**Department of Chemistry:** E331 CB, 335-1350 (Mark Arnold, DEO)
**Instructor:** Dr. Gregory K. Friestad (E455 CB, 335-1364)
e-mail: gregory-friestad@uiowa.edu
**Office hours:** Tuesday 12:00–1:30, Friday 10:30–12:00

**Scheduled Lectures:** Monday, Wednesday, Friday 9:30–10:20, W290 CB  
*Note: No lecture on the days of midterm exams.*

**Midterm Exams:**  
Monday February 20, 6:30–8:00 pm, C20 PC and 100 PH  
Monday March 26, 6:30–8:00 pm, C20 PC and 100 PH  
Monday April 23, 6:30–8:00 pm, C20 PC and 100 PH

**Teaching Assistants:** Jessica Boucher (jessica-j-clark@uiowa.edu)  
Ashabha Lansakara (ashabha-lansakara@uiowa.edu)  
Tyler Long (tyler-long@uiowa.edu)

---

**Course Goals**  
Develop an understanding of the properties and reactions of organic compounds:  
- spectroscopic properties of organic compounds, use of spectroscopy for structure determination  
- physical and chemical properties of aromatic compounds, carbonyl compounds, carboxylic acid derivatives, amines, and selected di- and polyfunctional organic compounds  
- chemical reactions of the aforementioned functional groups and their application to synthesis of organic compounds

---

**Prerequisites:** 4:121 or 4:123

---

**Course Materials**  

---

**Course Website:** ICON, http://icon.uiowa.edu (for assistance, contact icon-support@uiowa.edu)

---

**Course Administration at the Chemistry Center**  
A majority of course business can be accomplished at the Chemistry Center, E225 CB. The following SHOULD be accomplished at the Center: drop/add forms, discussion section changes, inquiries about TA office hours, submission of regrade requests. Please do not ask the instructor or TAs to do these; they should be handled in the Chem Center.

E225 CB Chemistry Center Hours: 8–12 noon & 1–5 pm on M-Th (close at 4:30 PM on Friday)  
Contact person: Jessica Alberhasky (335-1341).
**Office Hours:** Instructor office hours are Tuesday 12:00-1:30, Friday 10:30-12:00. Prior to exams, expanded office hours will be offered (times will be announced in class). If a meeting is needed outside of these times, please make an appointment.

**Discussion Sections:** Discussion Sections will be conducted by a Teaching Assistant (TA). These sessions provide additional opportunities to ask questions, work on problems, and improve understanding of the course material. Each TA also has scheduled office hours each week in the Student Resource Center (E244 CB). Students can get help from any of the 4:122 TAs who normally staff that room at various times M–Th 8:30a–6:30p and Fri. 9:30a–3:30p. A listing of the TAs and their office hours is also available in the Chem Center (E225 CB).

<table>
<thead>
<tr>
<th>Section</th>
<th>Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>013</td>
<td>Monday 11:30-12:20, C10 PC</td>
<td></td>
</tr>
<tr>
<td>017</td>
<td>Monday 3:30-4:20, C10 PC</td>
<td></td>
</tr>
<tr>
<td>021</td>
<td>Tuesday 9:30-10:20, C10 PC</td>
<td></td>
</tr>
<tr>
<td>022</td>
<td>Tuesday 11:00-11:50, C10 PC</td>
<td></td>
</tr>
<tr>
<td>033</td>
<td>Wednesday 11:30-12:20, C10 PC</td>
<td></td>
</tr>
<tr>
<td>035</td>
<td>Wednesday 1:30-2:20, C10 PC</td>
<td></td>
</tr>
<tr>
<td>036</td>
<td>Wednesday 2:30-3:20, C10 PC</td>
<td></td>
</tr>
<tr>
<td>040</td>
<td>Thursday, 8:30-9:20, C10 PC</td>
<td></td>
</tr>
<tr>
<td>045</td>
<td>Thursday, 12:30-1:20, C10 PC</td>
<td></td>
</tr>
<tr>
<td>046</td>
<td>Thursday, 2:00-2:50, C10 PC</td>
<td></td>
</tr>
</tbody>
</table>

**Grading**
A total of 400 points is possible:
• Exams (3 x 100) = 300 points
• Final Exam = 100 points

At the end of the semester, each student’s exam scores will be totaled, and the sum will be fit to a curve which approximates the CLAS recommended grade distribution and grade average (below). Letter grades are not given on the individual exams. Distribution of scores on individual exams will be provided, so that students will have a reasonable idea of their standing in the course throughout the semester.

CLAS Recommended Grade Distribution (% of class): A 18%, B 36%, C 39%, D 5%, F 2%
CLAS Recommended Grade Average = 2.63 / 4.0

**Course Outline**
This is a tentative outline of topics to be covered. Adjustments may be made as the semester proceeds; changes (if any) will be announced in lecture and/or on the course website. Practice problems for each chapter will be announced in lecture and/or on the course website.

