

Sul Ross State University

Syllabus for Reading and Research: CHEM 4311-MC1(CRN:12025) (Fall, 2021)

Class: Readings and Research

Place: Blackboard (Web-based)

Time: TR 12:30-1:45

Instructor: Dr. Hong Young Chang

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Office Phone: (432) 837-8113

Virtual Office Hours:

M-R 2:00-4:30pm (Phone or Zoom)

(Appointments only)

Objectives:

Student Learning Objectives (SLO):

A student graduating with the **chemistry major** is expected to demonstrate that (s)he is able to do the following:

1. **Organic Chemistry**—Students will be able to draw organic molecular structures and explain organic reactions, stereochemistry, structural analysis and reactions in biological systems.
2. **Inorganic Chemistry**—the student will be able to demonstrate understanding of coordination chemistry, valence theory, elementary actions and advanced molecular theory.
3. **Analytical Chemistry**—the student will be able to demonstrate an understanding of theory of analytical chemistry and conduct analytical analysis, including data analysis and calibration, equilibrium chemistry, gravimetric analysis, titrimetric analysis, spectroscopic analysis, and electrochemical analysis.
4. **Physical Chemistry**—the student will be able to demonstrate an understanding of the application and theory of physical chemistry, including topics such as atomic structure, electrochemistry, surface chemistry, solid-state chemistry, and thermodynamics.
5. **Research**—the student will collect and analyze published chemical literature and undertake a chemistry research project.

Core Objectives (CO):

1. **Critical Thinking Skills** – Students will gain/improve their critical thinking ability by solving research chemistry problems through inquiry, analysis, and evaluation of available information. Students will be tested on their critical thinking ability through lab experiments and research activities.
2. **Communication and Presentation Skills** – Students will have the opportunity of improving communication skills through oral presentations, poster presentation, and writing research reports (i.e. observation, explanation, and conclusion, etc.) in their research activities.
3. **Empirical and Quantitative Skills** – Students will use the mathematical skills needed to manipulate and analyze numerical data obtained through experimentation in order to form conclusions.
4. **Teamwork** – Students will use team-spirit and consider different points of view to work effectively while conducting experiments as a team working toward a shared purpose or goal.

CHEM 4311 MC1 Learning Objectives:

As research activities, students will review on the given research topics (by published research papers) with the related reference papers from a variety of chemistry literatures. (books, reports, and peer-reviewed journals) Students will also learn how to access in chemistry research through literature search and how to refer and use references for their research activities. In addition, as other research activities, students will investigate physical /chemical properties attributed to 3D structures, which will be visualized for clusters, supramolecules, and biomolecules. (Lipid, carbohydrates, protein, enzyme, etc.) At the end of this course, a student should have a good understanding of:

1. For the chemistry research review for given topics, students search for the published reference papers through library journal source of SRSU, Google scholar, Web of science, and SciFinder, etc.
2. Structural properties on inorganic-, organic-, and bio-molecular structures
(Polyoxometalates (POMs) clusters, supramolecules, lipid, carbohydrates, protein, enzyme, etc.)
3. Basic concept on crystallographic Files (CIF) for single crystal structures
(Crystallographic symmetry, atomic coordination, unit cells, space groups, etc.)
4. Visualization of 3D structures by free-downloaded software

5. Students will find where is the activity sites of proteins from the 3D structures and they will investigate which interactions are available between cluster molecules (low-weight molecules) and the amino acid sequence of the active sites of proteins.
6. The role of polyoxometalates (POMs) as an inhibitor in proteins.

Research Topics: The given research topic is following.

Investigation on the interactions between POMs and biological system
(3 papers (published review style) will be given)

1. *Chemistry & Biology* **15**, 683–692
2. *Current Opinion in Biotechnology* **2019**, 58, 92–99
3. *J. Am. Chem. Soc.* **2012**, 134, 9768–9774

How to Access in Chemistry Literature:

1. To find corresponding journals, SRSU Inter Library Loan (ILL) can be used, as are full text search engines.

<https://library.sulross.edu/home/services/online-services/interlibrary-loan-document-delivery/>

2. You must register as a new user for SciFinder use through the SRSU library:
<http://sulross.libguides.com/az.php?a=s>

If you are off Alpine campus you MUST go through the library home webpage (use the link for returning users) to gain access to SciFinder. You will need to use your Blackboard log in credential and then secondly your SciFinder credentials. Please register with your SRSU email.

