Principles of Food Science 11:400:201
Fall, 2010

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schaich@aesop.rutgers.edu

General Information

Course Web site: http://sakai.rutgers.edu/11-400-201

Learning Goals:

1. Gain an overview of Food Science and its interdisciplinary nature in an introduction to:
   -- common food systems, their composition, behavior, and uses
   -- fundamental molecules (water, proteins, lipids, carbohydrates) that provide the structure, function, and
     chemical/physical properties of foods
   -- microbiology and biotechnology in food systems.
   -- physical, chemical and microbial forms of food deterioration and preservation
   -- various forms of processing used for food preservation and their effects on food quality.

2. Develop a fundamental working knowledge of basic concepts in food science.

3. Develop critical thinking and problem solving skills and ability to apply working knowledge to real life
   situations (see pages 6-7).

4. Become familiar with food science literature and information resources.

Course materials:

Course notes, worksheets, exams, and support materials: Available on Rutgers Sakai website:
https://sakai.rutgers.edu

Most of the lectures and exercises are already on the website, some will be loaded onto the website
throughout the semester, along with other useful references. Watch for notices about changes.

It is strongly recommended that students supplement the Notes by reading additional reference materials on
Sakai and in the library in preparing for discussions.

A large number of relevant books, journals, and other references are available in Chang Library.
See especially Encyclopedia of Food Science and Technology.
Food Science and Technology Abstracts
Agricola, Web of Science, ScienceDirect, SciFinder Scholar data bases for lit searches

An excellent book explaining some of the science underlying food behaviors is On Food and Cooking: the
Science and Lore of the Kitchen by Harold McGee (First edition is now available in paperback for under $10).

Other suggestions for general learning: watch Alton Brown’s show, Good Eats, on the Food Network.

You may earn extra credit points by reading outside materials or watching relevant food programs, etc. then
writing a report. The template for the reports is included on page 4 of this syllabus.
Course Structure and Grading Basis:

Course Philosophy: Three R's of learning – Respect, Responsibility, and Reward

Respect – mutual: LEARNING IS A TEAM EFFORT. Professors respect students as individuals with different backgrounds and different ways of learning, having common goal of mastering material of course on the way to becoming professionals.

Students respect knowledge and commitment of professors, as well as courage to try many different ways to foster student learning and provide learning experiences that are interesting and challenging.

Responsibility – mutual: Professors provide interesting materials and exercises and treat students fairly and with consideration.

Students assume responsibility for studying course materials before class, coming to class on time and regularly, and taking initiative to read beyond the limited assigned readings, particularly when they find topics of personal interest.

Reward – mutual: students feel accomplishment in learning (and hopefully earn good grades) and professors see positive results of their efforts when students can actually apply course information creatively and to solve problems.

Course format:

To encourage learning rather than memorization, this course replaces in-class exams with pre-unit worksheets designed to introduce key concepts and teach you indirectly how to recognize what is most important in course notes. Fundamental concepts covered in the Worksheets will provide the base for later discussions in case studies and applications in class. These worksheets are due at the first lecture of the unit, as indicated on the course schedule. The worksheets vary in point value depending on material covered, 5 points will be deducted per day for late submissions.

Attendance at all classes is expected. Class periods in each unit will apply the fundamental information in class notes to various food systems or food situations. Discussions and case studies in class will examine in more depth material not necessarily covered in the course packet or on exams. Applications will be in various forms, including case studies, demonstrations, discussions, audiovisuals, etc. Most class sessions will have a response exercise (10 points) at the end to recap and reinforce key points of the application and evaluate effectiveness of the exercise. These exercises are 35% of your grade.

Active participation in class discussions will be critical for learning. Each student will be asked to grade his/her self on class participation at the end of the semester. This score will be averaged with professor evaluations for the 10% class participation points of your grade.

Students are encouraged to keep a journal with notes from class or outside readings, background explanations, extra information that may be useful in the case studies, etc. Journals (but no other outside materials) may be consulted on in-class exams and discussion responses.

Students must write an 800-word paper in format for submission to the IFT writing contest; it may be submitted at any time during the semester, but the absolute deadline is the last lecture of class. Papers should focus on communicating some important issue in food science to the general public. Guidelines for the paper are included in the course packet and will be posted on the website. Dr. Schaich is available for discussing the structure and contents of these papers.

The final exam is a take-home application question requiring integration of information from the entire semester.

