FS 514 STARCH CHEMISTRY

SPRING 2016

## Instructor:

(AMY) HUI-MEI LIN, Associate Professor

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**Course Location:** 323 Ag. Sci Building, University of Idaho (Moscow, ID)

**Course Time:** Tuesday and Thursday, 9:30 a.m. – 10:45 a.m. (Pacific Time, Two 75 min sections per week)

**Credits:** 3

## Subject Description:

FS 514- Starch Chemistry (Even years) is a student-centered, case study-teaching style class. Starch chemistry, its relationship with, and its roles in agricultural industry will be taught to enhance the critical thinking, rigor, creativity, and spirit of experimentation that defines research. Students will study pre-class reading handouts or articles and take quizzes. A reading guideline will be provided to students. In the classroom, students will work within their teams for case discussion or problem solving based on the knowledge provided in the pre-class reading materials. Two mid-term exams will be conducted to assess retained knowledge. After the second mid-term exam, the class will focus on three case studies: carbohydrate nutrition, wheat flour quality, and potato product quality. Cases will be assigned to teams, and students will use the knowledge and skills gained before the second mid-term exam to develop strategies, search literature, and problem solve. Students will work together in- and out- of the classroom to complete the cases. Case study reports will be required to assess students' learning. The course is designed to gain specific knowledge, enhance critical thinking and develop problem-solving skills through team learning. In addition to exams and case study reports, peer evaluation is part of grading.

## Course recommended:

University of Idaho: Carbon Compounds (Chem 275) or Organic Chemistry (Chem 277); Carbon Compounds Lab (Chem 276) or Organic Chemistry Lab (Chem 278); Biochemistry (Biol 380 or Biol 300) or other relevant courses/or instructor's permission.

Washington State University: Organic Chemistry (CHEM 345-346); Introductory Biochemistry (MBIOS 303 or 413) or other relevant courses.

## Course Goals:

1. Students will gain firsthand experience addressing global challenges, and bringing contemporary knowledge and experience into their careers and lives.
2. Students will be competent in critical questioning, analyzing, and identifying & addressing complex problems and opportunities.
3. Students will be more competitive in the agricultural industry.

## Course Objectives:

1. Students will gain knowledge about starch chemistry, including molecular structure, chemical and physical properties, nutritional properties, and applications in industries. This objective will be assessed through quizzes, exams and team reports.
2. Students will gain an understanding of the role of starch chemistry in agricultural industries and lives. This will be assessed through quizzes and team reports.
3. Students will read and analyze various hot topics in carbohydrate nutrition, potato and wheat industries. This will be assessed through team reports.

## Course Outcomes:

At the end of this course, students will

   a. be able to describe how starch chemistry plays important roles in food and agricultural industries (Assessment: quizzes and reports)
   b. be able to recite how starch molecular structure affects food quality, food safety and carbohydrate nutrition (Assessment: quizzes and exams).
   c. be able to identify how starch molecular structure influences crops' end-use quality (Assessment: quizzes and reports).
2. When given a case study, students will be able to identify problems, analyzing and thinking critically, outlining needed information for problem solving (Assessment: exams and reports).
3. When given a problem to solve, students will be able to analyze the issue(s) and develop a strategy with scientific support (Assessment: reports).

### Assessment:

Quizzes will be used to assess students' understanding of fundamental knowledge. Reports will be used to assess students' critical thinking and depth of knowledge. Peer evaluation will be used to assess individual performance fairly. Clicker or smart phone app will be used in the classroom upon the availability.

| *Graded Component* | *Percentage* | *Points* |
|---|---|---|
| Quiz (10 points per question; 50 points for each quiz)<br>- . | 25% | 750 |
| 1st exam | 16.7% | 500 |
| 2nd exam | 16.7% | 500 |
| Final exam | 16.7% | 500 |
| Team report (250 points of each)<br>- Twenty points will be deducted each day for late reports | 25% | 750 |

| | | |
|---|---|---|
| - Fifty points will be deducted each day from individual scores for late peer evaluation. Uncompleted peer evaluation will be returned for revision, fifty points will be deducted each day calculated from the original due day until the evaluation is completed or total 250 points are deducted.<br>- Individual grades will be the result of team grade multiplied by the average percentage of the points received from peers<br>Example:<br>John, Mary, Helen, Anne and Kyle are a group. Each group member would have 40 points to give to distribute among the other four members of his/her team. If John gets an average score of 10 points, he will receive 100% of the group score for the group project. If Mary gets an average of 8 and Kyle gets an average of 12 points from the group, then Mary gets only 80% of the group grade and Kyle gets 120% of the group grade. See the details in the table below. | | |
| Total | | 3000 |

