

**FSHN 461 - Food Processing. Fall, 2017, 272 AESB**  
**(2:00 – 3:50 pm, MW)**

Instructors:	Prof. Pawan Takhar	Bevier 439	300-0486
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	Prof. Hao Feng (lead instructor)	382 F AESB	244-2571
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Textbooks: Fellows, P.J. 2000. Food Processing Technology. Principles and Practice. 2<sup>nd</sup> edition. CRC Press, N.Y., NY.  
Karel, M., O.R. Fennema, D.B. Lund. 1975. Principles of Food Science. Part II. Physical Principles of Food Preservation. Marcel Dekker, Inc., N.Y., NY. (These books will be used for FSHN 462, as well.)

COURSE OBJECTIVES: 1) Heat transfer calculations, 2) Heat exchanger design, 3) Comprehension of the qualitative effects of heating and freezing on food components, 4) Engineering principles that govern food processing and preservation unit operations, including evaporation, freeze-concentration, membrane separation, dehydration, centrifugation, extrusion and frying, and 5) Comprehension of the effect of the process conditions of various unit operations on product characteristics and product quality.

Grade Distribution will be based on:

Four exams @ 100 pts each	=	400
Six problem sets @ 50 pts each	=	300
Participation (iClicker)	=	100
TOTAL		800

### Learning objectives

Students will be able to describe food processing unit operations, identify the underlying food engineering principles and utilize the principles to improve the processes.

### Assignments

1. In-class Heat transfer problems (Conduction)
2. In-class Heat transfer problems (Conduction, Convection and Radiation)
3. In-class Pasteurization exercise
4. Evaporation
5. Dehydration
6. Water activity and centrifugation

*Pre-requisite courses: one course in food chemistry, one course in food microbiology, and one course in food engineering. Graduate students do not have pre-requisites for courses at the University of Illinois, but if you are not familiar with these subjects, substantial extra work will probably be needed to excel in the course.*

**If you have a degree in Food Science, you do NOT need to take this course.**

### iClicker

Instructors will sometimes pose questions in class, to which students will respond using iClickers. For most classes, credit will be given to all respondents regardless of whether right or wrong answer is given.

For three of Dr. Takhar's classes (heat transfer, heat exchanger design and pasteurization), students will be guided to solve problems in class. Please bring your calculators and iClickers. Some responses to the questions maybe recorded using iClickers. Students will be required to compare their solution with the solution posted online.

Students are required to bring iClickers in all classes. Please make sure to keep extra batteries. For the entire semester, a student can turn in paper-based answers not more than two times if he or she forgot to bring iClicker to class.

<u>Date</u>	<u>Topic</u>	<u>Work Due</u>
Aug. 28	Introduction. Objectives & Procedures	
Aug. 30	Introduction to heat transfer	(In-class Problems)
Sep. 4	<b>Labor Day – no class</b>	
Sep. 6	Introduction to heat transfer continued & design of heat exchangers	
Sep. 11	Design of heat exchangers <i>continued</i>	
Sep. 13	Pasteurization, HTST & UHT	(In-class Problems)
Sep. 18	Pasteurization, HTST & UHT <i>continued</i>	
Sep. 20	Kinetics	(In-class Problems)
Sep. 25	Kinetics continued	
<b>Sep. 27</b>	<b>EXAM I. Related to topics covered till the last lecture</b>	
Oct. 2	Effect of freezing on foods	
Oct. 4	Frying of Foods	
Oct. 9	Extrusion of Foods	
Oct. 11	Simulations module based a self-paced exercise	
Oct. 16	Advanced Topic: Microwave heating of foods	
<b>Oct. 18</b>	<b>EXAM 2. Related to topics covered till the last lecture</b>	
Oct. 23	Introduction/Moisture removal by evaporation. (Prof. Feng – lectures 2 <sup>nd</sup> half of course)	
Oct. 25	Evaporation – fundamentals, design calculation applications	
Oct. 30	Freeze concentration and membrane separation	
Nov. 1	Membrane separation	(Assignment 4)
Oct. 6	Fundamentals of food dehydration	
Nov. 8	Dehydration calculation, review of Exam 3	
<b>Nov. 13</b>	<b>EXAM 3. Concentration module</b>	
Nov. 15	Dehydration – dryers and effect on food quality	
Nov. 18 - Nov. 26 <b>No Class - Thanksgiving break</b>		
Nov. 27	Freeze drying	
Nov. 29	Spray drying and drum drying.	(Assignment 5)
Dec. 4	Refractance Window drying and osmotic dehydration.	
Dec. 6	Centrifugation.	
Dec. 11	Advanced Topic 1: Emerging food processing technologies	
Dec. 13	Advanced Topic 2: Emerging food processing technologies, review of final exam	