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Topic</th>
<th>Reading (pp.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Mass Spectrometry and Infrared Spectroscopy</td>
<td>463-493</td>
</tr>
<tr>
<td>14</td>
<td>Nuclear Magnetic Resonance Spectroscopy</td>
<td>494-537</td>
</tr>
<tr>
<td>16</td>
<td>Conjugation, Resonance, and Dienes</td>
<td>571-606</td>
</tr>
<tr>
<td>17</td>
<td>Benzene and Aromatic Compounds</td>
<td>607-640</td>
</tr>
<tr>
<td>18</td>
<td>Electrophilic Aromatic Substitution</td>
<td>641-687</td>
</tr>
<tr>
<td>19</td>
<td>Carboxylic Acids and The Acidity of the O-H Bond</td>
<td>688-720</td>
</tr>
<tr>
<td>20</td>
<td>Introduction to Carbonyl Chemistry; Organometallic Reagents; Oxidation and Reduction</td>
<td>721-773</td>
</tr>
<tr>
<td>21</td>
<td>Aldehydes and Ketones – Nucleophilic Addition</td>
<td>774-824</td>
</tr>
<tr>
<td>22</td>
<td>Carboxylic Acids and Their Derivatives – Nucleophilic Acyl Substitution</td>
<td>825-879</td>
</tr>
<tr>
<td>23</td>
<td>Substitution Reactions of Carbonyl Compounds at the α Carbon</td>
<td>880-915</td>
</tr>
<tr>
<td>24</td>
<td>Carbonyl Condensation Reactions</td>
<td>916-948</td>
</tr>
<tr>
<td>25</td>
<td>Amines</td>
<td>949-1001</td>
</tr>
</tbody>
</table>
Exam Information

There will be three midterm exams on February 20, March 26, and April 23, 6:30-8:00 pm. The final exam time and location will be announced a few weeks into the semester.

End-of-Chapter Problems. All exams will include a couple of questions which are taken directly from the assigned end-of-chapter problems in the textbook, with only slight modifications. Assigned problems in the textbook will be announced in lecture and/or on the course website.

Cumulative exams: Because each unit in organic chemistry builds upon prior units, all exams are cumulative. Material covered since the previous exam will be emphasized, but this will require application of concepts learned earlier in the course and in the prerequisite (4:121 or 4:123) course.

Exam materials: Exams are closed-book. Prior to the start of the exam, all extraneous materials (models, notebooks, papers, backpacks, etc.) should be left at home or brought to the front of the room. Calculators are not needed. The use of any electronic devices during exams is strictly prohibited.

Regrades: If you feel that a mistake has been made in grading your exam, you may request a regrade. Regrades are intended to address issues where the answer matches the answer key, but was misgraded. Add a cover page which specifies the question to be regraded, with a one sentence explanation of what you believe was incorrectly graded. The entire exam will be regraded, and points awarded incorrectly may also be deducted during the regrading process. Regrade requests must be received at the Chemistry Center (E225 CB), with time stamped on them, within one week of the time they are first returned to you. There will be no regrade requests accepted after one week.

Make-up Exams: In the event that an exam is missed for valid reasons, a make-up exam may be arranged in advance. Permission to take a make-up exam will require a valid, written excuse (e.g., from student health services) presented in the Chemistry Center (E225 CB) before the scheduled time of the exam which is to be missed. There is only one make-up time available for each exam; it is in W128 CB at 5:30–7:00 pm on the Friday of the same week of the scheduled exam. The Chemistry Center will handle most issues of permission and registration for make-up exams. Approach the instructor about make-up exams only in cases where the registration has already been rejected by the Chemistry Center.

How to Succeed in Organic Chemistry

Put in a Solid Effort. From the CLAS website, “in a 3 semester hour course, students should expect (on average) 6 additional hours of outside work per week or a total of around 9 hours per course if classroom time is included. A student taking 5 courses (3 s.h. each) should expect to spend around 45 hours a week on academic work.” Some students who fall short of this recommendation still manage to do OK in other classes, but organic chemistry is not a place to cut corners. If you can average 6 hours per week (this means studying even in weeks when there is no exam), you’ll find that you’ll have a lot more success in organic chemistry!

Work Problems and Read Regularly. Read over the chapter before it is covered in lecture, and try a few of the in-chapter problems. After lecture, re-read it again, and then do problems at the end of the
It’s very important that you work problems to make sure you can use the concepts and retain the information for future application to new and different problems. This requires lots of simple ordinary practice; regurgitation from memory is not enough. Sit down with a pencil and paper and write out practice problems until you are sure you know how to actually apply your knowledge. Don’t assume that you can skip studying a particular topic and get by without it later! Sticking to a regular schedule of reading and problem-solving is highly recommended. This is not the sort of course where you can cram for the exams the night before, and expect to do well.