Grade Scale:

A ≥2700 B 2400-2699 C 2100-2399 D 1800-2099 F ≤1799

Peer Evaluation Form:

Name:_____ Group: _____

This is an opportunity to evaluate the contributions of your teammates to the group project (report) _____ . If you are in a group of four people, you each will have 30 points to distribute. If you are in a group of three, you will have 20 to give away. You don't give yourself points. If you believe everyone contributed equality, you should give each person 10 points. If someone worked harder than the rest, then you may give them more than 10 points.

There are some rules that you must observe in assigning points:

- You cannot give any one more than 15 points.
- You don't have to assign all of your points.
- Anyone receiving an *average* of less than 7 points will get zero points from the project (report).
- Be fair and professional; don't give students a grade that they don't deserve.
- The instructor will dismiss scoring outliers and use only the other scores for the average. For example, John received 10, 10, 12 and 5 from his team. Obviously, something is inconsistent with the score of 5. John's average will be the average of 10, 10 and 12 (10.6 points).

| | Group member | Score |
|---|---|---|

| | | |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |

- Please indicate why you gave someone less than 10 points.

  _____

- Please indicate why you gave someone more than 10 points.

  _____

- If you were to assign points to yourself, what do you feel you deserve? Why?

  _____

Rubric for assessing team reports:

Dimensions of the rubric at the program level:

1. Issues and systems: Identify and understand the issues and interactions among key components. Students are able to clearly identify the problem and key components. Students are familiar with and appropriately use the concepts and language associated with starch chemistry.
2. Scholarly information: Obtain, evaluate, and apply scholarly information to expand students' understanding and knowledge-base of starch chemistry. Students appropriately identify all needed information, and evaluate and use a wide variety of high quality sources that are relevant, balanced, and up to date.
3. Scientific reasoning: apply scientific and quantitative reasoning to address real world problems related to starch chemistry. Students can use scientific and quantitative methods to analyze problems, explore issues, and address research questions.
4. Diverse perspectives: Consider, evaluate, and integrate varying perspectives on issues related to starch chemistry. Students integrate different views in order to reach consensus. Students discuss which disciplines they would need to consider in order to solve problems with a broad spectrum of views.
5. Communication: Communicate effectively to a broad range of audiences using appropriate traditional and emerging technological media. Students communicate information in a polished, error-free, professional, and engaging style. Students work together to address the issues raised by acknowledging and building on each other's ideas; they will invite and encourage participation of all discussion participants.

## Learning activities:

1. Pre-class reading
2. In-class demonstration

3. In- and out- class group discussion
4. Guest lectures

## Course Agenda:

| WK | Tuesday | | Thursday | |
|---|---|---|---|---|
| **1** | | | 1/14 | Course overview |
| **2** | 1/19 | Course overview/Introduction of Starch | 1/21 | Introduction of Starch *(Demonstration of starch isolation)* |
| **3** | 1/26 | Nomenclature of carbohydrates | 1/28 | Carbohydrates reactions |
| **4** | 2/2 | Oligosaccharides | 2/4 | Polysaccharides |
| **5** | 2/9 | Starch molecules and starch granule architecture | 2/12 | Starch molecular architecture and starch analysis |
| **6** | 2/16 | **1st exam** | 2/19 | Starch biosynthesis |
| **7** | 2/23 | Starch molecules and starch technical functionalities | 2/25 | Starch digestion and starch nutritional functionalities |
| **8** | 2/30 | Starch modifications | 3/3 | Non-starch polysaccharides and their technical functionalities |
| **9** | 3/8 | Non-starch polysaccharides and their nutritional functionalities | 3/10 | **2nd exam** |
| **10** | 3/15 | Spring recess | 3/17 | Spring recess |
| **11-12** | 3/22-3/31 | Case study: starch nutrition/glycemic carbohydrates | | |
| **13** | 4/5 | Wheat chemistry and technology *[guest lecture: Dr. Craig Morris, Director, USDA Western Wheat Quality Laboratory]* | 4/7 | Potato chemistry and technology in the U.S. *[guest lecture: Dr. Jeff Bohlscheid, Senior Principle Scientist, J.R. Simplot]* |
| **14** | 4/12-4/15 | Case-study: Starchy food quality | | |
| **15-16** | 4/19-4/28 | Problem solving: potato and potato starch | | |
| | 5/2 | **Final exam** | | |

