begins.

All lab reports must be submitted via Canvas as doc, dox or pdf files. Hard copies will not be accepted. Lab reports will be graded according to rubrics for each report, which are available for download as a portion of each Lab Report assignment on Canvas. Late lab reports will be accepted, but will be subject to a 10-point reduction per day past the due date, starting immediately after the assignment deadline passes.

PROJECT: INNOVATION WITH PLANT PRODUCTS & PROCESSES

This course will require a research paper to be written in groups of 3. You are free to form these groups yourselves. This assignment will make up 15% of your total grade. You will have designated time throughout the course to meet with me about your ideas and the progress of your project. This project will **not** require you to physically develop and test a product. Please refer to the Canvas page for a detailed description of project expectations and requirements.

ATTENDANCE POLICY

We will adhere to the University's class attendance policy (42-23). **Laboratory attendance is required.** Absences such as illnesses, emergencies, tragedies or (on a happier note) job interviews or weddings, will be excused with a signed statement documenting the absence; however, you are responsible for contacting me or the TAs to make up the work. When possible, please notify instructors in advance of your absence so that we can arrange for you to attend a different lab section. While lecture attendance is not required, this course will feature activities such as short assignments and quizzes that will make up 10% of your final grade. These activities cannot be made up, so regular attendance is strongly recommended for success in the course.

EXTRA CREDIT OPPORTUNITIES

Extra credit may be earned in the form of social media engagement. You can earn 0.5 bonus points per week towards your next exam by doing the following:

- Posting an original photo of something related to plant foods with a short but substantial description of how it relates to plant food science
- Post an original photo from the lab session with a description of what was done in lab and why
- Tweeting a link to a current (no more than 1 week old) release about plant food news or innovation with a short statement about your opinion or why it is important (hint: use bit.ly to shorten URLs)

Examples of what does and what does not count as a substantial contribution can be found on Canvas.

Be sure to use the #FDSC413 hashtag and tag @psu_plantfoods so your post (and points!) can be accounted for!

Note that by posting photos with the the #FDSC413 tag, you are giving permission for this to be reposted by the psu_plantfoods handle. You will be given credit as the original poster in these instances.

EDUCATIONAL OBJECTIVES

The overarching aim of this course is to apply knowledge of the chemistry, microbiology, engineering and nutrition of plant-based food products in order to analyze the impact of different processing methods on those plant foods, as well as develop new plant-based products, evaluating the quality, stability and safety of those products in comparison with existing products.

Food Chemistry

- Describe the properties and reactions of food components before, during and after processing as they relate to food quality (nutrition, acceptance, safety) and design methods for controlling deterioration of quality
- Apply principles, methods and techniques of food analysis in order to measure physical and chemical changes in plant-based food products, interpret the data gathered in order to draw conclusions regarding the observed results

Food Microbiology

- Use the principles of microbial growth, injury and death to control growth of microorganisms in foods to solve problems associated with food safety and microbial spoilage
- Identify the conditions and strategies by which pathogenic and spoilage microorganisms are killed, injured or made harmless in foods, with particular respect to products that require microbial growth during their production (i.e. fermented products)

Food Engineering

- Apply the principles of food processing unit operations as related to preservation, packaging, and cleaning and sanitation in order to predict and control spoilage and deterioration in foods
- Understand the principles and current practices of processing techniques and the effects of processing parameters on product quality as well as identify new and novel (non-thermal) technologies that can improve the safety and quality of foods
- Evaluate processing methods with respect to specific food products in order to compare and select the most appropriate treatments for increasing the safety, quality and shelf life of a food product

Food Processing and Manufacturing

- Understand how the choice of ingredients influences the physical, chemical and microbiological properties of a specific food by identifying and measuring quality parameters for a variety of products in order to determine the likely causes of specific quality defects
- Use pilot-scale processing equipment to manufacture and edible food product while adhering to Good Manufacturing Procedures, suggesting corrective actions where appropriate

The Human/Food Interface

- Apply basic principles of sensory science by selecting appropriate analyses and statistical methods to assess sensory attributes of food
- Understand the contribution of food and food processing to nutrition, health and wellness by evaluating beneficial and detrimental aspects of bioactive components in food products
- Analyze the factors that influence the acceptance or rejection of food in the general marketplace and how consumer perception of risks and benefits can influence consumer behavior
- Understand the context of plant food processing in society through exploration of current consumer trends towards “natural” and organic foods

The Department of Food Science’s complete set of undergraduate educational objectives can be found at <http://foodscience.psu.edu/files/undergraduate-educational-objectives>.

