

CHE 533: The Science and Artisanry of Glass

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Hours TBA

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Prerequisite / Co-requisite:

None

Audience:

Science and art students

Course Description:

Course is primarily for students in the science field. History of scientific glass will be covered as well as the different composition, safety and uses. Students will learn how to form glass in a flame.

Additional Course Description:

Many students working in the science field use scientific glass apparatus that is specific to their work. There are many different types of glass and glass parts that are manufactured and we will go over what type of glass and glass parts are best used for different experiments. Using a small flame and glass tubing and rod, students will also learn how to design and create their own apparatus. This will decrease breakage in the labs when they are working and increase safety in the lab. We will go over the history of scientific glass apparatus to give a better knowledge of where we have been and where we are headed.

Credits:

1

Learning Objectives:

After taking this course, students will be able to:

- describe the properties of different types of glass and know what types of glass to use for specific experiments.
- demonstrate familiarity with glass component names, types and how they are best used.
- create simple glass apparatus.

- interpret pressure charts for glass components.
- describe vacuum technology and demonstrate the care of vacuum pumps.

Bibliography/ Texts / Supplies – Required:

“Scientific Glassblowing” E.L. Wheeler. Out of print - permission from the author to place the text on Blackboard has been granted. One book in our library. No materials will need to be purchased.

Requirements:

Students are required to demonstrate the development of the following skills:

Glass Compatibility Test - Students will learn about the compatibility of different types of glasses by completing tests that will show the coefficient of expansion. This project will also cover uses of different types of glass.

Cutting Glass - Using a glass scoring knife students will learn how to cut glass safely. TLC plates used in Chemistry labs will also be covered.

Making a Prince Rupert Drop – This project will teach the student about strain in glass, how it can be used and when it is a danger. Knowing how strain works in glass will allow the student to understand why glass breaks and how to avoid breaking glass.

Fire Polish - Using a small flame, students will learn how to fire polish sharp edges. Students will learn never to use broken glass in the labs.

Basic Glassblowing - Students will learn basic glassblowing skills such as “Y” seals, side seals, test tubes, ampules and ring seals. Projects using these skills will enable the students to make “Y”, small condensers, traps and small manifolds. We will discuss how to safely use these apparatus in the lab.

Learning the Components of Scientific Glass – We will go over glass to metal seals, glass joints and stopcocks. Students will learn how to choose which style is best for different experiments.

Final Project – Undergrads will design an apparatus using three glassblowing skills and Graduate students will design an apparatus using five glassblowing skills. Students will present their final project the last day of class.

This is a pass fail course and will be based upon:
attendance 60%
midterm 20%
final 20%.

There will be two written exams on which the student must receive a minimum of 70% credit to receive a passing grade. Attendance at all class meetings is mandatory.

Course Specific Policy on attendance:

Attendance is very important in this class; every effort should be made to make each class. In each class new skills will be built on previous skills.

If a student has a conflict in attending class, the student is required to arrange a time with the instructor to make up the class during the same semester.

Academic Integrity Policy

Syracuse University's academic integrity policy reflects the high value that we, as a university community, place on honesty in academic work. The policy defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The university policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same written work in more than one class without receiving written authorization in advance from both instructors. The presumptive penalty for a first instance of academic dishonesty by an undergraduate student is course failure, accompanied by a transcript notation indicating that the failure resulted from a violation of academic integrity policy. The presumptive penalty for a first instance of academic dishonesty by a graduate student is suspension or expulsion. SU students are required to read an online summary of the university's academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check-in on MySlice. For more information and the complete policy, see <http://academicintegrity.syr.edu/>.

Disability-Related Accommodations

If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS), <http://disabilityservices.syr.edu>, located in

Room 309 of 804 University Avenue, or call (315) 443-4498, TDD: (315) 443-1371 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue students with documented Disabilities Accommodation Authorization Letters, as appropriate. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

Diversity and Disability:

Syracuse University values diversity and inclusion; we are committed to a climate of mutual respect and full participation. My goal is to create learning environments that are useable, equitable, inclusive and welcoming. If there are aspects of the instruction or design of this course that result in barriers to your inclusion or accurate assessment or achievement, I invite any student to meet with me to discuss additional strategies beyond accommodations that may be helpful to your success.

Religious Observances Notification and Policy

SU religious observances notification and policy, found at <http://hendricks.syr.edu/spiritual-life/index.html>, recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holidays according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance provided they notify their instructors before the end of the second week of classes for regular session classes and by the submission deadline for flexibly formatted classes.

For fall and spring semesters, an online notification process is available for students in **My Slice / StudentServices / Enrollment / MyReligiousObservances / Add a Notification**. Instructors may access a list of their students who have submitted a notification in My Slice Faculty Center.

Course Schedule:

Week	Topic	Lab	Required Reading from "Scientific Glassblowing"
Aug. 31 (Week 1)	Syllabus / Course Overview.	Safety in working with glass. Glassblowing Equipment. Working with solid rod.	pages 10-48
Sept. 7 (Week 2)	Properties of Borosilicate Glasses.	Cutting glass. Cutting TLC plates. Oxidation and reducing flames. Fire Polishing, Bending Glass	
Sept. 14 (Week 3)	Physical Properties of Glass: Working, Strain and Annealing Point.	Side Seal, "Y" tubes, Hearts.	pages 52-75
Sept. 21 (Week 4)	Properties of Soft Glass. Coefficient of Expansion of different glasses.	Identification of different glass with a compatibility test. Flares, funnels	TBA
Sept. 28 (Week 5)	Properties of Fused Silica, Quartz. Vycor and Uranium Glasses.	Making a rotation tool. Points, Flat and Round Bottomed tubes, Beaded Edge.	
Oct. 5 (Week 6)	"History of Scientific Glass Apparatus" Powerpoint presentation	Bulbs, Constrictions and Rings	pages 76-102
Oct. 12 (Week 7)	Why glass breaks. Types of glass strain. Show "Mystery of Prince Rupert's Drop at 130,00fps"	Review of last week. Making a Prince Rupert Drop.	
Oct. 19 (Week 8)	Midterm exam		
Nov. 2 (Week 9)	Go over Midterm. Methods of distillation.	How to fix star cracks. Ring seals, bubblers, condensers, cold traps.	pages 235-316
Nov. 9 (Week 10)	Ground Glass Joints how to measure and use them. How to choose which style is best for different experiments.	Holders for sealing on joints	
Nov. 16 (Week 11)	Stopcocks, how to measure and use them. How to choose which style is best for different experiments.	Continue to work on condensers and sealing on components.	
Nov. 23 (Week 12)	Vacuum Technology. Glass to metal seals, graded seals and glass to ceramic seals.	Design and create a glass manifold	pages 157-189

Nov. 30 (Week 13)	Vacuum pumps, what can go wrong and what to do.	Finish glass manifold and start on trap.	
Dec. 7 (Week 14)	How to set up a glass manifold safely in the lab.	Vessels for evacuation. Dewar seals.	
Dec. 14 (Week 15)	How to use a tesla coil.	Evacuation of vessels and sealing of evacuated vessels	
Final	TBA		