This course outline is subject to change over the course of the semester at the discretion of the instructor. Nevertheless, any modification to the course material and sequence will be effectively communicated to students in advance by class announcement, e-mail, etc.

**Textbook:** None

### Reference:


1. Whistler, R., BeMiller, James N, & Paschall, Eugene F. (1984). Starch: Chemistry and technology (2nd ed.). Orlando: Academic Press.
2. BeMiller, J., & Whistler, Roy Lester. (2009). Starch chemistry and technology (3rd ed., Food science and technology). London: Academic.
3. Eliasson, A. (1996). Carbohydrates in food (Food science and technology (Marcel Dekker, Inc.) ; 74). New York: Marcel Dekker.
4. Whistler, R., & BeMiller, James N. (1997). Carbohydrate chemistry for food scientists. St. Paul, Minn.: Eagan Press.
5. Khan, K., & Shewry, P. R. (2009). Wheat : Chemistry and technology (4th ed.). St. Paul, Minn., USA: AACC International.


The listed references will be available for check out for maximum three hours each time from the UI Library Reference Desk.

### Pre-course reading assignment:

Students will be provided with pre-course reading assignments to prepare for the course.

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## Learning Resources

#### Study Skills and Resources

Remember, you should spend, on average, at least 3 hours of study time (pre-class reading assignments, etc) for each hour you spend in class. There is additional time devoted to researching and writing papers, and to developing projects. Plan accordingly. If you need help with note-taking, strategies for studying, writing, time-management, or tutoring assistance, please do not hesitate to talk to the course instructor.

### Writing Your Research Paper:

Consider the resources at:

http://www.uidaho.edu/class/english/WritingCenter,
http://universitycollege.wsu.edu/units/writingprogram/index.html

### Library Resources:

Become very familiar with our library, as it will become a second home.

University of Idaho: The UI Library has people and resources to help you succeed in the research for this course. The library website www.lib.uidaho.edu has many databases that will help you find relevant and reliable books, articles, images, and more, many available online. For a general overview of library resources, see "Getting started on research in the UI Library," a research guide at www.libguides.uidaho.edu/gettingstarted . Don't hesitate to contact a librarian for research assistance, either in person at the library reference desk, or by phone, email, or chat (http://www.lib.uidaho.edu/index-help.html). UI librarians specialize in helping you find high

quality sources for class papers and projects. Take the **Information Literacy Tutorial** at: http://www.webs.uidaho.edu/info_literacy/.

Washington State University: Students from WSU can gain similar support from the WSU library and librarians, http://libraries.wsu.edu , http://libraries.wsu.edu/research

### Questions about Technology at UI:

Visit the ITS Help Desk at their office in the Administration Building room 133, contact them by e-mail helpdesk@uidaho.edu, or call at 208-885-HELP (4357) with any technology questions they may have. The web site is at http://support.uidaho.edu/.

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## Learning Environment

### University Disability Support Services at UI

University of Idaho: Reasonable accommodations are available for students who have documented temporary or permanent disabilities. All accommodations must be approved through Disability Support Services located in the Idaho Commons Building, Room 306. Please meet with the staff of the DSS office (885-6307 , dss@uidaho.eduat the beginning of each semester to set up accommodations for the semester so that you may notify your instructor(s) early in the semester regarding accommodation(s) needed for the course.

Washington State University: Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center. When this course is taught at the Moscow campus, students also need to contact the Disability Support Services located at the University of Idaho.

