

## Food Chemistry ANFS 428/628 (4 cr)

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Class meeting times: Mon, Wed, Fri, 11:10 am – 12:05pm  
Lab meeting time: Mon 12:20-1:50 pm  
Office hours: Tue 1-2 pm or email for appointment

### Textbook and references:

Fennema's Food Chemistry, 4th edition, by Damodaran, Parkin, Fennema  
Principle of Food Chemistry, 3rd Edition by DeMan, John M.  
The Food Chemistry Laboratory, 2<sup>nd</sup> edition by Weaver, Connie M and James R. Daniel

### Course Summary

The course is intended to give students an overview of the chemical and physical properties of the major and minor food components and their changes during processing, handling and storage. The course will cover water, carbohydrates, protein, lipids, minerals, vitamins and enzymes. In addition, color, flavor, and additives will be discussed. There will be an emphasis on the applied aspects of food chemistry with the help of real-world examples, and lab experiments. Problem-based learning, group work, and lab experiments will be integrated into the course to help students to apply scientific principles to understanding the chemical properties of foods.

### Course Objectives and Student Learning Goals

1. Use food chemistry knowledge to determine the major change in color, flavor, texture and nutritive value during food processing, handling and storage  
ANFS Learning Goals: “critical thinking” and “knowledge of core concepts in Animal and Food Sciences”
2. Solve simple problems concerning chemical properties of major food components  
ANFS Learning Goals: “Students will use critical thinking and reasoning, skeptical inquiry and scientific approach to solve problems”
3. Demonstrate oral and written communication skills to effectively communicate scientific ideas related with food chemistry  
ANFS Learning Goals: “Students will demonstrate oral communication skills important for communicating scientific ideas” and “Students will demonstrate written communication skills important for communicating scientific ideas”

Note: The Department of Animal and Food Sciences assessment learning program can be found at <http://canr.udel.edu/anfs/policies-committees/>.

### Laboratory Safety

Protective eyewear is required (must provide own). Lab coats (must provide own) and gloves (provided) will be required for exercises as indicated by instructors. No open-toe shoes or shorts are permitted. Report all accidents to the instructor. Clean up any spills immediately.

### **Academic Honesty**

Academic dishonesty in any form will not be tolerated. Please familiarize yourself with the University's Policy on Academic Honesty found in the *Student Guide to University Policies* (<http://www.udel.edu/stuguide/14-15/code.html>). The content of the guide applies to this course. Responsible computing guidelines can be found at <http://www.udel.edu/stuguide/14-15/code.html>.

### **Code of Conduct**

Guidelines for appropriate conduct can be found at <http://www.udel.edu/stuguide/14-15/code.html>. Electronic devices should be turned off and not accessed during class, including cellular phones, pagers, and personal digital assistants. Class attendance is required.

### **Disability Statement**

Any student who thinks s/he has a need for accommodation based upon the impact of a disability should contact the professor as soon as possible. You should also contact the Office of Disabilities Support Services (<http://www.udel.edu/DSS/>) to coordinate appropriate accommodations.

### **Grade Scale**

Straight arithmetic average with 100-93 an A, 92-90 an A-, 89-88 a B+, 87-83 a B, 82-80 a B-, 79-78 a C+, 77-73 a C, 72-70 a C-, 69-68 a D+, 67-63 a D, 62-60 a D-, 59 and below an F. *Attendance is required. Points will be deducted from late work at a rate of 10% per day. Students are responsible for informing the instructor of absences and obtaining missed material.*

<b>Assignments and Exams</b>	<b>Percentage of Total Grade</b>
Assignments - All weighted equally Includes case studies, quizzes, or other as indicated by instructor	25
Class attendance and engagement	10
Lab assistance and engagement	15
Midterm Exam	15
Final Exam	20
Project and Poster	15

### **Assignments (25%)**

Assignments of various formats will be given. These may include class discussion, quizzes, or other formats as assigned by the instructor. Assignments will be due one week from the time the assignments are given. Assignments will be submitted online in Sakai before due date unless notified differently. Late assignments will only be accepted with good reason, and **points will be deducted from late work at a rate of 10% per day**. Students are responsible for informing the instructor of absences and obtaining missed material.

