

CHEM 5500

Safety in the Chemical Laboratory

Prerequisites:

A chemistry background that includes completion of at least CHEM 3320L (Organic Chemistry Lab) or equivalent experience is necessary.

Lead Instructor	Email	Office Hours	Office phone	
Dr. Theresa Windus	twindus@iastate.edu	By appointment <i>1605 Gilman Hall</i>	515-294-6134	Virtual and other meetings by appointment only
Charles Ward (TA)	cjward@iastate.edu	Wednesday 3-4 PM <i>2305 Hach Hall</i>		

*** All e-mails must be sent to both Dr. Windus and Mr. Ward. All e-mails must contain Chem5500 in the subject line.**

Many thanks to the members of the Department of Environmental Health and Safety (EH&S) at Iowa State University and the Ames Laboratory's Environment, Safety, Health and Assurance office, who are the actual instructors for this class.

Course (Catalog) Description

(1-0) Cr. 1. S. Prereq: CHEM 3320L

Introduction to laboratory safety and chemical hygiene. Use of engineering controls and personal protective equipment. Chemical storage and waste disposal practices. Handling hazardous chemicals. Radiation safety and laser safety. Offered on a satisfactory-fail basis only.

Course Procedures

This is essentially a half-semester course. This course is designed as a **blended** (part-online, part-on-campus) course where students are required to be on-campus for the live sessions on the specified dates and time. The rest of the course content will be delivered online through the learning management system, **Canvas** (<https://canvas.iastate.edu>). **For many topics, students will have to take the online training available from Environmental Health and Safety (EH&S) through Workday or Canvas by scheduled times given below. The details can be found on your Canvas course page.**

Canvas course page:

Students will use their Canvas accounts (**ISU net id and password**) to login to the course, where required course content will be posted. Contact the instructor if you do not have an ISU net id.

Students are expected to participate in all online/on-campus activities as listed on the course schedule. To optimize the online learning environment students should be regularly and actively engaged in lecture videos and responding to assigned materials.

Four On-campus sessions (other modules will not need to be in-person)

Tuesday, January 21, 8:00-8:50 AM CST in 1104 Gilman Hall

Thursday, March 27, 8:00-8:50 AM CST in 1104 Gilman Hall

Attend an assigned EH&S Facility Tours on Thursday, March 6 or Tuesday, March 11, 8:00-8:50 AM CST.

Participate in two laboratory inspections with the date and time to be determined.

Course Overview

The objective of this course is to provide an introduction to laboratory safety and chemical hygiene. This includes the use of engineering controls and personal protective equipment, chemical storage and waste disposal practices, handling hazardous chemicals, and radiation safety and laser safety. The course covers general laboratory safety and is intended for chemists working—or teaching—in a chemical laboratory or related facility. It is offered on a satisfactory/fail basis, only.

Overall learning outcomes:

- **Attain a broad overview of laboratory safety and chemical hygiene**
- **Value and support our culture of safety first among peers and others**

This course covers general laboratory safety and is intended for chemists working—or teaching—in a chemical laboratory or related facility. A chemistry background that includes completion of at least Chem 3330L/3340L (Organic Chemistry Lab) or equivalent experience is necessary. Parts of this course constitute introductory safety training for beginning researchers in the Chemistry Department.

A computer database (electronic record) showing satisfactorily completed topics will be maintained for each individual enrolled in the course. Copies of these training records will be generated and, **upon a supervisor's request**, made available to the research group or laboratory director or person in charge of each individual working in research, teaching or service laboratories.

Course Resources

- Text: *Prudent Practices in the Laboratory, Handling and Disposal of Chemicals*; National Academy Press: Washington, D.C., 2011. (<http://www.nap.edu/catalog/12654/prudent-practices-in-the-laboratory-handling-and-management-of-chemical>). Students are not required to own a personal copy, but it is highly recommended to read and learn more about lab safety. Some chemistry department faculty members may have copies of older monographs.
- EH&S Website: <http://www.ehs.iastate.edu/>

Course Objectives

After completing the course, students will be able to ...

- Learning Objective 1:** (Understand) Demonstrate the use of personal protective equipment (PPE), including safety goggles, gloves, and lab coat, when working in the chemical laboratory.
- Learning Objective 2:** (Understand) Demonstrate and describe the use of appropriate engineering controls (fume hoods, regulators, glove boxes, etc.) when working in the chemical laboratory.
- Learning Objective 3:** (Understand) Demonstrate the use of approved and environmentally conscious guidelines and standard operating procedures (SOPs) for handling, segregating, and disposing of hazardous and chemical waste.
- Learning Objective 4:** (Remember) Describe the procedures to follow in the case of emergencies or chemical spills.
- Learning Objective 5:** (Remember) Relate to Safety Data Sheets (SDSs) before handling any new/unknown compound(s).
- Learning Objective 6:** (Apply) Apply knowledge of emergency actions and procedures.
- Learning Objective 7:** (Understand) Identify the concerned contact personnel in cases requiring emergency actions and procedures.
- Learning Objective 8:** (Understand) Identify the personal protective equipment (PPE), engineering controls, safety data sheets, and other necessary items and actions needed to work with more specialized hazards, including cryogenics, high pressure cylinders, biological samples, lasers, electrical (power) devices, radioactive materials, and nanomaterials.

