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


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

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

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