### **Class attendance and engagement (10%)**

Because this class is taught using constructivist theory, your attendance in class and lab is essential. Constructivist theory says that the learner constructs his/her knowledge from experiences, reading, etc. in and outside the classroom. In order to learn the maximum amount and perform well on assignments in this course, the learner has to be present for the in-class experiences. In addition, the learner needs to bring a desire to learn to the experience. I will try to help motivate you, but in the end, you must **WANT** to learn to maximize the experience. We want you to become “life long active learners”. Because it is impossible to duplicate an entire class session just for you, the only way to stay fully informed is to attend class.

You are required to actively participate in group discussions and other in-class exercises. Roll will be taken by participation and engagement in group discussions and other in-class activities. Please notify me in advance if you will need to be absent from class. If you *are not* in class, you are *absent*. The *exception* will be times that the University of Delaware campus is closed by the University administration or other emergency situation. In such a case, absences will not count. If you have a unique and urgent situation, the instructor will work with you individually. You will need to document the absence in such a case. You might have up to three excused absence in an entire semester, depending on your individual situation.

The grading of your active participation in group discussion and other in-class exercises are shown as below, all of which counts for class attendance (10 % of total course grade):

<b>Class Activities</b>	<b>Total number in a semester</b>	<b>Percentage of Total Course Grade</b>
Group discussion or online posting	10	0.8 % for each participation and sharing in a class
Pre-class assessment	1	1 %
Engagement in other types of class activities	10	0.1 % for each class, in your best efforts

### **Lab assistance and engagement (15%)**

#### **Lab assistance (5%)**

Lab attendance is required. Actively participate and engage in all the lab activities during the assigned lab periods. Assist with lab instructor and Teaching assistant to set up and clean the lab space as needed. Electronic devices should be turned off and not accessed during lab sections, including cellular phones and personal digital assistants.

### Lab assignments and lab reports (10%)

Lab assignments including pre-lab or post-lab questions should be submitted before due date. Post-lab assignments or lab reports will be due one week from completion of lab exercise unless notified otherwise. ***Late submission of assignments will not be accepted.***

The required lab reports (Lab 3 and 4) must follow the listed format. Lab reports should include the following sections: abstract, objectives, methodology, results and discussion, conclusions, and references. The abstract should be a maximum of 300 words and include a statement on the importance of the topic, the objective(s) of the study, methods, major results, and conclusions. The Objective section (one to two sentences) should state the aim, (i.e. what is to be learned/tested), in conducting the experiment. The Methodology section should provide enough detail on the materials and procedures used for a laboratory worker to be able to repeat the experiment. Any additional information about individual samples and/or calculations used must be added. The Results and Discussion section should include calculated data and any figures or tables that present the data succinctly. The text of the results should be a summary rather than a complete reiteration of all data presented in the figures and tables. The discussion should not repeat the results but rather include thoughts on how the experiment addressed the objective, any hypotheses, and its contribution to understanding a food system, an analyte, or analytical method. The conclusion should be one to two sentences on the implications of the findings. References used in preparation of the lab report must be cited in the text and listed in the reference section according to the Institute of Food Technologists *Journal of Food Science* Style Guide. Please refer to lab report rubrics for additional grading expectations.

### **Midterm Exam (15%)**

The midterm exam will include material covered up to the exam. Exam format may include multiple choice, short answer, calculations, graphing, and essays.

### **Final Exam (20%)**

The final exam will be cumulative but with emphasis on material not covered in the previous exams. Exam format may include multiple choice, short answer, calculations, graphing, and essays. Makeup exams will not be given unless an exam is missed for reasons documented from your dean's office (illness, personal tragedy, or university business). The final exam is mandatory. All students must take the final exam to receive a grade in the course.

