Class Time: Tuesday, Thursday 11:00a - 12:15p Location: TLC 47 (UI Moscow)

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Course Description: FS 303 Food Processing 3 credit Fall Specialized techniques, concepts and practices of food processing. Cooperative course taught jointly by WSU and UI. Prerequisites: WSU student: FS 302 or c//; FS 110 or 220; MATH 140 or 171; STAT 212, UI student: FS 302 or c//; FS 110 or 220; MATH 160 or 170; STAT 250.

Course Overview: In this course we will explore many of the common and novel unit operations utilized in industry which are effective and economical for processing food to enhance a products safety, shelf-life, variety and nutrition.

Learning Outcomes (for IFT Food Science Degree Core Competencies):
The student will:

1. Identify the basic principles and key variables of unit operations utilized for food processing.
2. Understand the source and variability of raw food materials and their impact on food processing operations.
3. Analyze yield and losses by calculating mass and energy balances for food processes.
4. Evaluate processes and equipment according to the principles that make a food product microbiologically safe for consumption.
5. Analyze the effectiveness of thermal processes for inhibition of spoilage and food borne pathogenic microorganisms.
6. Select packaging materials for a product based its properties and uses.
7. Apply statistical control principles for analyzing and controlling food manufacturing processes.

Required Texts:

1. Fellows, P. J., 2009, Food Processing Technology, Principles and Practice, Third Edition. CRC Press, Woodhead Publishing Ltd (ISBN 9781439808214 paperback).
2. Unit Operations in Food Processing by Earle and Earle. Online book available free on the web at (http://www.nzifst.org.nz/unitoperations/), 2003. (first published 1966)
3. Course handouts

Recommended Texts (optional, but good for your personal library):

4. Robertson, Gordon L., 2006, Food Packaging, Principles and Practice, 2nd edition CRC Press.
5. Singh R. P. and D. R. Heldman. 2008. Introduction to Food Engineering 4th ed. Academic Press. (this is the required text for FS 432/433 Spring 2014)
6. Heldman, D.R. and R.W. Hartel. 1997. Principles of Food Processing. Chapman & Hall
7. Wheeler, Donald. J. and David S. Chambers, 1992, "Understanding Statistical Process Control", 2nd ed. SPC Press Knoxville, TN

Course Grading:

Midterm Exam 1	15%	The class is intended to be graded on a straight scale:
Midterm Exam 2	15%	100-90.0 = A, 89.9-80.0 = B, 79.9-70.0 = C,
Final Exam	30%	69.9-60.0 = D, 59.9 or less = F.
Commodity Report	15%	
Packaging Report	15%	It is acceptable and desirable for the entire class to
Homework	10%	receive As, if you earn them.

Late Assignment Policy
Assignments lose 20% of total possible score for each university business day late (5:00 pm cutoff). So if you turn in a report (which was due 10/6) on 10/9, three business days late, it will be docked 60% of its total possible score (i.e. a three day late report that is scored a 93% will only get a 33% grade after being docked 60%). Assignments received five or more business days late will be recorded as a zero. No reports will be accepted after 5:00 pm Friday December 11, 2015. They will be recorded as a zero.

Attendance

Attendance and participation is expected and will contribute your learning which will reflect on your performance which influences to your final grade. Please provide the instructor notice of any planned absences (such as a required field trip for another class) so arrangements can be made for you to complete the requirements for this course.

Learning Goals and Assessment

At the end of this course, students should be able to:		Course topics (&dates) that advance these learning goals:	This objective will be assessed
LG1	Use Critical and Creative thinking to integrate and synthesize knowledge from multiple sources. And to combine and synthesize existing ideas, images, or expertise in original ways.	Lectures and class discussions comparing classical vs novel technologies for sterilizing (10/7), and drying food (10/23). Lecture on emerging packaging technologies (10/4).	Exams, Commodity Report, Packaging Report
LG2	Use Quantitative Reasoning to convert relevant information into various mathematical forms. And to understand and apply quantitative principles and methods in the analysis of data.	Lectures with in class examples on mass and energy balances. Group problem solving session on mass balances (9/4). Lectures on mixing theory (9/16), thermal process calculations (10/9) and Statistical Process Control lectures (12/2, 4). SPC computer software tutorial (12/9).	Homework assignments, exams
LG5	Use communication skills to tailor message to audience, express concepts, propositions, and beliefs in coherent, concise and technically correct form.	Lectures on postharvest physiology (9/2) and packaging (11/4, 6, 11) which include how to write an internal business report.	Commodity Report, Packaging Report
LG7	Develop depth, breadth, and integration of learning in Food Science / Food Engineering.	Lectures on food process unit operations through the semester	Exams, Commodity Report, Packaging Report, in-class participation