Course Expectations

Attendance and participation in all online (web-based) and on-campus (live) lectures and activities is mandatory.

All students are responsible for attending each and all of the on-campus sessions and activities, as well as watching all of the online presentations and videos in full and passing quizzes by assigned deadlines. Most training modules must have been completed within the last year to count for credit.

You **must** complete all course material at the date/time posted. If you should miss one assignment, you will be given an opportunity complete the training and to write a short report to complete the requirement. If the report is not completed at the given date/time, you will fail the course. If you should miss more than one assignment or otherwise not complete all requirements, you will fail the course.

Please see the course schedule below and in Canvas for due dates and deliverables.

Contacting the Instructor

You can contact the Instructor of the course *via email* regarding any questions you may have. You can generally expect a response within **48 h from the time your question was received.**

All e-mails must be sent (cc'd) to both Dr. Windus and Mr. Ward, and all e-mails must contain the title Chem5500.

Alternately, **you are encouraged to post your comments/doubts/questions to the discussion 'Help Forum'**, within your Canvas course page. Your peers may also have similar questions and can benefit from the response you get from the Instructor. Again, **expect a response within 48 h from the time your question was received.**

Please have an appropriate subject line when posting in the Help Forum. Expect a response within 48 h from the time your question was received.

Quizzes

There are online quizzes after each and all of the online topics, as well as a final quiz after the last on-campus session. You must **score 80% or above on all of these quizzes**. For the Canvas quizzes, you will have **3 attempts** for each quiz and the highest grade will be recorded. Once you start you will have **40 min** to finish and submit the quiz in Canvas.

Grade Distribution

Grading will be on a satisfactory/fail scale (S/F). Evaluation of performance will be based on (i) online participation and on-campus attendance; (ii) satisfactory completion of all online training; (iii) participation in the EH&S Facility tour; and (iv) completion of two laboratory inspections among participating laboratories.

Getting Started

Log in to Canvas (<https://canvas.iastate.edu>)

1. **Be sure you have an ISU NetID**. If you do not, please contact the Instructor.
2. Login to Canvas with your ISU NetID and password and **look for your course, CHEM 5500**
3. To begin, go to **‘Modules’** on the left navigation bar, open the **‘About the course’** module (if it is not open), and carefully read all sections.

Academic Misconduct

The class will follow [Iowa State University’s policy on academic dishonesty](#). Anyone suspected of academic dishonesty will be reported to the [Office of Student Conduct in the Dean of Students Office](#). Academic Misconduct includes, but is not limited to: copying or sharing answers on tests or assignments, plagiarism, and having someone else do your academic work. Depending on the act, a student could receive an F grade on the test/assignment, F grade for the course, and could be suspended or expelled from the University. Information about academic integrity and the value of completing academic work honestly can be found in the [Iowa State University Academic Integrity Tutorial](#).

Accessibility needs

Please address any special needs or special accommodations with the instructor the first day of class or as soon as you become aware of your needs. Iowa State University is committed to advancing equity, access, and inclusion for students with disabilities. Promoting these values entails providing reasonable accommodations where barriers exist to students’ full participation in higher education. Students in need of accommodations or who experience accessibility-related barriers to learning should work with Student Accessibility Services (SAS) to identify resources and support available to them. Staff at SAS collaborate with students and campus partners to coordinate accommodations and to further the academic excellence of students with disabilities. Reasonable accommodations are not retroactive in nature and are not intended to be an unfair advantage. Additional information or assistance is available online at www.sas.dso.iastate.edu, by contacting SAS staff by email at accessibility@iastate.edu, or by calling 515-294-7220.

Disclaimer about Usage of Course Materials

The materials on this course website are only for the use of students enrolled in this course, for purposes associated with this course, and may not be further disseminated. The materials on this course website may be protected by copyright; any further use or distribution of this material may be in violation of federal copyright law.

Disclaimer about Laboratory Safety

It is every student's responsibility to follow standard laboratory procedures and ensure laboratory safety.

