College of Liberal Arts and Sciences

Department of Chemistry

Spring 2021

CHEM 550

Safety in Chemical laboratory

Prerequisites:

A chemistry background that includes completion of at least CHEM 333L/334L (Organic Chemistry Lab) or equivalent experience is necessary.

Lead Instructor	Email	Office Hours	Office phone	
Dr. Wenyu Huang	whuang@iastate.edu	Monday and Wednesday 11AM-noon CST ***2124 Hach Hall***	515-294-7084	**Virtual and other meetings by appointment only**
Ranjan Behera (TA)	rkbehera@iastate.edu	Tuesday and Thursday 11AM-noon CST ***2255 Hach Hall***		

*** All e-mails must be sent (cc-ed) to both Dr. Huang and Mr. Behera, and all e-mails must contain the title Chem550.**

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 332L

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 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), and upload (email) their certificates of completion onto Cybox. 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 would 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.

On-campus sessions:

Students will meet **Tuesdays/Thursdays, 8:00-8:50 AM CST in 1002 Gilman Hall** (Due to COVID-19, the visit of EH&S Facility Tours will be conducted by a virtual tour prepared by EH&S staff).

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:

- Outline laboratory safety and chemical hygiene
- Spread and enhance a culture of safety among peers

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 333L/334L (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 ...

1. Learning Objective 1: Value and support a culture of safety first among peers and others.

2. Learning Objective 2: Demonstrate the use of personal protective equipment (PPE), including safety goggles, gloves, lab coat, etc., when working in the chemical laboratory.

3. Learning Objective 3: Demonstrate and describe the use of appropriate engineering controls, including fume hoods, regulators, glove boxes, etc., when working in the chemical laboratory.

4. Learning Objective 4: Demonstrate the use of approved and environmentally conscious guidelines and standard operating procedures (SOPs) for handling, segregating and disposing of hazardous and chemical waste.

5. Learning Objective 5: Describe the procedures to follow in the case of emergencies or chemical spills.

6. Learning Objective 6: Relate to Safety Data Sheets (SDSs) before handling any new/unknown compound(s).

7. Learning Objective 7: List, demonstrate and apply the knowledge of emergency actions and procedures.

8. Learning Objective 8: Identify the concerned personnel to contact in cases of emergency actions and procedures.

9. Learning Objective 9: 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 cryogens, 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. Certificates are required for the online training modules from EH&S. Most training modules must have been completed within the last year to count for credit.

If you have not taken an online course previously, it is very important that you familiarize yourself with the technology well before class begins.

Please see the course schedule 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-ed) to both Dr. Huang and Mr. Behera, and all e-mails must contain the title Chem550.

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.**

Help Forum

You can also post any questions or concerns you may have regarding the assignments, homework/lab exercises or final

project, in the **Help Forum** in Canvas. You are also encouraged to post any questions, concerns, and doubts and suggestions regarding course mechanics or content to this forum.

Please have an appropriate subject line when posting in the Help Forum. Expect a response within 24 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**. You will have **3 attempts** for each quiz and the highest grade will be recorded. Once 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) weekly online quizzes on the topics discussed each session; (iii) satisfactory completion of all online training; and (iv) completion of a laboratory inspection 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 550**

3. To begin, go to **'About the course'** on the left navigation bar and carefully read all sections.

Technical Requirements

Basic System Requirement

For the best online learning experience you will need:

- Windows 7 or later, or, Mac OS X 10.6 or later
- At least 512 MB RAM
- Broadband Internet Connection (1.5 Mbps required, 3.0 Mbps recommended)
- Chrome, Safari, or Firefox (latest version recommended)
- Java (click here to check version and download updates)
- User privileges to install software (for required software installations)
- Courses that utilize online meetings with audio and video participation require a computer with microphone and webcam (headphones recommended)

Technical Assistance

For technical assistance contact elotech@iastate.edu. You will get a response within 1 business day, Mon-Fri 8:00 AM-5:00 PM, CST. There could be limited availability on weekends.