### **Project and Poster (15%)**

#### **Project (10%)**

This is semester-long group project focused on replacing a food component in a self-selected food product. Select a problem for your individual or group project as soon as possible, and have your topic and methods approved by the instructor. Develop a testable hypothesis with clearly identified independent and dependent variable. Apply the principles of the scientific method in approaching your problem. To help you keep on target on project, there are three milestones. Each is a written report outlining the problem and the progress and future direction of the project. Written report must be typed, spell –checked and neat. Use a technical writing style. Avoid use of first person, colloquial and literary styles. The emphasis of each report is different. For example, the first report will be mostly literature review and planned experiments. There will be very little data analysis, if any.

Report #1 will include:

1. **Title**
2. **Hypothesis and objectives**
3. **Background:** review the literature and establish what is known and what gaps remain to answer your question. Include a justification for studying your problem. Justify your dependent variables. Is there a logical relationship between the dependent and independent variables? Justify the methods you selected. Are they standard procedures? Give the purpose of your project.
4. **Approach:** Give methods-what you plan to do and how. Be specific. Include procedures and recipes and their source. Quantities of ingredients must be in metric units (e.g. grams, milliliters). If you are doing sensory evaluation, include an example of your scorecard and describe your panel. How do you plan to control variables other than the one tested. For example, variation within a food sample, temperature, mixing procedure, size of product, sample preparation required for testing, etc? Show that you thought through the problem.
5. **Work plan:** plan each step-what you are going to do each week and preparation required prior to the laboratory period. Plan to replicate as time allows, preferably three times
6. **Supplies needed:** Turn in supply sheets and market orders with your proposal. List item and amount and when needed along with any specifications (brand, etc). For some materials, it is beneficial to have the same lot or variety for replicate, so enough should be ordered at one time for the entire project. Perishable items must be ordered as needed. Prepare a separate supply order form for each day that you wish to receive materials and date the order form for the date you wish to receive the items.

Report #2 and #3 will include:

1. **Abstract:** one paragraph summary of problem, methods, main findings and significance of work (take-home message).
2. **Introduction:** this section should state the problem being studied with sufficient background so reader can fully understand the project. This will likely require a discussion of a chemical process learned in a class such as starch gelatinization, oxidative rancidity (with reactions), etc. This section may also include a review of methods available to test your dependent variable and explanation for your selected approach. This section should include a statement of the purpose of the project including specific independent and dependent variables.
3. **Methods:**
  - 1) Subheading will help.
  - 2) Give your overall design then specific procedures/assays/formulas.
  - 3) Include your sensory scorecard where appropriate.
  - 4) Give the sufficient detail so that the project could be repeated by someone else (e.g. include settings/probes for texture analyzer, any important temperature or pH controls, equipment type, sample preparation, etc).
  - 5) Discuss replications, randomization, and sampling.
4. **Results:** summarize data in tables and figures using complete titles that can be understood without reference to the text (including type of product if relevant). The text must refer to each table and figure, and tables and figures must be numbered sequentially.

5. **Discussion:**

- 1) If calculations are used in creating data, sample calculations should be provided here or in the appendix. If standard curves are used, include figure or correlation coefficient and p value.
- 2) Give the specific and literature-based explanations and potential sources of error in interpreting results. Discussion without sufficient citations from the literature will result in substantial point deductions.
- 3) Give your take-home message. The reader should be able to determine whether your project was successful.
- 4) Give suggestion for further work

6. **Reference:** References must be cited in the text and listed in the reference section according to the Institute of Food Technologists *Journal of Food Science* Style Guide (<http://members.ift.org/IFT/Pubs/JournalofFoodSci/jfsauthorinfo/jfsstyleguide.htm>). Avoid direct quotations of references, paraphrase sources—do not plagiarize! Limited use of general textbook is acceptable. Emphasize original journal articles. The literature available on the selected topic should be well represented.

Report #3 should clearly indicate the difference from the Report #2, whether the work presented is the repeat or modification of work presented in Report #2 should be clearly stated in Abstract, Introduction and Discussion of Report #3.

**Poster (5%)**

**To present information to your instructor and classmates on one food component regarding its chemical properties and associated functionality or its change during food handling, processing, and storage, a poster will be prepared related with your topics in class project. Poster will be prepared with your lab partner, and only one poster is required for each team.**

**Poster** should be 2-3 feet wide by 4-5 feet high, and the main message should be easy to understand. Templates will be posted on Sakai. Poster will be presented at the last day of class, and the presentations will be evaluated for content, style, and demonstration of knowledge (evaluation form included in syllabus). Evaluations will be given by classmates and instructors, with instructor evaluations twice the weight of student evaluations.