Disclaimer about Freedom of Speech and Academic Freedom

Iowa State University supports and upholds the First Amendment protection of [freedom of speech](#) and the principle of [academic freedom](#) in order to foster a learning environment where open inquiry and the vigorous debate of a diversity of ideas are encouraged. Students will not be penalized for the content or viewpoints of their speech as long as student expression in a class context is germane to the subject matter of the class and conveyed in an appropriate manner. No employee, student, applicant, or campus visitor is compelled to disclose their pronouns. Anyone may voluntarily disclose their own pronouns.

Course Schedule (Spring 2025)

Module	Date/Deadline	Instructor and/or Details	Topic
1	Tuesday, January 21 Gilman 1104 8:00-8:50 AM	On-campus (live) session Theresa Windus twindus@iastate.edu Michelle Thompson mjl@iastate.edu	Welcome to Chem 5500 and Introduction Laboratory Risk in-person
	Complete by Wednesday, January 22, 11:59 PM CST	Online training	<i>EH&S: Laboratory Safety: Core Concepts</i> (also covers unwanted materials and chemical spills) Go to Workday for EH&S online training Take the training
	Complete by Friday, January 24, 11:59 PM CST	Online training	<i>Risk vs. Hazard and Research Safety Planning</i> Go to Canvas to view the lecture videos Take the Canvas quiz by the deadline

2	Complete by Wednesday, January 29, 11:59 PM CST	Online training	<i>GHS-Compliant Hazard Communication covering MSDS and SDS</i> Go to Canvas to view the lecture videos Take the Canvas quiz by the deadline
	Complete by Friday, January 31, 11:59 PM CST	Online training	<i>Laboratory Safety Inspections</i> Go to Canvas to view the lecture videos Take the Canvas quiz by the deadline
3	Complete by Wednesday, February 5, 11:59 PM CST	Online training	<i>EH&S: Emergency Response Guide</i> Go to Workday for EH&S online training Take the training
	Complete by Friday, February 7, 11:59 PM CST	Online training	<i>EH&S: Biohazardous Materials: An Introduction</i> Go to Workday for EH&S online training Take the training
4	Complete by Wednesday, February 12, 11:59 PM CST	Online training	<i>EH&S: Laboratory Safety: Fume Hoods</i> Go to Workday for EH&S online training Take the training
	Complete by Friday, February 14, 11:59 PM CST	Online training	<i>EH&S: Hazardous Materials Shipping Awareness</i> Go to Workday for EH&S online training Take the training
5	Complete by Wednesday, February 19, 11:59 PM CST	Online training	<i>EH&S: Laboratory Safety: Chemical Storage</i> Go to Workday for EH&S online training Take the training
	Complete by Friday, February 21, 11:59 PM CST	Online training	<i>Electrical Safety</i> Go to Canvas to view the lecture videos Take the Canvas quiz by the deadline
6	Complete by Wednesday, February 26, 11:59 PM CST	Online training	<i>EH&S: Fire Safety and Extinguisher Training</i> (online course version) Go to Workday for EH&S online training Take the training
	Complete by Friday, February 28, 11:59 PM CST	Online training	<i>Engineering Controls and Cryogenic Safety</i> Go to Canvas to view the lecture videos Take the Canvas quiz by the deadline

7	Complete by Wednesday, March 5, 11:59 PM CST	Online training	<i>EH&S: Laboratory Safety: Compressed Gas Cylinders</i> Go to Workday for EH&S online training Take the training
	Complete by Thursday, March 6, 8:00-8:50 AM CST	On campus (live) session	Tour of Environmental Health and Safety, 2408 Wanda Daley Drive (You be assigned a session to attend. More information will be provided.)
	Complete by Friday, March 7, 11:59 PM CST	Two online pieces of training	<i>EH&S: Radiation Safety Awareness</i> Go to Workday for EH&S online training Take the training <i>EH&S: Laser Safety Awareness Training</i> Go to Workday for EH&S online training Take the training
8	Complete by Tuesday, March 11, 8:00-8:50 AM CST	On campus (live) session	Tour of Environmental Health and Safety, 2408 Wanda Daley Drive (You be assigned a session to attend. More information will be provided.)
	Complete by Wednesday, March 12, 11:59 PM CST	Online training	<i>EH&S: Nanotechnology Safety</i> Go to Workday for EH&S online training Take the training
	Thursday, March 27 Gilman 1104 8:00-8:50 AM	On-campus (live) session Michelle Thompson mjl@iastate.edu Theresa Windus twindus@iastate.edu	Review
	Complete by Friday, April 4 11:59 PM CST	Final online quiz	Take the final quiz in Canvas by the deadline
	Complete by Friday, April 18, 11:59 PM CST	Lab Inspection Report	Completion of two laboratory inspections among participating laboratories. (You will be assigned a group to work with, as well as two laboratories to inspect.)