Lecture Schedule

Class:	Topic: (chapter reading) [assignment]
Aug 25	Introduction: Food processing and preservation (Fellows 1.1.2, 1.1.4)
Aug 27	Food physical properties, density, color, texture, viscosity [*Assignment of the Commodity Report, draft due 9/15, final copy due 10/6*]
Sept 1	Postharvest physiology and respiration
Sept 3	Material/mass balances tutorial session (Fellows 1.3)
Sept 8	Raw materials, cleaning, sorting, peeling (Fellows 2)
Sept 10	Size reduction (Fellows 3)
{Sept 14}	{FS 302 all day field trip, for FS 302 Lab students only}
Sept 15	Mixing theory (Earle and Earle, Fellows 4) [***Commodity Report draft due***]
Sept 17	Mixing and forming / [***HW #1 due***]
Sept 22	Separation and concentration (Fellow 5)
Sept 24	**EXAM 1**
Sept 29	Heat processing, blanching (Fellows 10, 11)
Oct 1	Pasteurization (Fellows 12)
Oct 6	Heat sterilization equipment (Fellows 13) [***Commodity Report final due***]
Oct 8	Heat sterilization calculations (Fellows 13) [*Assignment of the Packaging Report, draft due 11/12, final due 12/3*]
Oct 13	Evaporation (Fellows 14.1)
Oct 15	Distillation (Fellows 14.2)
Oct 20	Water activity (Fellows 1.1.2 pp 40-44)
Oct 22	Drying methods (Fellows 16) [***HW #2 due***]
Oct 27	Freeze drying (Fellows 23)
Oct 29	**EXAM 2**
Nov 3	Trends in food packaging (Fellows 25.1)
Nov 5	Food packaging properties (Fellows 25.2)
Nov 10	Modified atmosphere packaging (Fellows 25.3)
Nov 12	Coating (Fellows 24) [***Packaging Report, draft due***]
Nov 17	Chilling (Fellows 21)
Nov 19	Freezing (Fellows 22)
Nov 23-27	**Fall Recess Break**
Dec 1	Statistical process control (Wheeler, handouts)
Dec 3	Statistical process control (Wheeler, handouts) [***Packaging Report final due***]
Dec 8	Tutorial on statistical process control [***HW #3 due***]
Dec 10	Review
Dec 14-18	Finals week
Dec 16	**Final exam at TLC 47 from 10:00 am to 12:00 noon**

(WSU cooperative students please check your WSU final exam schedule for conflicts.)

Reading Assignments
You are expected to complete the assigned reading prior to the class period in which it is to be discussed. This practice will permit the instructor to expand on and clarify the topics. Reading ahead is encouraged.

Writing Assignments
Two major technical writing assignments of a Commodity Report and a Packaging Report will be assigned. For both of these, a student will turn in a draft which the instructor will mark for improvement and return to the student (similar to WSU Writing in Major [M] classes). Then the student will make revisions and turn in a final copy. For each of these assignments a handout with additional details on scope, content and format will be provided.

Commodity Report – You are an intern in the R&D group of a major food company. The company has developed a new product and needs to acquire and store the raw materials for processing. You boss has asked you to research one of those raw commodities/ingredients and write a report detailing the:

1. Availability of the raw material (how it is sold, seasonality, how it is shipped)
2. Grades of the material and how that is assessed.
3. Required storage conditions and storage life for the material.
4. Cost of the raw material.