For any course content related assistance, contact the Instructor and TA.

Academic Misconduct

All acts of dishonesty in any work constitute academic misconduct. Online courses are not exception. The Student Disciplinary Regulations (http://policy.iastate.edu/policy/SDR) will be followed in the event of academic misconduct. 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. Academic misconduct includes all acts of dishonesty in any academically related matter and any knowing attempt to help another student commit an act of academic dishonesty. Academic dishonesty includes, but is not limited to each of the following acts when performed in any type of academic or academically related matter, exercise, or activity:

Plagiarism: Plagiarism is the act of representing directly or indirectly another person's work as your own. It can involve presenting someone's speech, wholly or partially, as your; quoting without acknowledging the true source of the quoted material; copying and handing in another person's work with your name on it; and similar infractions. Even indirect quotations, paraphrasing, etc., can be considered plagiarism unless sources are properly cited. Plagiarism will not be tolerated, and students could receive an F grade on the test/assignment or an F grade for the course. The Iowa State University policy for academic misconduct can be found in the Student Disciplinary Regulations.

Obtaining Unauthorized Information: Information is obtained dishonesty, for example, by copying graded homework assignments from another student, by working with another student on a take-home test or homework when not specifically permitted to do so by the instructor, or by looking at your notes or other written work during an examination when not specifically permitted to do so.

Tendering of Information: Students may not give or sell their work to another person who plans to submit it as his or her own work. This includes giving their work to another student to be copied, giving someone answers to exam question during the exam, taking an exam and discussing its contents with students who will be taking the same exam, or giving or selling a term paper to another student.

Misrepresentation: Students misrepresent their work by handing in the work of someone else. The following are examples: purchasing a paper from a term paper service; reproducing another person's paper (even with modifications) and submitting it as their own; having another student do their computer program or having someone else take their exam.

Bribery: Offering money or any item or service to a faculty member or any other person to gain academic advantage for yourself or another is dishonest.

Special Accommodations

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. Those seeking accommodations based on disabilities should obtain a Student Academic Accommodation Request (SAAR) from the Disability Resources Office.

Student Disability Resources

1076 Student Services Building

Ames, IA 50011-2222

Phone: 515 294-7220

Fax: 515 294-2397

TTY: 515 294-6635

E-mail: disabilityresources@iastate.edu

Website: http://www.dso.iastate.edu/dr/

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.

COVID-19 health and safety requirements

Students are responsible for abiding by the university's COVID-19 health and safety expectations (dso.iastate.edu/guidance-for-supporting-community-expectations-during-covid-19-pandemic). All students attending this class in-person are required to:

- properly wear a face covering and/or face shield, covering the nose and mouth, while in classrooms, laboratories, studios, offices, and other learning spaces. It is important to remember that a face covering and/or face shield is required to be worn whenever you are on campus, in the presence of others, and unable to maintain physical distance.
- practice physical distancing to the extent possible;
- assist in maintaining a clean and sanitary environment;
- not attend class if you are sick or experiencing symptoms of COVID-19;
- not attend class if you have been told to self-isolate or quarantine by a health official.
- follow the faculty member's guidance with respect to these requirements. Failure to comply constitutes disruptive classroom conduct. Faculty and teaching assistants have the authority to deny a non-compliant student entry into a classroom, laboratory, studio, conference room, office.

Course Schedule (Spring 2021)

