FOOD 3001 FOOD CHEMISTRY Fall 2023

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Description:
This course deals with the structure, properties, composition and reactions of food constituents. It is an application of fundamental laws and concepts of chemistry to properties that account for flavour, texture, colour, stability, and nutritional values of foods. Emphasis will be on mechanisms those reactions that involve carbohydrates, proteins, lipids, and pigments.

Format: This course includes

- In class lectures Wednesdays and Fridays **4:00-5:30 pm, Room: 280 Nideyinàn (former University Centre)**
- Learning activities in class and on Brightspace

Laboratory

- Perform experiments
- Write a report for each lab
- Pre-lab questions

The lecture and the lab components support one another, and both prepare students to meet the required learning outcomes and, thus, to achieve a passing grade in this course.

S**tudents' responsibility:** Make sure you do any required reading, complete required leaning assignment and tests by each deadline.

Learning Outcomes:
By completing this course, you will

1. Describe the importance of water in foods and its effect on the quality of foods
    a. Define the physical state of water and illustrate phase diagrams
    b. Describe the different types of water present in foods
    c. Calculate the water available in foods
    d. Explain how water present in foods affect chemical reactions and quality of foods
2. Describe structures, chemical properties, and reactions of major food components
    a. Draw the structures of carbohydrates, proteins and lipids
    b. Classify nutrients in groups based on chemical and physical properties
    c. Demonstrate proficiency in the use of chemical reactions to explain changes in nutritional quality, texture, colour, and flavors of foods under various conditions

3. Demonstrate knowledge of the use of additives in foods
    a. Describe the rationale behind the use of additives and the way they can affect food attributes
    b. Elucidate chemical reactions of additives with food components
    c. Discuss health and safety that may be associated with food additives
4. Demonstrate basic knowledge and understanding of the application of enzymes in foods
    a. Describe the classification of enzymes based on chemical reactions that they catalyze
    b. Explain the effect of enzymes on food quality
    c. Calculate the enzyme activity and enzymatic reaction rates
    d. Elucidate the chemical and physical parameters affecting enzymes reactions

5. Conduct appropriate laboratory experiments common to basic and applied food chemistry, and interpret results.
    a. Work cooperatively in a team to solve a food chemistry problem by conducting experiments, analyzing and interpreting the data.
    b. Demonstrate analytical proficiency to obtain accurate data
    c. Write chemical reactions that account for change observed
    d. Proficiently and safety use laboratory instruments
6. Analyze data obtained from food chemistry laboratory experiments
    a. Apply appropriate calculations to data to explain physical or chemical changes to foods
    b. Present results in the form of graphs or tables
7. Clearly communicate research results using appropriate written and visual communication techniques (Laboratory experiment reports)

Pre-requisites:
For taking this course are FOOD 2001, CHEM 2203 (Organic Chemistry), BIOC 2200 (Cell Physiology and Biochemistry), BIOL 2303 (Microbiology)

Evaluation:
Course content will be tested through assignments mid-term and final exams. They will focus on lecture material, including questions and discussions in class. Final grades will be assigned as follows: A+ ≥ 90%, A ≥ 85%, A- ≥80% B+ ≥ 77% B ≥ 73%, B- ≥ 70% C+ ≥ 67% C ≥ 63%, C- ≥60, D+ ≥ 57%, D ≥ 53, D- ≥ 50%, and F <50%.

COMPONENT	GRADE VALUE
ASSIGNMENT 1	20%
MIDTERM EXAM	20%
EXAM COMPREHENSIVE	30%
LABORATORY REPORTS	30%

Assignment: Effect of processing on the chemistry and quality of foods. Chemical reactions involving simple sugars, construction and interpretation of moisture sorption isotherms, chemistry of physical and chemical modified polysaccharides, chemistry and reactions involving food proteins.

Exams
Enzymatic reactions (chemistry, kinetic), identify food colorants and their possible modifications under various conditions, lipid structures and their chemical reactions, chemistry of methods to characterize, lipids, proteins, or polysaccharides, chemistry and molecular mechanisms of flavoring molecules.

If you are unable to complete an assignment or test due to medical reasons (medical certificate required) or compassionate reasons, please contact the instructor. In these circumstances, the instructor will make arrangements for an extension for the assignment or another date for writing the test.

