

Chemistry 351: Advanced Organic Lab

Instructor: Dr. Patrick Lutz (he/him/his), jlutz@stlawu.edu, JHS 315
I generally respond to emails within 24 hours during the week.

Class meetings: Tu/Th, 12:40–4:00pm, JHS 308

Student hours: Wednesday, 3:30–5:30pm and Thursday, 9:30–10:30am.

Your success in this course is one of my highest priorities. The times listed above are designated as student hours, but if my office door is open (even just a little bit), feel free to knock and I'll try to help out if I have time. You are also welcome to email me to try to schedule another time to meet. If you would prefer to meet virtually, please let me know in advance so that I can make arrangements.

Welcome to Advanced Organic Lab! This course is designed to introduce you to methods in synthetic chemistry beyond what you have encountered in previous courses. You will have the opportunity to synthesize small-molecule organic compounds, organometallic complexes, and polymers. You will also gain experience characterizing chemical structures, with a heavy emphasis on NMR spectroscopy. Overall, I hope this course builds confidence and helps prepare you to work as an independent scientist.

Learning goals. In this course, students will:

1. Acquire advanced laboratory techniques for synthesizing organic and organometallic compounds.
2. Develop a practical understanding of NMR and IR spectra, as well as the ability to use spectroscopic data to derive structural information about organic compounds.
3. Gain experience searching and reading the chemical literature.

Required texts and materials:

1. Safety glasses/goggles.
2. Laboratory notebook – any lined, *permanently-bound* notebook is acceptable (e.g., a composition notebook). It is fine to continue using a notebook from a previous semester, but I do not recommend using the same notebook for two courses at the same time.

Course format. This class will mainly consist of lab work, though some lecture will be used to introduce techniques and theory behind the reactions we are performing and characterization techniques we are using. You should endeavor to complete experiments during lab time, but if you find it necessary to work outside of our scheduled meetings, you should make arrangements with me.

Note that the policies and procedures described throughout this syllabus are subject to change in response to changing circumstances, or just because we discover that some aspect of the

course does not work as well as intended. Of course, I will communicate any important changes as soon as I can.

Evaluation. Grades will be determined using the components in the table below:

| | |
|---------------------------------------|-----|
| lab reports | 40% |
| prelabs | 10% |
| lab notebook | 20% |
| problem sets | 15% |
| lab safety, efficiency, & citizenship | 15% |

A partial scale for determining final grades is shown below. Grades are based on your score alone; there is no “class curve” and you are not competing directly against your fellow students. It is possible that I could lower the grade borders if aspects of the course prove more challenging than anticipated, but I will not *raise* the cut-offs. CHEM 351 cannot be taken pass/fail.

| | |
|-----|-------|
| 4.0 | ≥ 92% |
| 3.0 | ≥ 82% |
| 2.0 | ≥ 72% |
| 1.0 | ≥ 60% |
| 0.0 | < 60% |

Lab conduct. As an advanced lab course with special emphasis on technical skills, a portion of your grade will be based on your conduct in lab. This includes how careful and successful you are at performing various reactions and how carefully you handle glassware and other equipment (although I appreciate that sometimes glassware gets broken without anyone being at fault). Your lab conduct grade will also include wearing appropriate attire (close-toed shoes that cover your entire foot, shirts that cover your entire torso and shoulders, full-length pants) and coming to lab prepared. Additionally, because some of our experiments will require the full class time, failure to come prepared and to work efficiently may result in an inability to complete a given experiment.

General safety. Think about everything you do before you do it. When you are setting up equipment, when you are planning and executing a reaction, when you are working up a reaction and purifying your products. Do not blindly follow procedures. Question why others may have done a reaction or workup in a certain way, and whether it is safe for you to do so with your specific reaction, or on the scale on which you are working. Be sure you have thought through the reaction to the end (i.e. do you have all reagents and glassware ready?) before you begin working. Wear your safety goggles at all times and gloves whenever you are handling anything hazardous.