Module	Date/Deadline	Instructor and/or Details	Topic
1	Tuesday, January 26 Gilman 1002 8:00-8:50 AM	**On-campus (live) session** William Jenks wsjenks@iastate.edu Wenyu Huang whuang@iastate.edu Michelle Thompson mjl@iastate.edu	Welcome to Chem 550 and Introduction Laboratory Risk in-person
	Complete by Wednesday, January 27, 11:59 PM CST	Online training	***EH&S: Laboratory Safety: Core Concepts*** (also covers unwanted materials and chemical spills) Go to Canvas for EH&S online training Take the training Upload certificate of completion to Cybox and Canvas by the deadline
	Complete by Friday, January 29, 11:59 PM CST	Online training	***Risk vs. Hazard and Research Safety Planning*** Go to Canvas to view the lecture videos Take the quiz by the deadline
2	Complete by Wednesday, February 03, 11:59 PM CST	Online training	***GHS-Compliant Hazard Communication covering MSDS and SDS*** Go to Canvas to view the lecture videos Take the quiz by the deadline
	Complete by Friday, February 05, 11:59 PM CST	Online training	***Laboratory Safety Inspections*** Go to Canvas to view the lecture videos Take the quiz by the deadline
3	Complete by Wednesday, February 10, 11:59 PM CST	Online training	***EH&S: Emergency Response Guide*** Go to Canvas for EH&S online training Take the training Upload certificate of completion to Cybox and Canvas by the deadline
	Complete by Friday, February 12, 11:59 PM CST	Online training	***EH&S: Biohazardous Materials: An Introduction*** Go to Canvas for EH&S online training Take the training Upload certificate of completion to Cybox and Canvas by the deadline

4	Complete by Wednesday, February 17, 11:59 PM CST	Online training	***EH&S:* Laboratory Safety: Fume Hoods** Go to Canvas for EH&S online training Take the training Upload certificate of completion to Cybox and Canvas by the deadline
	Complete by Friday, February 19, 11:59 PM CST	Online training	***EH&S: Hazardous Materials Shipping Awareness*** Go to Canvas for EH&S online training Take the training Upload certificate of completion to Cybox and Canvas by the deadline
5	Complete by Wednesday, February 24, 11:59 PM CST	Online training	***EH&S:* Laboratory Safety: Chemical Storage** Go to Canvas for EH&S online training Take the training Upload certificate of completion to Cybox and Canvas by the deadline
	Complete by Friday, February 26, 11:59 PM CST	Online training	***Electrical Safety*** Go to Canvas to view the lecture videos Take the quiz by the deadline
6	Complete by Wednesday, March 3, 11:59 PM CST	Online training	***EH&S:* Fire Safety and Extinguisher Training** (online course version) Go to Canvas for EH&S online training Take the training Upload certificate of completion to Cybox and Canvas by the deadline
	Complete by Friday, March 5, 11:59 PM CST	Online training	***Engineering Controls and Cryogenic Safety*** Go to Canvas to view the lecture videos Take the quiz by the deadline

7	Complete by Wednesday, March 10, 11:59 PM CST	Online training	***EH&S: Laboratory Safety: Compressed Gas Cylinders*** Go to Canvas for EH&S online training Take the training Upload certificate of completion to Cybox and Canvas by the deadline
	Complete by Friday, March 12, 11:59 PM CST	Two online pieces of training	***EH&S:*** **Radioactive Materials Awareness Training** Go to Canvas for EH&S online training Take the training Upload certificate of completion to Cybox and Canvas by the deadline ***EH&S:*** **Laser Safety Awareness Training** Go to Canvas for EH&S online training Take the training Upload certificate of completion to Cybox and Canvas by the deadline
8	Tuesday, March 16 Gilman 1002 8:00-8:50 AM	**On-campus (live) session** Ranjan Behera (TA) rkbehera@iastate.edu	Virtual Tour of **Environmental Health and Safety, 2408 Wanda Daley Drive**
	Complete by Wednesday, March 17, 11:59 PM CST	Online training	***EH&S:*** **Nanotechnology Safety** Go to Canvas for EH&S online training Take the training Upload certificate of completion to Cybox and Canvas by the deadline
	Thursday, March 18 Gilman 1002 8:00-8:50 AM	**On-campus (live) session** Michelle Thompson mjl@iastate.edu Wenyu Huang whuang@iastate.edu	Review
	Complete by Friday, March 19, 11:59 PM CST	Final online quiz	Take the final quiz in Canvas by the deadline
	Complete by Friday, April 30, 11:59 PM CST	Lab Inspection Report	Completion of a laboratory inspection among participating laboratories.