Chemistry 250 (2 credit) Instrument Proficiency for Scientists - XRF
Fall 2021
Operated as an Independent Study with times arranged

Instructor

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Phone 274-4812 class website: faculty.augie.edu/~dew
Office hours by appointment

Class schedule

Work will be centered around the Bruker Tracer IV XRF Spectrometer.
Wet lab work: 2-3 hours per week, specifically scheduled with the instructor to coordinate schedules and avoid conflicts for time on the instruments.
Permissible unscheduled work (not wet lab): computer, literature, writing reports.
Principal locations of course work: FSC 350 and FSC 312
Regular attendance is expected.
Work in groups of two is permitted and encouraged.

- For safety the instructor needs to be available during the times you work in lab. To keep his time demands reasonable:
  - Groups may schedule up to 4 hr/week.
  - There can be some flexibility of times to accommodate special circumstances. **However, you need to provide advance notice and coordinate with the instructor.**
  - Adding additional meeting times later in the semester will be allowed only if there are extenuating circumstances. (If you are not diligent at the beginning, don't ask the instructor to put in extra time at the end for you to catch up.)

Supplies

Safety goggles with full splash guards (wear them consistently for lab work).
Permanently bound lab notebook with carbon/carbonless pages. It can be a continuation of a notebook used for another course. Students may opt to use a digital notebook instead – details are outlined below.

Catalog Description

Each offering enables students to develop a solid foundation in the theoretical aspects and operating principles, as well as develop hands-on proficiency in the operation of the featured instrument and interpretation of the data. XRF Corequisite: Chem 202.

Student Outcomes

Students will be able to:

- For a C
  - Start up the XRF, select settings and other conditions, and obtain a spectrum.
  - Display and analyze spectra using S1PXRF.
  - Create a project, display and analyze spectra using Artax.
- For a B
  - Assemble a minicup and analyze solutions.
  - Determine the infinite thickness for a solution sample, theoretically and experimentally.
  - Prepare and use calibration curves for quantitative analysis of elements in solution.
  - Set up and use the Direct Comparison Concentration Ratio method for quantitative analysis.
- For an A
  - Determine the infinite thickness for a solid sample, theoretically and experimentally.
  - Prepare pellets of a solid mixture.
  - Prepare and use calibration curves for quantitative analysis of solid samples.
  - Analyze solid samples using the Lucas-Tooth and Price method.

Canvas

The syllabus and other handouts for this class will be posted on Canvas as **CHEM 250 XRF Fall 2021**. You should be automatically enrolled. I'm still new to Canvas, so let me know if you encounter problems. An Overview of Canvas for Chem 250 will be emailed to all students prior to the beginning of the course to help you get started. Briefly:

The **Home Page** for this course is **Modules View**. Expand the module to see all handouts, assignments, and resources. Click on one to open it.

The **Grade Book** shows you which assignments have been completed (no specific grade except for the Safety Quiz).

Reports are outlined in the Projects handouts and will be submitted in Canvas. No paper copies are required for Reports. Feedback will be provided electronically through Canvas.

- Insert the Honor Pledge in one file for each submission set. A copy of the Honor Pledge will be posted on Canvas.
- Email the instructor when you have made a submission so I know there is one to grade.
- Submissions must be in one of these formats: Word, Excel, pdf, Google docs or Google sheets, jpg, gif, or png.

COURSE POLICIES

Notebook
Previous chemistry courses have taught you how to keep a good notebook. Continue to do that in this course. Be sure to date and initial each page If you choose to use a paper notebook: at the end of each work period, be sure to put the carbons on the instructor's desk. If you choose to use an electronic notebook: 1) create a file in Word or Google Sheets and add new pages as needed so at the end of the semester all notebook entries are in one file, and 2) at the end of each work period, email or share the file with the instructor.

Deadline
Submit reports and documentation of completed projects as you finish them; **don't** wait until the end of the term to submit everything. Completion of all work and submission of reports is the last day of classes, Friday, December 10.