If you do not attend the final exam, contact your Student Advisor or Carleton Exam Services for procedures for deferred exams.

Recommended textbook:
Food: The Chemistry of its Components: 6th Edition, 2016. By Tom Coultate, ISBN- 978-1-84973-880-4. Electronic version available through the library

Additional Resources:
Principles of Food Chemistry - Third Edition by John deMan, 2013, Publisher: Springer. ISBN: 1461463890, 9781461463894

Food Chemistry, 4th Edition,
By H. D. Belitz, Werner Grosch, Peter Schieberle, 2009. Springer Publishing,

Fennema's Food Chemistry 2007,
4th Edition, edited by Srinivasan Damodaran, CRC Press

Course outline

1. INTRODUCTION TO FOOD CHEMISTRY	
2. WATER	
– Fundamental Properties / Structure – Availability in Foods – Water Activity / Food Stability	Leaning outcome: 1
3. CARBOHYDRATES	
– Structure and Isomerism – Reactions of Carbohydrates – Functions of Monosaccharides and Oligosaccharides – Functions of Polysaccharides	Leaning outcomes: 2a, 2b, 5
4. PROTEINS	
– Amino Acids / Basic Building Blocks – Peptides and Proteins – Denaturation – Functional Properties – Nutritional Properties – Protein Modification / Processing and Storage – Maillard Browning	Leaning outcomes: 2a, 2b, 5
5. LIPIDS	
– Fatty Acids – Glycerides – Physical Aspects – Chemical Aspects – Fat and Oil Processing – Role of Food Lipids	Learning outcomes: 2a, 2b, 5, 7a
6. ENZYMES	
– Specificity, Catalysis and Regulation – Factors Influencing Activity – Endogenous Enzymes – Enzymes Added to Food / Processing	Learning outcome: 4
7. COLOUR	
– Carotenoids – Anthocyanins – Betalaines/Melanin – Artificial foods colorants – Molecular basis of food colorants	Learning outcome: 2c

8. FLAVOUR	
– Taste – Odour	Learning outcome: 2c
9. FOODS ADDITIVES	
– Nitrites – Benzoates – Sulfites – Sodium chloride	Learning outcomes: 3
10. Laboratory experiments	
- Perform experiments - Data analysis - Reports	Learning outcomes: 5, 6, 7

Assistance for Students
Academic and Career Development Services: http://carleton.ca/sacds/
Writing Services: http://www.carleton.ca/csas/writing-services/
Peer Assisted Study Sessions (PASS): https://carleton.ca/csas/group-support/pass/
Math Tutorial Centre: https://carleton.ca/math/math-tutorial-centre/
Science Student Success Centre: https://sssc.carleton.ca/

Please Refer To Carleton University Academic Regulations Regarding Academic Integrity, Examination Policies, Etc.
University rules regarding registration, withdrawal, appealing marks, and most anything else you might need to know can be found on the university's website, here:
http://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/

Plagiarism and Cheating
The university define plagiarism as presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own. Plagiarism includes reproducing or paraphrasing portions of someone else's published or unpublished material, regardless of the source, and presenting these as one's own without proper citation or reference to the original source.

Cheating in examinations or tests may take the form of copying from another student or bringing unauthorized materials in the exam room (e.g., crib notes, pagers or cell phones). Exam cheating can also include exam impersonation. A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty.

When in doubt about any practice, ask your professor or instructor.

Examinations: Students are required to follow proper examinations procedures. A student who commits a violation of this policy on an examination, test, or take home examination, or obtains or produces an answer or unfair advantage by deceit, fraud, or trickery, or by an act contrary to the rules of the examination are subject to the sanction.

By enrolling in this course, students accept a commitment to academic freedom for all participants, themselves, and the instructor. The study of nutrition may expose you to foods you don't like. You must be willing to examine the relevant texts and be willing to discuss, verbally and in writing.

Information on Academic Accommodations

Requests for Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

Pregnancy obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Religious obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Academic Accommodations for Students with Disabilities

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. carleton.ca/pmc

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and is survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: carleton.ca/sexual-violence-support

Accommodation for Student Activities
Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf

For more information on academic accommodation, please contact the departmental administrator or visit: students.carleton.ca/course-outline
Information on Academic Accommodations