Packaging Report – You are food product developer in the R&D group of a small food company. You have developed a new product that needs appropriate retail packaging. Management has asked you to work with marketing and manufacturing to develop a proposal for:

1. The style and size of the package for retail sale.
2. The type of packaging material and material properties for its required shelf life.
3. The legal and marketing requirements for package labeling.
4. The size and type of tertiary packaging (i.e. boxes, cases) for distribution.
5. Cost of the packaging material on a per retail sales unit.
6. The sustainability of the proposed package and distribution system in regard to manufacturing and consumer waste.

Students with Disabilities
UI students: Reasonable accommodations are available for students who have documented temporary or permanent disabilities. All accommodations must be approved through Disability Support Services located in the Idaho Commons Building, Room 306 in order to notify your instructor(s) as soon as possible regarding accommodation(s) needed for the course. 208-885-6307, email at dss@uidaho.edu, website at <www.access.uidaho.edu>

WSU student: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.

Academic Regulations & Student Affairs Policy Regarding Absences
It is the policy of the Office of Student Affairs to assist students during crisis situations where they are unable to notify their instructors prior to a hurried emergency departure. The Office of Student Affairs will send professors an "Emergency Notification" in those instances where the student will be away for more than two days. The Office of Student Affairs will not issue notifications retroactively or for "one-day emergencies."

Academic Etiquette
Do not carry on side conversations or read during class. Please mute cellular phones during class.

Academic Integrity
You are encouraged to work with classmates on assignments. However, each student must turn in original work. No copying will be accepted. Students who violate the UI *Student Code of Conduct* or the WSU *Standards of Conduct for Students* will receive an F as a final grade in this course, will not have the option to withdraw from the course and will be reported to the UI Dean of Students or WSU Office Student Standards and Accountability. Cheating is defined in the UI *Student Code of Conduct* and the WSU *Standards for Student Conduct* (WAC 504-26-010 (3)). It is strongly suggested that you read and understand these definitions.

Plagiarism
Plagiarism is defined by Webster's Dictionary as, "*to steal and pass off the ideas or words of another as one's own*." There are two general forms of plagiarism:

(a) Unintentional: the use of other writers' words, phrases, sentences, paragraphs as though they were your own *without understanding* the need to cite the original source. Unintentional plagiarism normally occurs when the individual does not understand the conventions of scientific writing and the need to cite sources of information.

(b) Intentional: the use of other writers' work and claiming it as your own. Intentional plagiarism includes *knowingly copying* or incorporating sections of books, articles, or other sources into your work without citation.

To evade plagiarism, you must acknowledge the source of information. In scientific writing, this can be performed in the text of your work through the use of surnames of authors and the year of publication or by using numbers enclosed by parentheses which correspond to specific citations in the reference section. In addition to employing citations in the text, plagiarism can be avoided by applying special techniques when writing about information obtained from a source:

(a) Paraphrase: rewording information in which you accurately present the main ideas from the source but do so using your own organization, words, and sentence structures.

(b) Summary: a concise statement of the main idea from a section within a source.

(c) Direct quotation: use of quotes surrounding the passage written by another author.

In general, paraphrasing (a) and the use of summary statements (b) are very common techniques used in scientific writing. Use of quotations (c) in scientific writing is rare and should be avoided.

Plagiarism is dishonest and is **not** tolerated. If caught using all or portions of a current or former classmate's writing or other sources of information, a grade of "zero" will be given for the exercise. Additional penalties for plagiarism are possible as outlined in the University of Idaho *Student Code of Conduct* and the Washington State University *Student Handbook*.

Safety
Washington State University is committed to enhancing the safety of the students, faculty, staff, and visitors. It is highly recommended that you review the Campus Safety Plan (http://safetyplan.wsu.edu/) and visit the Office of Emergency Management web site (http://oem.wsu.edu/) for a comprehensive listing of university policies, procedures, statistics, and information related to campus safety, emergency management, and the health and welfare of the campus community.

Access to the FSHN G20 Pilot Plant
You will be assigned a card or keypad access code to the Pilot Plant so you can visit the instructor's office. Your code will be active during regular 8am – 5pm business hours. The lock keeps date/time records so please do not share your personal code.