Come to Class. Course lecture notes will be provided online, but they are incomplete without the explanations, emphasis, model demonstrations, and examples provided in class. Most students find that they learn best by a combination of inputs, including listening and taking notes of their own in class to complement the lecture notes provided online. It is not likely that reading the online lecture notes will be sufficient to understand the material. Usually, more explanation is needed, not less.

Take Advantage of Discussion Sections and Office Hours. Attending discussion sections regularly will provide opportunities to ask questions and discuss sample problems in a less formal environment. It may also help facilitate formation of study groups with classmates; working problems together in pairs or groups can be a useful study strategy for some students.

Further comments about learning Organic Chemistry.

Learning Organic Chemistry is an exciting endeavor because it is the language of life. Indeed Organic Chemistry is critical to communication, energy transfer and storage, nutrient uptake, growth, replication, and virtually everything else needed for life to exist on earth. Our understanding and manipulation of Organic Chemistry also impacts our daily lives in uncounted ways; treatment of our diseases (drugs), fueling our cars (gasoline) and our bodies (food), coloring our clothes (dyes), constructing our homes (building materials) and our fancy lightweight electronic gadgets (polymers). A scientific understanding of something so ubiquitous in our daily lives, and so critical to life itself, clearly enriches us.

To enrich your life experience through learning Organic Chemistry you essentially need to learn a new language. As you may know, once you learn a new word in a foreign language, you must retain that vocabulary in order to be able to make a complete sentence or carry on a conversation. When you don’t know any words at all, a foreign language seems mysterious and perhaps intimidating. Learning the language of organic chemistry is no different; each new concept will build upon a foundation that you will construct from scratch. It may seem frustrating and confusing at the beginning, kind of like trying to understand someone speaking another language at full speed when you only know a couple of words. You must learn to use each organic chemistry concept properly, and then retain that knowledge so that the foundation doesn’t collapse later.

The process of learning Organic Chemistry will benefit you in intangible ways. Many students find Organic Chemistry fun because it involves an appealing combination of both logic and creativity. This combination stimulates the development of valuable critical thinking skills which will be useful no matter what career path you eventually choose. Good luck and have fun!
Statements of University and/or College Policy

Administrative Home. The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS Academic Policies Handbook.

Electronic Communication. University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondences. (Operations Manual, III.15.2. Scroll down to k.11.)

Accommodations for Disabilities. A student seeking academic accommodations should first register with Student Disability Services and then meet privately with the course instructor to make particular arrangements. See www.uiowa.edu/~sds/ for more information.

Academic Honesty. All CLAS students have, in essence, agreed to the College's Code of Academic Honesty: “I pledge to do my own academic work and to excel to the best of my abilities, upholding the IOWA Challenge. I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty.” Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled (CLAS Academic Policies Handbook).

CLAS Final Examination Policies. The date and time of every final examination is announced during the fifth week of the semester; each CLAS student will receive an email from the Registrar stating the dates and times of the student's final exams. Final exams are offered only during the official final examination period. No exams of any kind are allowed during the last week of classes. All students should plan on being at the UI through the final examination period.

Making a Suggestion or a Complaint. Students with a suggestion or complaint should first visit with the instructor (and the course supervisor), and then with the departmental DEO. Complaints must be made within six months of the incident (CLAS Academic Policies Handbook).

Understanding Sexual Harassment. Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI Comprehensive Guide on Sexual Harassment for assistance, definitions, and the full University policy.

Reacting Safely to Severe Weather. In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Public Safety web site.

*These CLAS policy and procedural statements have been summarized from the web pages of the College of Liberal Arts and Sciences and The University of Iowa Operations Manual.
Supplemental Instruction

Supplemental Instruction (SI) is offered for Organic Chemistry II. This is a completely optional program, administered separately from the 4:122 course, and Dr. Friestad is not responsible for the content or administration of the SI program. More information provided by the SI program is copied below, and schedules of SI meetings will be posted on the SI website:

http://www.uiowa.edu/~ucoll/swat.shtml

“Supplemental Instruction (SI) is a free academic program that utilizes peer-assisted study sessions. SI sessions are regularly-scheduled, informal review sessions in which students compare notes, discuss readings, develop organizational tools, and predict test items. Students learn how to integrate course content and study skills while working together. The sessions are facilitated by “SI leaders”, students who have previously done well in the course and who attend all class lectures, take notes, and act as model students. SI is a non-remedial approach to learning as the program targets high-risk courses rather than high-risk students. All students are encouraged to attend SI sessions, as it is a voluntary program. However, feel free to attend SI sessions throughout the semester as often as you would like.”