IF YOU ARE UNSURE ABOUT ANYTHING, ASK ME. IF I AM NOT AROUND AND YOU CAN'T GET RELIABLE INFORMATION ELSEWHERE, WAIT FOR ME TO REAPPEAR. Your safety is more important than any other aspect of this course.

Course materials. Materials from CHEM 351 should not be distributed outside of the educational framework of this course (including and especially online) without prior permission of the instructor.

Student accessibility. It is the policy and practice of St. Lawrence University to create inclusive and accessible learning environments consistent with federal and state law. If you have already established accommodations with the Student Accessibility Services Office, please meet with them to activate your accommodations so we can discuss how they will be implemented in this course.

If you have not yet established services through the Student Accessibility Services Office but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), please contact the Student Accessibility Services Office directly to set up a meeting to discuss establishing with their office. The Student Accessibility Services Office will work with you on the interactive process that establishes reasonable accommodations.

For more specific information about setting up an appointment with Student Accessibility Services please call (315) 229-5537 or email studentaccessibility@stlawu.edu. For further information, see the website at <https://www.stlawu.edu/offices/student-accessibility-services>.

Student resources: If you experience difficulty during the semester that interferes with your ability to come to class or complete your work, including difficulty securing food or housing, or stress and mental health issues, I urge you to contact the Office of the Dean of Students [in person or by phone at (325) 229-5311] or Health and Counseling Center [in person or by phone at (315) 229-5392]. If the Dean of Students is consulted, they can notify all of your instructors (for all of your classes) at your request. Their services are confidential – so while they may contact your instructors on your behalf to alert them that you are experiencing difficulty, they do not disclose details to your instructors. I am also available to walk you over to the Health and Counseling Center or the Office of the Dean of Students.

Inclusivity: The course instructor is committed to cultivating an inclusive and supportive learning environment that respects and celebrates a rich variety of backgrounds and perspectives. Please speak with the course instructor or the Chemistry Department chair, Prof. Samantha Glazier, if you have an experience in this class that is not consistent with this commitment.

Academic integrity: Per the SLU student handbook, “All students at St. Lawrence University are bound by honor to maintain the highest level of academic integrity. By virtue of membership in the St. Lawrence community, every student accepts the responsibility to know the rules of academic honesty, to abide by them at all times, and to encourage all others to do the same.”

The SLU handbook also states that “[i]nstructors have the duty to investigate any instance involving possible academic dishonesty.” I am obligated to report any suspected violations of the honor code to the Dean or the Academic Honor Council.

If you ever have questions about what is or is not appropriate academic behavior on any component of this course, please do not hesitate to ask me.

| Day | Date | Topics | Assignments |
|-----------|--------|---|--|
| Tues | Mar 12 | start Exp 1 : pharmaceutical unknown | |
| Thurs | Mar 14 | finish Exp 1 | |
| Mar 16–24 | | Spring Break | |
| Tues | Mar 26 | start Exp 2 : Ni complex synthesis | Exp 2 prelab due PS1 due |
| Thurs | Mar 28 | finish Exp 2 | Exp 1 report due |
| Tues | Apr 2 | intro to 2D NMR | lab notebook due |
| Thurs | Apr 4 | start Exp 3 : Suzuki coupling | Exp 3 prelab due Exp 2 report due |
| Tues | Apr 9 | finish Exp 3 start Exp 4 : synthesis of an unknown ester | Exp 4 prelab due PS2 due |
| Thurs | Apr 11 | finish Exp 4 start Exp 5 : trichloroacetylation of guaiazulene | Exp 5 prelab due Exp 3 report due |
| Tues | Apr 16 | Exp 5 | PS3 due |
| Thurs | Apr 18 | finish Exp 5 start Exp 6 : synthesis of a guaiazulene amide | Exp 5 prelab due Exp 4 report due |
| Tues | Apr 23 | finish Exp 6 start Exp 7 : polymer synthesis | Exp 7 prelab due Exp 5 report due |
| Thurs | Apr 25 | Exp 7 | |
| Tues | Apr 30 | finish Exp 7 | Exp 6 report due |
| Thurs | May 2 | clean-up day | Exp 7 report due lab notebook due |