### University Classroom Learning Civility Clause:

In any environment in which people gather to learn, it is essential that all members feel as free and safe as possible in their participation. To this end, it is expected that everyone in this course will be treated with mutual respect and civility, with an understanding that all of us (students, instructors, professors, guests, and teaching assistants) will be respectful and civil to one another in discussion, in action, in teaching, and in learning. Respect your fellow students by:

- Respecting the rights of others to express their views, regardless of what you may think of them.
- Respecting the rights of others by voicing your own observations in a clear, concise, and precise manner, and by not dominating the conversation.

- And adhering to common courtesies and civilities, such as coming to class on-time, turning off cell phones, listening and not talking while others "have the podium," etc., in short, "do unto others as you would have them do to you."

Should you feel our classroom interactions do not reflect an environment of civility and respect, you are encouraged to meet with your instructor during office hours to discuss your concern. Additional resources for expression of concern or requesting support include the Dean of Students office and staff (5-6757), the UI Counseling & Testing Center's confidential services (5-6716), or the UI Office of Human Rights, Access, & Inclusion (5-4285)

## Safety:

Concealed Carry of Firearms at UI: The University of Idaho bans firearms from its property with only limited exceptions. One exception applies to persons who hold a valid Idaho enhanced concealed carry license, provided those firearms remain concealed at all times. If an enhanced concealed carry license holder's firearm is displayed, other than in necessary self-defense, it is a violation of University policy. Please contact local law enforcement (call 911) to report firearms on University property.

Washington State University is committed to maintaining a safe environment for its faculty, staff, and students. Safety is the responsibility of every member of the campus community and individuals should know the appropriate actions to take when an emergency arises. In support of our commitment to the safety of the campus community the University has developed a Campus Safety Plan, http://safetyplan.wsu.edu. It is highly recommended that you visit this web site as well as the University emergency management web site, http://oem.wsu.edu/ to become familiar with the information provided.

Classroom and campus safety are of paramount importance at Washington State University, and are the shared responsibility of the entire campus population. WSU urges students to follow the "Alert, Assess, Act" protocol for all types of emergencies and the "Run, Hide, Fight" response for an active shooter incident. Remain ALERT (through direct observation or emergency notification), ASSESS your specific situation, and ACT in the most appropriate way to assure your own safety (and the safety of others if you are able). Please sign up for emergency alerts on your account at MyWSU. For more information on this subject, campus safety, and related topics, please view the FBI's Run, Hide, Fight video and visit the WSU safety portal."

## Emergencies

In the event of a major campus emergency, course requirements, deadlines, and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website, or can be obtained by contacting the instructors via email or phone. You are expected to read your university e-mail on a frequent basis and sign up for the emergency alert systems on both UI and WSU campuses.

When unexpected emergencies happen at the individual levels and may affect grades, students must inform the instructor through e-mail or other written forms in 24 hours for arranging a make-up exam. When the emergencies are at the university wide level, the instructor will adjust the assessments listed on this syllabus and schedule make-up examinations or assignments.

UI: www.uidaho.edu/public-safety-and-security/emergency-management/vandal-alert

WSU: http://www.alert.wsu.edu

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# Policy

## Absences:

Excused missed classes (and possibly grades) will typically be given for these three circumstances: (a) illness; (b) personal crisis (e.g., automobile accident, death of a close relative, weather conditions which make it impossible to get to the university); and (c) required attendance at an official university activity (e.g., exam conflict, athletic event, band concert). Contact the relevant instructor IN ADVANCE (if at all possible) by e-mail. For illness, students must contact the instructor in 24 hours, and then provide a course pass from a medical service provider in three days. Students should not provide private information such as a doctoral statement with the cause of illness. If you will be or have been out for five consecutive days, you must contact the Office of the Dean of Students; they will send us a letter.

Grief Absence Policy. The instructor recognizes that a time of bereavement is very difficult for a student. Students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for missed assignments or assessments in the event of the death of a member of the student's family. However, contacting the instructor IN ADVANCE by e-mail is required to receive the opportunity to earn equivalent credits.

The policy on absences for University-related activities is stated below:

The absence policy is enforced by the Vice Provost for Student Affairs and Office of the Dean of Students, and no other written or verbal agreements preempt this policy.

Students are not to be excused from class sessions for any living group-related activities (including, but not limited to, residence hall meetings, fraternity or sorority house meetings, or other living group functions). This includes any function deemed "mandatory" by the living group officers that may carry with it fines or other penalties for non attendance.

