Instructor: Dr. Gopal Subramaniam  
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Office: Remsen 206  Tel: (718) 997-4123  Office hours: 11:00 am - 12:00 pm, W

Laboratory Hours: Fridays 10 to 12:30, Remsen 017. Students taking more than 1 credit are required to do additional work which are arranged by mutual consent.

Course Content: A project based laboratory for students in Chemical Education. This course is also open for students majoring in Chemistry who wish to improve their hands-on performing skills for educating non-chemists.

Pre-Requisites: Students must have completed 2 semesters of organic chemistry (equivalent to Chem 251 and 252 at Queens College) including 2 credits of organic chemistry laboratories intended for chemistry majors.

Goals/Objectives: Ability to perform chemical demonstrations in a safe manner in front of an audience. An understanding of the development and application of chemical demonstrations and laboratories in an educational setting.

Text: Lecture Demonstration Manual – Compiled by Thomas Hayden (III) and Randolph Smith, Queens College. A copy of this manual is available in the lab.

In addition, students must read articles from Journal of Chemical Education and also refer to online resources for chemical demonstrations relevant to introductory chemistry classes.

Schedule

Laboratories: There are 14 weeks during a semester. The projects performed during these weeks will be scheduled during the first week in consultation with the instructor and will be consonant with the number of credits that a student is registered for. Demonstrations covering density, temperature, absolute zero, exothermic and endothermic reactions, acid-base reactions, light, etc. are some of the typical topics covered in the first year
chemistry curriculum and hence forms part of the demonstration schedule. When in-person classes are in session, you will be given a 2-week advance notice of the upcoming lecture and the demonstrations needed for the class. Relevant reading from the lab manual and online resources must be completed and appropriate procedures must be written before carrying out the demonstration for practice. There is always room for innovation and that is expected from you. Think about safety, waste reduction, and non-toxic (green chemistry) materials while you plan for modifications. These are the basis for your original lab report. Your initial practice is in the lab without an audience so that you can confirm the methods and feel confident about the demonstration. Typically, when covid restrictions are not in place, the next lab session will feature the demo in front of an audience and obviously for Spring 2021 it is not possible. Instead you are expected to present the demo and videotape it and deposit it in a common folder. You must have written instructions for performing the lab with a lesson plan in front of an audience. The final lab report should contain all the details including safety precautions, difficulties and outcome while performing in front of an audience and audience reactions wherever applicable.

EXPERIMENTS

See attached list for all experiments that are to be performed during the semester.

Students who take the course for more than 1 credit: In addition to demonstrations, you will be given projects to test new labs, lesson plans, surveys, etc. Students testing new laboratories or performing research in chemical education will be required to present their results at the Chemistry Undergraduate Research Day. Good sources for such work include: New York Times Science section, Scientific American, Discover, Science, Nature, Synchrotron Radiation News, Photonics, Laser Focus World, Physics Today, Chemical and Engineering News, Journal of Chemical Education, and the standard scientific literature. You are required to report every week and discuss with the instructor
while completing the additional work. As a general rule, every laboratory credit hour will require 4 hrs of work.

**Safety:** You must wear eye protection at all times while in the laboratory or in class performing an experiment or demonstration. Failure to do so will result in ejection from the laboratory. Students will be given a safety/laboratory technique, access to MSDS database, and the opportunity to take C14 exam given by New York City Fire Department. Everyone taking the course for more than 1 credit will be required to complete the Laboratory Certificate of Fitness (C14).

**Grade:** The grade will be determined from writing lesson plans, the final comprehensive report, and the actual presentations. Equal weighting is given for all 3 pieces.