To prepare your poster, please follow the instructions:

1. Poster should be 2-3 feet wide by 4-5 feet high
2. Poster should include:
  - (1) **Title** which is scientific in format and should reflect the work being discussed on the poster
  - (2) **Author's name and affiliation**
  - (3) **Abstract** which should be no longer than 300 words and address the following: the topic to be addressed, why the topic is important for the food industry, the objective of the presentation, and highlights of the specific topics to be included in the presentation.
  - (4) **Introduction** which explains the purpose of your poster and explain the background related with your results and discussion.
  - (5) **Materials and Methods** which briefly explain the major procedures and analytical methods related with your results

- (6) **Results:** use as many pictures, graphics, and tables as you can to explain your results; use statistical analysis wherever possible; keep text brief.
- (7) **Discussion/Conclusion**
- (8) **Reference** (no more than 5 reference and follow the reference format of *Journal of Food Science Style Guide* at the end of this syllabus)
- (9) Any acknowledgements

### Course Schedule

*Topics and exam dates are subject to change with advanced notice.*

Lecture 1	Introduction
<b>Lab</b>	<i>lab orientation</i>
<b>No class</b>	<b>Labor day</b>
Lecture 2	Water
<b>Project</b>	project brainstorming
<b>Lab 1</b>	<i>water activity</i>
Lecture 3	Carbohydrates
<b>Project</b>	<b>Project report #1</b>
<b>Lab 2</b>	<i>Properties of carbohydrates, Work on project</i>
Lecture 4	Lipids
<b>Lab 1</b> (cont.)	<i>water activity, Work on project</i>
<b>Case study</b>	<i>Class discussion on trans fat</i>
<b>Mid-term Exam</b>	<b>Water, carbohydrates, Lipids</b>
<b>Lab 3</b>	<i>Effect of sweeteners on cookies</i>
Lecture 5	Proteins
Lecture 6	Enzymes
<b>Project</b>	<b>Project report #2</b>
Lecture 7	Vitamins
<b>Lab 4</b>	<i>Protein functionality</i>
Lecture 8	Minerals
Lecture 9	Additives
Lecture 10	Color
Lecture 11	Flavor
<b>Project</b>	<b>Project report #3</b>
Lecture 12	Bioactive Substance and Toxin
<b>No Class</b>	<b>Thanksgiving Break</b>
Last week of semester	Poster presentation , Review class
Final Exam	

## Food Chemistry Evaluation of Poster Presentation

Name of Presenter \_\_\_\_\_

Please give your evaluation of the presentation in the following categories by circling a number below (0 = very unsatisfactory; 10 = outstanding).

Content	Your Rating	% of Final Points
How well was the issue (topic) <u>introduced</u> ? Was sufficient <u>background</u> information provided?	1 2 3 4 5 6 7 8 9 10	10
Was the issue discussed in <u>sufficient detail</u> so that the magnitude of the problem became clear? How well did the <u>content</u> of the presentation reflect your expectations?	1 2 3 4 5 6 7 8 9 10	20
How <u>clearly</u> was the information conveyed? Did the presentation contain any confusing statements?	1 2 3 4 5 6 7 8 9 10	10
Were the conclusions justified by the information presented?	1 2 3 4 5 6 7 8 9 10	10
<b>Style</b>		
How well was the poster done? (readable, without distractions, typos and grammatical errors)	1 2 3 4 5 6 7 8 9 10	20
How would you rate the presenter? (Audible, confident, response to questions, etc.)	1 2 3 4 5 6 7 8 9 10	20
<b>Knowledge</b>		
How well did the presenter know his/her material?	1 2 3 4 5 6 7 8 9 10	10

Any question did you ask the presenter? How did the presenter response? (10 bonus points)

**Very Important:** Please write down any comments about the presentation and/or the presenter: