ANFS443 - Food Engineering Technology
Syllabus, Spring 2015

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Lecture:	002 Townsend Hall; 11:00AM - 12:15PM TuTh
Laboratory:	202 Worrilow Hall or 007 Townsend hall; 12:45PM - 3:15PM Tu

Required Textbook: Singh, R.P. and Heldman, D.R. 2009. Introduction to Food Engineering. 4th Edition. Academic Press, Inc.

Attendance Policy, Homework, and Exams

Class and laboratory attendance is critical to your academic success, and it is a policy of the university. Homework will be assigned every one or two weeks on Thursday lecture and will be due next Thursday at the beginning of the lecture. Solutions sets to each homework assignment will be provided after the homework is graded. Late homework will not be accepted. There are two midterm exams and one final exam. Failure to take an exam will result in a zero score for that exam. Makeup exams will not be administered without an acceptable excuse.

Grading System

Homework problems	15%
Laboratory Reports	20%
Quizzes (4)	10%
Midterm Exams (17.5% each)	35%
Final Exam	20%
Total	100%

Course letter grade assignment based on the total points: A: 93.0 - 100 %; A-: 90.0 – 92.9 %; B+: 87.0 – 89.9 %; B: 83.0 – 86.9 %; B-: 80.0 – 82.9 %; C+: 77.0 – 79.9 %; C: 70.0 – 76.9 %; D: 60.0 – 69.9 %; F: < 60.0 %.

Academic Integrity

All students are expected to adhere to the Student Code of Conduct and conduct themselves with the highest academic integrity.

Lecture Topics

Topic	Reading
Introduction a. Engineering units and dimensional analysis b. Laws of thermodynamics c. Principles of mass and energy balances	pp. 1-64, 237-241
Viscosity a. Definition and measurement b. Newtonian and non-Newtonian liquids	pp. 71-81, 148-161
Heat transfer in food processing a. Thermal properties of foods b. Modes of heat transfer c. Steady-state heat transfer d. Unsteady-state heat transfer e. Heat exchangers	pp. 84-90, 247-401
Psychrometrics a. Properties of dry air, water vapor, and air-vapor mixtures b. Psychrometric chart	pp. 571-593
Preservation processes a. D and z values b. Thermal death time F c. Method for process calculation	pp. 403-453
Refrigeration a. Components of a refrigeration system b. Pressure-enthalpy charts c. Coefficient of performance	pp. 455-499
Food freezing a. Freezing systems b. Freezing-time prediction	pp. 501-541

Laboratory Notebook

Throughout the course, you will be required to keep a laboratory notebook. For each experiment include the following information:

1. Title of the experiment.
2. Date the experiment was started.
3. Objective or Purpose - In 2 or 3 sentences explain exactly what you intend to accomplish by performing this experiment.
4. Procedure: Reference the procedure given in the laboratory handout. Be sure to clearly note any changes in the experimental procedure in your laboratory notebook.
5. Observations and Notes: What went right or wrong during the experiment. What factors would you change if the experiment were repeated?
6. Raw Data: Record all your original data in the notebook.

Laboratory Reports

Lab reports are due in class (lecture) on next Tuesday following the lab exercise. Late reports will receive a 20% reduction in points during the week following the due date of the lab. Beyond that time, the lab will not be accepted. Bring with you to the lab sessions a USB flash drive to store data and spreadsheets on.

Laboratory reports for this course must be typed. Note that neatness and spelling and grammar count. The reports should include the following information:

1. The title of the experiment
2. Your name and the names of your lab partners
3. Date submitted
4. Experimental results
5. Sample calculations
6. A brief discussion of your results
7. Answers to questions found in the laboratory handout

Results will be requested in either tabular or graphical format. When calculations are required, show one example of each type of calculation for each question below the table or figure.

Tables. Number each table in sequence and give each table a title. Be sure and show units in the headings. When appropriate, summarize the data and calculate mean and standard deviations.

Figures. Number each figure in sequence and give each figure a title. Be sure to label each axis.

Note: The glassware and equipment used in experiments is to be cleaned and returned at the end of each laboratory period. Please help to maintain a clean work area.

Laboratory Safety

1. Eye protection is required at all times in the laboratory.
2. Dress appropriately. No one will be allowed to work in the laboratory with shorts, short skirts, or open-toed shoes. If you wear contact lenses, it would be a good idea to take them out before lab. Long hair should be tied back out of the way.
3. Do not work in the laboratory alone or when the instructor or a TA is not present.
4. Never eat or drink in the laboratory.
5. No mouth pipetting in the laboratory.
6. Inform the instructor of all spills and accidents in the laboratory, no matter how minor.
7. **Read the directions before you start.**

Laboratory Schedule

Date	Laboratory	Topic	Location
2/10/2015	Lab1	Data processing and analysis	007 TNS
2/17/2015	Lab2	Temperature measurement and calibration	202 Worrilow
2/24/2015	Lab3	Rheological properties of fluid foods	202 Worrilow
3/3/2015	Lab4	Specific heat of foods	202 Worrilow
3/10/2015		Exam 1	202 Worrilow
3/17/2015	Lab5	Heat Transfer - Excel application	007 TNS
3/24/2015	Lab6	Convective heat transfer coefficient estimation - Excel application	007 TNS
3/31/2015	Spring break		
4/7/2015	Lab7	Convective heat transfer coefficient determination	202 Worrilow
4/14/2015		Exam 2	202 Worrilow
4/21/2015	Lab8	Psychrometrics calculation - Excel application	007 TNS
4/28/2015	Lab9	Thermal inactivation of *Escherichia coli*	202 Worrilow
5/5/2015	Lab10	Thermal processing of foods	202 Worrilow
5/12/2015	Lab11	Freezing of foods	202 Worrilow

Program Student Learning Outcomes

- Students will demonstrate written communication skills important for communicating scientific ideas.
- Students will use critical thinking and reasoning, skeptical inquiry and scientific approach to solve problems.
- Students will demonstrate knowledge of the major core concepts in food science.
- Students will be able to work and learn both independently and collaboratively.

Course Student Learning Outcomes

- Understand the basic principles of mass and energy balances and able to apply them in food processing.
- Understand the basic concepts of rheology and measurement of viscosity.
- Understand the different modes of heat transfer and conduct basic heat transfer calculations.
- Understand the principle of thermal processing. Be able to calculate D, z, thermal death time and thermal lethality.
- Understand principles of refrigeration. Be able to identify the major components of a refrigeration system and conduct refrigeration calculations.
- Understand different freezing systems and predict freezing time.
- Understand principles of psychrometrics. Be able to use a psychrometric chart and mathematical equations to identify and calculate different properties of air-water vapor mixtures.