Safety
1) Ordinarily students are not allowed to work alone in the lab. However, this course is structured as an independent study with minimized risks, so you will be allowed to work alone in the lab. It is imperative that you work only when the instructor is available (scheduled times or by special arrangement).
2) A review of Lab Safety is required for all Chemistry lab courses. To satisfy this requirement, a Chem 250 Safety Review document is posted on Canvas and a Chem 250 Safety Review Quiz (on Canvas) will document your completion of this requirement.
3) Work on a Project MUST NOT proceed until your Safety Report for that Project is APPROVED.
4) If you have asthma, allergies, are pregnant, or have other special circumstances, please inform your lab instructor so we can plan appropriate accommodations for your safety.
5) Generally, calculators and cell phones should be kept out of the lab. If you need to use one in the lab, keep it encased in the baggie provided in your Supplies Kit to prevent contamination.
6) Do not bring your personal laptop into the lab. If a laptop is necessary, see the instructor to get access to a Departmental laptop.

Responsibility for Equipment
Students are entrusted with the laboratory equipment in individual kits provided and are responsible for its care and cleaning. In the event that laboratory equipment is broken or lost, the costs will be assessed directly to student accounts.

Kits will be distributed on or before we meet to introduce you to the instrument.

Grading
Criteria for grades of C, B, and A are outlined below. Plus/minus grades will be determined by the quality of the work submitted.

To earn a grade of C:
1) Read the Chem 250 Safety Review and submit the Chem 250 Safety Review Quiz.
2) Be present in lab each week.
3) Each **person** maintain a current and satisfactory laboratory notebook.
   a) Turn in notebook carbon pages each week (paper - on instructor's desk, electronic – email).
4) Do XRF Project for a C provided as a handout.

To earn a grade of B - requirements for a C plus:
5) Be present in lab each week and turn in notebook carbon pages each week (paper - on instructor's desk, electronic – email).
6) Do XRF Project for a B provided as a handout.

To earn a grade of A - requirements for a B plus:
7) Be present in lab each week and turn in notebook carbon pages each week (paper - on instructor's desk, electronic – email).
8) Do XRF Project for an A provided as a handout.

Resources (no texts to purchase)
Do not remove resources from FSC 312 except briefly (half hour or less) to make copies in Mikkelsen Library!

1) Palmer, P. Introduction to Energy-Dispersive X-Ray Fluorescence (XRF) – an Analytical Perspective, https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Analytical_Sciences_Digital_Library/JASDL/Courseware/Introduction_to_XRF-_An_Analytical_Perspective (accessed 7/12/21). (Also on Analytical Sciences Digital Library website).
2) Introduction to X-Ray Fluorescence Analysis, http://www.spectro.co.th/images/column_1225688948/Basicxrf.ppt (accessed 5/7/21).
3) Amptek Operating Manual XR-100CR X-RAY DETECTOR SYSTEM, 2003 (absorption edge info).
4) Bruker Tracer and Artax XRF Raw Spectrum Analysis User Guide draft, 2008.
5) Calculation of the depth an x ray comes out of a material, Bruker, 2011.
6) Eggert, T. Semiconductor X-Ray Detectors, Ketek GmbH http://wwwmayr.informatik.tu-muenchen.de/konferenzen/Jass04/courses/4/Tobias%20Eggert/TalkIoffe.pdf (Accessed 7-13-17).
7) Kaiser, B. Full day and a half xrf seminar, 2013. Presented during instrument installation at Augie.
8) Understanding How to Use the Physics of Atomic Interactions of 2 to 40 keV Photons to Probe Materials, Bruker, 2010.
9) Lucas-Tooth, H. J.; Price, B. J. Metallurgia 1961, 64, 149–152.
10) *X-Ray Methods,* Whiston and Prichard, ACOL, John Wiley and Sons: New York, NY, 1987 (QD 96 .X2 W47 1987).
11) Dr. Weisshaar's Courses Home Page at URL http://faculty.augie.edu/~dew and associated links.
12) Analytical Sciences Digital Library http://asdlib.org/ - a peer-reviewed digital library for the analytical sciences.
13) *J. Chem. Ed.* searchable index on the web at URL http://data.jche.divched.org/~/cesearch/index.php (link provided on the course web site).
14) Chemistry 311 materials in Computer Lab FSC 312.
    a) Lab and Writing Resources - experimental procedures.
    b) Articles on Instrumental Methods.
    c) Analysis and Instrumental Methods texts and lab manuals.
15) Do your own search for others, include SciFinder. Share good links with your instructor.

UNIVERSITY POLICIES

Accessibility
Augustana welcomes students with disabilities to participate in all of its courses, programs, services, and activities. If you have a documented disability and are requesting accommodations, please contact Susan Bies, Director of Accessibility and Academic Support. Her office is located in the Student Success Center (Edith Mortenson Center, Suite 100) and she may be reached at 605-274-5503 or susan.bies@augie.edu.