Grade basis:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Worksheets and</td>
<td>35%</td>
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<tr>
<td>Class exercises</td>
<td>35%</td>
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<tr>
<td>Final</td>
<td>15%</td>
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<tr>
<td>Essay</td>
<td>5%</td>
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<tr>
<td>Class participation</td>
<td>10%</td>
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</tbody>
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# Class Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Assignment</th>
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<tbody>
<tr>
<td>SEPT. 2</td>
<td>Course Introduction and requirements, Overview of Food Science</td>
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<tr>
<td>7</td>
<td>Water properties and importance in foods</td>
<td>Worksheet 1</td>
</tr>
<tr>
<td>9</td>
<td>Case study/discussion -- water</td>
<td></td>
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<tr>
<td>14</td>
<td>Acids, bases, and pH in foods</td>
<td>Worksheet 2</td>
</tr>
<tr>
<td>16</td>
<td>Case study/discussion -- pH</td>
<td></td>
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<tr>
<td>21</td>
<td>Proteins -- structures, functions and reactions in foods</td>
<td>Worksheet 3</td>
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<tr>
<td>23</td>
<td>Case study/discussion -- protein foods</td>
<td></td>
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<tr>
<td>28</td>
<td>Case study/discussion -- protein functions in foods</td>
<td>Worksheet 4</td>
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<tr>
<td>30</td>
<td>Case study/discussion -- enzymes</td>
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<tr>
<td>OCT. 5</td>
<td>Carbohydrates -- structures, functions and reactions in foods</td>
<td>Worksheet 5</td>
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<tr>
<td>7</td>
<td>Case study/discussion -- sugars</td>
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<tr>
<td>12</td>
<td>Case study/discussion -- starches</td>
<td>Worksheet 6</td>
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<tr>
<td>14</td>
<td>Case study/discussion -- gums</td>
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<tr>
<td>19</td>
<td>Lipids -- structures, functions and reactions in foods</td>
<td>Worksheet 7</td>
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<td>21</td>
<td>Case study/discussion -- melting pt and crystallization</td>
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<td>26</td>
<td>Case study/discussion -- modification and degradative reactions</td>
<td>Worksheet 8</td>
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<tr>
<td>28</td>
<td>Case study/discussion -- emulsions</td>
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<td>NOV. 2</td>
<td>Browning reactions in food</td>
<td>Worksheet 9</td>
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<td>4</td>
<td>Microbiology -- Microbial growth and spoilage</td>
<td>Worksheet 10</td>
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<td>9</td>
<td>Microbial growth and spoilage</td>
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<td>11</td>
<td>Pathogens</td>
<td>Worksheet 11</td>
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<tr>
<td>16</td>
<td>Food fermentations</td>
<td>Worksheet 12</td>
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<tr>
<td>18</td>
<td>Biotechnology and Toxicology</td>
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<tr>
<td>23</td>
<td>Engineering and Processing -- unit operations</td>
<td>Worksheet 13</td>
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<tr>
<td>30</td>
<td>Goals and challenges of food preservation</td>
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<tr>
<td></td>
<td>Preservation by dehydration</td>
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<tr>
<td>DEC. 2</td>
<td>Preservation by heat and freezing</td>
<td>Worksheet 14</td>
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<tr>
<td>7</td>
<td>Preservation by chemicals</td>
<td></td>
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<tr>
<td>9</td>
<td>Preservation by novel methods -- radiation, high pressure, ohmic,</td>
<td>Final out</td>
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<td>Essay due</td>
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<tr>
<td>17</td>
<td>Final exam due 4:30 PM Fd Sci 315 or 107 (Karen Ratzan)</td>
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Template for Extra Credit Projects

Title of article, resource, or program:

Author and Source:

General overview of content:

Relationship of resource to general or specific material in Principles of Food Science course:

What you learned from this resource:

Most interesting feature of resource and why:

Problem aspects of resource and why:

Would you recommend this resource to other students? Why or why not?
Go to http://sakai.rutgers.edu.

Log in with your eden user name and password.

(recipe information must be provided to Teaching Asst. Peng to add permissions to the website)

All the course sites of which you are a member will be shown on individual tabs.

Click on 11:400:201 (or 11:400:202 for the lab).

Click on the topics in the left-hand margin to find:
- course announcements (including class closing or time changes)
- schedule of lectures and assignments
- modules with lectures for each section
- resources on each course topic (lots of reference material)
- reviews and thinking questions
- grades (you have access only to your own)
- chat room and discussion sites
Goal 1 of this course:
Learn to think of foods as molecules rather than something you eat or cook with.

SCHAICH'S LAW

FOODS ARE NOT BLACK BOXES --

TREATMENT

×

BEHAVIOR

They behave according to fundamental laws of CHEMISTRY and PHYSICS!

If you want to understand and control food properties and characteristics,

you must first identify the underlying chemistry responsible for each property of interest.

Then you can use and manipulate that chemistry to your advantage.
Goal 2 of this course: Learn to think and reason with information rather than just memorize facts.

Schaich’s Active Learning Process

INFORMATION / DATA → THINK!!! → NO INFO / DATA

REASON (INSUFFICIENT INFORMATION) → QUESTION
CONNECT
INTEGRATE
EXTRAPOLATE
EVALUATE

ACT!!!

SOLVE A PROBLEM
CREATE SOMETHING NEW

Use this process to help you become aware of the complexities involved in learning and make learning a mindful, conscious process.