### Illinois Compass - Course Web Site:

Some of the instructional materials for this course will be delivered to you via Illinois Compass, the asynchronous learning network used to organize this course. The Uniform Resource Locator (URL) for the course is: [http:// compass2g.illinois.edu](http://compass2g.illinois.edu)

GUARANTEED MINIMUMS (Percentage of 800 points, e.g., 92% = 736 points)

	<i>Graduate Students</i>	<i>Undergraduate Students</i>
GRADES:	≥92% = A	≥90% = A
	≥90% = A-	≥88% = A-
	≥87% = B+	≥85% = B+
	≥84% = B	≥82% = B
	≥80% = B-	≥78% = B-
	≥76% = C+	≥74% = C+
	≥72% = C	≥70% = C
	≥68% = C-	≥66% = C-
	≥64% = D+	≥62% = D+
	≥60% = D	≥58% = D

*Official office hours are after class or by appointment.* The preferred mode of communication is via email. We would prefer phone communication only for urgent issues.

**Exam questions** will include information covered in the lectures, lecture handouts, the problem sets, and **BOTH** textbooks. Understanding and completing the homework assignments with diligence will help you to perform well in the exams. The format for the **first two exams** will be problems that will be similar but not the same, as those in the in-class problem sets. True/false and multiple choice questions will be involved in first two exams. Equation and cheat sheets will not be permissible in Dr. Takhar's portion of the course. For solving some assignments the use of computers may be needed. The **third exam and the final** (Dr. Feng's portion of the course) will have a different format from the first two exams. Each student will be allowed a one page "cheat sheet" (in addition to the equation sheet). Details regarding the content of the "cheat sheet" will be provided in lecture. For the third and fourth (final, non-cumulative) exam, in addition to calculation problems, true/false and multiple choice questions, (*rather than essay questions*), will be used. **No** old exams will be provided for both instructors' portions.

**NOTE: Students with special needs should notify the instructor during the first week of class, so adjustments can be made early in the semester.**

**Any student who has suppressed their directory information pursuant to FERPA must self-identify to the instructor to protect the privacy of their attendance in this course.**

## General Emergency Response Recommendations

These recommendations are provided by the Office of Campus Emergency Planning. There are two basic methods to respond in emergencies that may affect persons on campus, and more specifically, individual buildings: Building Evacuation (GET OUT) and Shelter-In-Place (STAY IN).

ONLY FOLLOW THESE ACTIONS IF SAFE TO DO SO. When in doubt, follow your instincts - you are your best advocate!

**Building Evacuation (GET OUT)** — Action taken to leave an area for personal safety.

- Take the time to learn the different ways to leave your building BEFORE there is an emergency.
- Evacuations are mandatory for fire alarms and when directed by authorities! No exceptions!
- Evacuate immediately. Pull manual fire alarm to prompt a response for others to evacuate.
- Take critical personal items only (keys, purse, and outerwear) and close doors behind you.
- Assist those who need help, but carefully consider whether you may put yourself at risk.
- Look for EXIT signs indicating potential egress/escape routes.
- If you are not able to evacuate, go to an Area of Rescue Assistance, as indicated on the front page of this plan.
- Evacuate to Evacuation Assembly Area, as indicated on front page of this plan.
- Remain at Evacuation Assembly Area until additional instructions are given.
- Alert authorities to those who may need assistance.
- Do not re-enter building until informed by emergency response personnel that it is safe to return.

**Shelter-in-Place (STAY IN)** — Action taken to seek immediate shelter indoors when emergency conditions do not warrant or allow evacuation.

- Severe Weather
  - If you are outside, proceed to the nearest protective building.
  - If sheltering-in-place due to severe weather, proceed to the identified Storm Refuge Area or to the lowest, most interior area of the building away from windows or hazardous equipment or materials.
- Security Threat
  - If you cannot safely evacuate, find a secure area within your building to stay and await further information.
  - Assist those who need help, but carefully consider whether you may put yourself at risk.
  - Once within a safe place, attempt to secure the space (i.e.: lock doors, close windows/blinds).
  - If unable to lock the door, secure it by any means possible.
  - Remain quiet, unless making noise would be beneficial to your safety (i.e.: rescue recovery).
  - Without jeopardizing your safety, try to obtain additional clarifying information by all possible means, including the Illini-Alert Emergency Text Notification System.