Honor Code
As a community of scholars, the students and faculty at Augustana University commit to the highest standards of excellence by mutually embracing an Honor Code. The Honor Code requires that examinations and selected assignments contain the following pledge statement which students are expected to sign:

> "On my honor, I pledge that I have upheld the Honor Code, that the work I have done on this assignment has been honest, and that the work of others in this class has, to the best of my knowledge, been honest as well."

Faculty members are responsible for investigating all instances involving any student who does not sign the Honor Pledge or who bring forward an academic integrity concern. The complete Honor Code can be found at www.augie.edu/honor.

What does this mean in this course?

- You do your own work on individual assignments (not copying others). On group assignments you contribute to the group effort and strive to understand all parts of the project, not just the part you do.
- In lab you are "true" to your data - your report reflects what *you* measured and observed; data is not changed or manufactured to fit expectations. If you missed collecting some data, see the instructor; don't copy someone else's data.
- Give credit where credit is due. When you gather data from the Web, books, magazines, etc. cite the reference (author, title, etc.).

I presume we are in this class to help each other learn some chemistry (yes, instructors learn in this class too), so I trust you to turn in work that reflects your efforts and also, that as individuals and in your small groups, to help each other adhere to the **Honor Code**. The above statement *should be added to one file in each submission set.*

If you cannot, in good conscience, sign this pledge or if you have other concerns about academic integrity in this course, please come visit with me (in confidence of course) or send me an e-mail note. At a minimum, students caught violating this code will receive a zero (0) on the assignment or exam and the incident will be reported to the Academic Dean in accordance with the **Honor Code** procedures.

Commitment to Preventing Discrimination and Sexual Harassment
Augustana University is committed to creating and fostering a learning and working environment based on open communication and mutual respect. This is an integral part of the academic mission to enrich our students' educational experiences and prepare them to live in and contribute to a global society. If you encounter sexual harassment, sexual misconduct, sexual assault, or discrimination please contact the Title IX Coordinator at 605-274-4044 or belam@augie.edu. If you make a report of this nature to a faculty member, they must notify the Title IX Coordinator about the basic facts of the incident (you may choose whether you or anyone involved is identified by name). For more information about options at Augustana, please visit www.augie.edu/titleix.

Turnitin
Turnitin is an originality detection service. Its use in this class is both to prevent plagiarism and to help the student improve his or her writing. Turnitin.com compares a document with its extensive database of submitted papers, published works, and documents from the internet. Turnitin issues a "similarity score." Your instructor will review the similarity report and make any determinations about any improper citations, missing citations, or plagiarism. Student papers will be retained in the global Turnitin repository for future comparisons.

Augustana University Mental Health Resources
Augustana promotes student well-being and healthy self-care by offering a number of services on campus in the areas of counseling services, health services, and other wellness-related resources.

- **The Campus Clinic** is located in the lower level of Solberg Hall and is staffed by a Sanford Health Registered Nurse and Certified Nurse Practitioner. The clinic is available for all medical needs and can be reached at 605-274-5552. Services provided by the RN are covered under the student activity fee and Certified Nurse Practitioner visits will be billed toward insurance.
- Students may contact the **Dean of Students Office** for assistance with mental health and other health-related concerns or help setting up counseling appointments by calling 605-274-4124 or emailing Beth Elam at belam@augie.edu.
- The **Campus Pastor** is available to meet with students around topics of grief, anxiety, vocational discernment, or spiritual care. Contact Pastor Ann Rosendale in the Chapel (605-274-5403) to schedule an appointment).
- Concerns related to academics, career, and vocation may be directed to the **Student Success Center** (605-274-4124). Career and academic specialists are ready and eager to meet with students.
- The **International Programs Office** (605-274-5050) assists international and third culture students when issues of culture shock and adjustment arise, as well as with other cultural elements such as adjusting to U.S. academic and classroom expectations.
- All Augustana students have access to confidential, counseling services through our campus partners at **Sioux Falls Psychological Services**. Counseling services are available across the street from the Mikkelsen Library—located on Summit Avenue. The door to the counseling services will be on the east side of the building (facing Norton Avenue). Our counselors are licensed professional counselors and specialize in a number of mental health areas including anxiety, depression, transition to college, grief & loss, and many more. Students can call 605-334-2696 to set up a time that works best. All counseling sessions are covered under the student activity with no billing towards insurance or copays.

Under Consideration: "Sioux Falls Psychological Services is not affiliated with Sioux Falls Seminary."