Course Syllabus
FDSC 4754
Engineering Principles of Food Processing
Spring, 2016

Instructor:
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Office hours: Open Door Policy

Graduate/Teaching Assistants:
TBD

Class Time/Place:	Tuesday & Thursday 9:30-10:45 am	D-1&-2 Food Science
Lab Time/Place:	Wednesday 1:30- 4:20 pm	D-1&-2 Food Science

Prerequisites: Math 1213 (Trigonometry) and Phys 2013 (College Physics I) and Phys 2011L (College Physics I Lab)

Catalog Description: Basic mechanics of refrigeration, temperature controls, materials handling, and mechanical problems as applied to food processing. Lecture 3 hours, laboratory 3 hours per week.

Text Book: Wilhelm, L.R., D.A. Suter, and G.H. Brusewitz. 2004. Food & Process Engineering Technology. American Society of Ag. Engineers, 2950 Niles Rd., St. Joseph, MI 47085-9659.

Supplemental Texts: Toledo, R.T. 2007. Fundamentals of Food Process Engineering, 3rd Ed., 233 Spring Street, New York, NY 10013-1522. Paul Singh R. and Heldman, D.R. 2013. Introduction to Food Engineering, 5th Edition. Academic Press. 525 B Street, Suite 1800, San Diego, CA 92101-4495. Paul, Heldman, D.R. and R.W. Hartel. 1997. Principles of Food Processing. Chapman and Hall. 115 Fifth Av., New York, NY 10003-1004. Henderson, S.M., Perry, R.L., & Young, J.H.1997. Principles of Process Engineering. 4th Edition. The Society for engineering in agricultural, food, and biological systems. 2950 Niles Road, St. Joseph, MI 49085-9659.

Course Objectives: Learn basic principles of food engineering and apply these principles by solving food processing problems using calculations.

Class Procedures:

- Homework assignments are due at the beginning of the class period of the day in which they are due.
- Late homework or laboratory assignments will be penalized by deducting 50% of the point value of the assignment per late day.
- "Make-up" tests will be given for missed exams; ***however, please make every effort to take the exam during the assigned, class examination period.***

- University rules apply as to the consequences of cheating.

Laboratories: Unit exams will normally be given during laboratory times. Additionally, many labs will be used to illustrate problem-solving demonstrations. Some labs may be used for field trips to local food industry facilities or to conduct experiments in the FDSC labs and pilot plant.

Evaluation Methods: Problem sets will be assigned approximately once/week, graded, returned, and counted toward the final grade tabulation. Exams will be administered after each technical unit; these unit exams will comprise both essay-and problem-oriented questions. The final exam is comprehensive.

Grading Structure:

Evaluation Method	**Final Grade Weight**
Exams	60%
Final exam	20%
Problem sets, possible quizzes	20%

Note: The 12-point grading system will be utilized. Students caught using unauthorized electronic equipment, or other disruptive behavior, will have test score deductions applied.

Students with Disabilities: *If any student needs accommodations due to a physical or learning disability, make arrangements to discuss this with the instructor within the first week of the semester.*

University of Arkansas Inclement Weather Policy:
See the University's Inclement Weather Policy at http://emergency.uark.edu/11272.php. You may check the University of Arkansas Weather Hotline (479) 575-7000 for recorded messages giving information about delays and University closings. *The policy for this class is that if the Fayetteville Public School System is cancelled due to inclement weather, FDSC 4754 lecture periods will also be cancelled or postponed. Laboratories will be held unless the University is closed or you receive an e-mail indicating that the lab has been cancelled or postponed.*

Disruptive Behavior:
"Disruptive behavior may best be defined as any of the following:
1. Generally, disruptive behavior is any behavior that inhibits a faculty member or TA's ability to conduct class or limits other students' ability to benefit from instruction.
2. Conduct, speech or activity that interferes with the learning activities of other students.

Behaviors that can be disruptive are chatting and whispering during class, the use of electronic equipment, reading the paper during class, preparing to leave before class is over, and consistently arriving late to class. ***Please*** keep these disruptions to an absolute minimum." ***Inappropriate behavior in the classroom may result in a request to leave the class and/or a referral to an appropriate administrative office.***
"Note: It is important to remember that emotional and/or mental distress, or psychological disorders are not legitimate excuses for disruptive behavior in the classroom or in an academic setting. Disability claims and accommodations should be discussed with the Center for Educational Access (CEA) at 575-3104. There are established procedures that should be followed if reasonable accommodations are required."

Emergency Procedures:
Many types of emergencies can occur on campus; instructions for specific emergencies such as severe weather, active shooter, or fire can be found at **emergency.uark.edu**.

Severe Weather (Tornado Warning):
Follow the directions of the instructor or emergency personnel. Seek shelter in the basement or interior room or hallway on the lowest floor, putting as many walls as possible between you and the outside. If you are in a multi-story building, and you cannot get to the lowest floor, pick a hallway in the center of the building. Stay in the center of the room, away from exterior walls, windows, and doors

Violence/Active Shooter (CADD):
CALL- 9-1-1. **AVOID-** If possible, self-evacuate to a safe area outside the building. Follow directions of police. **DENY-** Barricade the door with desk, chairs, or any items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police it's safe. **DEFEND-** Use chairs, desks, cell phones or whatever is immediately available to distract and/or defend yourself and others from attack.

Projected Schedule for FDSC 4754

Unit 1, Mass & Energy Balances, Drying

Week 1	Syllabus; Introduction to dimensions, units, mass/force relationships; Symbols and definitions
Week 2	Mass balances: approach, wet/dry basis MC Mass balance example problems
Week 3	Energy balance; combined mass and energy balances Combined mass and energy balance example problems Steam tables: Explanation and use; steam table application;
Week 4	Introduction to psychrometrics; Psychrometric processes: wet bulb temperature, heating, cooling, adiabatic saturation Equilibrium moisture content: definition and relationships Drying: constant rate and falling rate regions, thin layer drying equation
Week 5	Grain drying calculations using the psychrometric chart **Exam 1** Review of exam 1

Unit 2, Heat Transfer

Week 6	Thermal properties of foods Basic overview of heat transfer modes Concept of resistance for calculating heat transfer Conduction: Heat transfer in rectangular plane wall, radial and multilayered systems
Week 7	Convection heat transfer: Estimation of convective heat transfer coefficient Example problems Overall heat transfer coefficient
Week 8	Radiation heat transfer Thermal sterilization of foods

	Heat exchanger overview
Week 9	Unsteady-state heat transfer—lumped capacitance
	Unsteady-state heat transfer—Heisler charts
	Superposition principle for finite dimensional objects: example of computing center of can temperature
Week 10	**Exam 2**
	Review of Exam 2

Unit 3, Fluid Flow

Week 11	Classification of fluids and flows: Reynolds No., mass/volumetric flow relationships
	Energy components of fluid flow
	Mechanical energy balance of fluid flow: Bernoulli's Equ.
Week 12	Pump and system characteristic curves
	Pumping system analysis: pump sizing problem
	Development of viscosity: Newton's viscosity law
Week 13	Non-Newtonian fluids
	Considerations for pumping non-Newtonian fluids.
	Exam 3

Unit 4, Refrigeration

Week 14	Introduction to vapor compression and other cooling systems
	Introduction to the Mollier diagram
	Application of the Mollier diagram to vapor compression systems
Week 15	Refrigeration system calculations
	Freezing load calculations
	Wrap up of refrigeration and semester review

Final Exam