PILOT PLANT PERSONAL APPEARANCE AND HYGIENE POLICY

All persons working in direct contact with food, food-contact surfaces, or food-packaging materials shall conform to hygienic practices to the extent necessary to protect against contamination of food or persons, including, but not limited to:

- Hairnets and beard nets shall be worn in a manner that covers all loose hair
- Clothing shall be clean and properly secured to avoid risk of being caught in moving equipment
- Open toed shoes shall not be worn
- Jewelry shall be removed
- Maintain adequate personal cleanliness, including thorough hand washing
- Gloves and protective outerwear should be worn when appropriate, and disposed of properly
- Mobile phone use is not permitted

For more information see 21 CFR Part 110 – Current Good Manufacturing Practice in Manufacturing, Packing, or Holding Human Food: http://www.access.gpo.gov/nara/cfr/waisidx_07/21cfr110_07.html

Our Pilot Plant Personal Appearance and Hygiene Policy will be strictly enforced. Here are the consequences for not following this policy:

- 1st Offense: Student is not permitted to participate in the lab exercise until she or he corrects the situation. If the problem cannot be corrected, the student will receive zero participation points for the day's lab.
- 2nd Offense: The student receives zero participation points for that day's lab. If the problem cannot be corrected, the student will receive zero participation points for the entire semester (5% of the final grade).
- 3rd Offense: The student will automatically receive zero participation points for the entire semester.

LOCKER POLICY

Personal use lockers are made available for daily use as a courtesy to those who attend laboratory classes or short courses at the Food Science Building. These lockers are not to be used to store items which can cause, or can reasonably be foreseen to cause an interference with an educational function or those what are forbidden by state law or institutional policy.

- Personal Use Lockers are the property of the Food Science Department. As such, the department retains the right to inspect the lockers and its contents to ensure that the locker is being used in accordance with its intended purpose.
- Personal Use Lockers are available for use only during participation in laboratory or short courses.
- All personal items shall be stored completely within a locker- this includes cell phones, laptops, book bags, coats, etc.
- Items may not be stored on the hallway floors.
- The use of a lock is optional.
- If desired, each student/participant shall supply his or her own lock however; the Food Science Department assumes no responsibility for loss or damage to items stored in an unsecured locker.
- Overnight locker use is forbidden.
- Locks left on lockers after the end of the laboratory session or given day of a short course will be cut off and all items will be removed. The contents of the locker will be sent to lost and found.
- The Food Science Department is not liable for any locks or items removed from the lockers.
- Lockers shall be kept clean at all times.
- All trash, debris, spills, etc. must be cleaned up/disposed of after use.

DISABILITY STATEMENT

Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services (ODS) at 814-863-1807 (V/TTY). For further information regarding ODS, please visit the Office for Disability Services Web site at <http://equity.psu.edu/ods/>. In order to receive consideration for course accommodations, you must contact ODS and provide documentation (<http://equity.psu.edu/ods/guidelines/documentation-guidelines>). If the documentation supports the need for academic adjustments, ODS will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your instructor as early in the course as possible. You must contact ODS and request academic adjustment letters at the beginning of each semester.

ACADEMIC INTEGRITY STATEMENT

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts. Academic integrity includes a commitment not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others (see Faculty Senate Policy 49-20 and G-9 Procedures, <http://studentaffairs.psu.edu/conduct/codeofconduct>). Academic Integrity Guidelines for the College of Agricultural Sciences can be found at <http://agsci.psu.edu/students/resources/academic-integrity>. A lack of knowledge or understanding of the University's Academic Integrity policy and the types of actions it prohibits and/or requires does not excuse one from complying with the policy. Penn State and the College of Agricultural Sciences take violations of academic integrity very seriously. Faculty, alumni, staff and fellow students expect each student to uphold the University's standards of academic integrity both in and outside of the classroom.