Only students with a written request signed by a university official will be granted an excused absence for university-sponsored activities, including, but not limited to, travel to sporting events in which the student is an official participant (not spectator) and participation in scheduled, university-sponsored class field trips.

Students who seek excused absences from class sessions because of other university-related activities must notify the instructor in advance of the absence to request an excused absence.

Students who are granted an excused absence are responsible for completing all work assigned during their absence in the timeframe the instructor has established.

When students are absent on the exam or quiz date with the reasons stated above, students must inform the instructor according to the requested time stating above for better arrange a make-up exam or assignment.

## Academic Dishonesty

Any students caught cheating will be dropped from the course and receive an F for the entire course. No cheating; no plagiarism. For a definition of academic dishonesty, read the website http://www.uidaho.edu/dos/academicintegrity/student%resources/what%20is%20academic%20dishonesty

UI Academic Honesty Student Policy: http://www.uidaho.edu/dos/judicialaffairs/studentcodeofconduct/articlcii

WSU's Academic Integrity Statement and policy: Academic integrity is the cornerstone of the university. Any student who attempts to gain an unfair advantage over other students by cheating, will fail the assignment and be reported to the Office of Student Conduct. Cheating is defined in the Standards for Student Conduct WAC 504-26-010 (3). Visit the linked websites below for more details. www.conduct.wsu.edu/default.asp?pageID=343 , www.wsulibs.wsu.edu/plagiarism/main.html

## Use of Copyrighted Materials

Among the materials that may be protected by copyright law are the lectures, notes, and other materials presented in class or as part of the course. Always assume the materials presented by an instructor are protected by copyright unless the instructor has stated otherwise. Students enrolled in, and authorized visitors to, the University courses are permitted to take notes, which they may use for individual/group study or for other non-commercial purposes reasonably arising from enrollment in the course or the University generally.

Notes taken in class are, however, generally considered to be "derivative works" of the instructor's presentations and materials, and they are thus subject to the instructor's copyright in such presentations and materials. No individual is permitted to sell or otherwise barter notes, either to other students or to any commercial concern, for a course without the express written permission of the course instructor. To obtain permission to sell or barter notes, the individual wishing to sell or barter the notes must be registered in the course or must be an approved visitor to the class. Course instructors may choose to grant or not grant such permission at their own discretion, and may require a review of the notes prior to their being sold or bartered. If they do grant such permission, they may revoke it at any time, if they so choose.

## Plagiarism:

Plagiarism is defined by Webster's Dictionary as, "to steal and pass off the ideas or words of another as one's own." There are two general forms of plagiarism:

(a) Unintentional: the use of other writers' words, phrases, sentences, paragraphs as though they were your own without understanding the need to cite the original source.

Unintentional plagiarism normally occurs when the individual does not understand the conventions of scientific writing and the need to cite sources of information.

(b) Intentional: the use of other writers' work and claiming it as your own. Intentional plagiarism includes knowingly copying or incorporating sections of books, articles, or other sources into your work without citation.

To avoid plagiarism, you must acknowledge the source of information. In scientific writing, this can be performed in the text of your work through the use of surnames of authors and the year of publication or by using numbers enclosed by parentheses, which correspond to specific citations in the reference section. In addition to employing citations in the text, plagiarism can be avoided by applying special techniques when writing about information obtained from a source:

(a) Paraphrase: rewording information in which you accurately present the main ideas from the source, but do so using your own organization, words, and sentence structures.

(b) Summary: a concise statement of the main idea from a section within a source.

(c) Direct quotation: use of quotes surrounding the passage written by another author.

In general, paraphrasing (a) and the use of summary statements (b) are very common techniques used in scientific writing. Use of quotations (c) in scientific writing is rare and should be avoided.

Plagiarism is dishonest and is not tolerated. If caught using all or portions of a current or former classmate's writing or other sources of information, a grade of "zero" will be given for the exercise. Additional penalties for plagiarism are possible as outlined in the University of Idaho and/or Washington State University Student Handbook.

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*This syllabus is designed to help you, the students, achieve academic success and to remain a full and productive member of our classroom community. If you have any questions, please contact the instructor in the first two weeks of the semester.*