Once you have registered as a new user you will need to activate your account by clicking on the SciFinder link in the email that you registered your account with.

Here is a short video outlining the basics for registering for SciFinder.

<http://screencast-o-matic.com/watch/cbV0YIQ7eA>

3. Need more help with registering &/or accessing SciFinder?

Please contact Betsy Evans:

Office Address:C-109

WLIB 107

Library

Alpine, TX 79832

Office Telephone: 432 837-8312

Fax Number: 432 837-8212

E-mail: betsy.evans@sulross.edu

4. Citations to be based according to the American Chemical Societies (ACS) guidelines: <http://pubs.acs.org/doi/pdf/10.1021/bk-2006-STYG.ch014>
Page 292 contains the basics. I think that is the 6th page in this .pdf
(The title of journal articles can be left out).

5. Example Citation Format:

Thesis citation

Mäckel, H. Capturing the Spectra of Silicon Solar Cells. Ph.D. Thesis, The Australian National University, December 2004.

Book citation

Le Couteur, P.; Burreson, J. *Napoleon's Buttons: How 17 Molecules Changed History*; Jeremy P. Tarcher/Putnam: New York, 2003; pp 32–47

Article citation

Klingler, J. *Chem. Mater.* **2005**, *17*, 2755–2768.

Download of Free Chemistry Software to visualize 3D structure:

Several free-software will be installed by students in their personal computers and they will use these software to visualize and analyze 3D chemical structures.

1. VESTA (Visualization for Electronic and Structural Analysis): to analyze the metal oxides [VESTA \(jp-minerals.org\)](http://jp-minerals.org)
2. Diamond (Crystal and Molecular Structure Visualization): Demo Version [Diamond Download Area \(crystalimpact.com\)](http://crystalimpact.com)
3. Chemdraw and Chem3D: to visualize 3D smaller molecular structure [PerkinElmer Informatics Support Home – Technical Support \(cambridgesoft.com\)](http://cambridgesoft.com)
4. Avogadro: to visualize 3D protein [Download Avogadro from SourceForge.net](http://sourceforge.net)

Availability: This course proceeds through **online (Blackboard of SRSU)**. Students will participate in the meeting of this course and students have to download and install free software described above. After reading the papers that students request from the ILL of SRSU or receiving the chemical structures, which will be given by professor, students understand and summarize the functionality of proteins, the active sites of proteins, the amino acid sequences of the active sites, the structural characteristics of POMs, and the physical interactions between POMs and the amino acids of the active sites. To do that, students have to visualize 3D structures of proteins and POMs by the software. Students sometimes read the manuals of their installed software and professor will show any

demonstrations to visualize 3D structures. Students will figure out atomic positions, electron density distribution by chemical bonding, and physical properties and interactions attributed to chemical structures.

Research Reports and Summary: students have to report and explain their research summary or the papers that they read at the online class meeting and professor will check that students read and summarized the published research papers and sometimes, students will receive questions from professor. In the end of this fall semester (**until Nov. 11, 2021**) students have to submit their research summary including any pictures for the research topics (7-8 slides as the *MS Power Point* style). Things that should be thought about and/or addressed in the report or summary are following.

1. Classification of POMs (Among various POMs, it has to be described which one is used)
2. Visualization of POMs structures
3. Description of physical and chemical properties on POMs
4. Summary or background on corresponding proteins (the functionality of proteins has to be described.)
5. Visualization of 3D on proteins
6. Description on active sites of proteins (describe by which amino acids the active sites are composed.)
7. Analysis of interactions between protein active sites and POMs (as an inhibitor for the corresponding protein)
8. References (How to cite on references is described in "citations" of "How to Access in Chemistry Literature")

Students with Special Needs: *Sul Ross State University (SRSU) is committed to equal access in compliance with Americans with Disabilities Act of 1973. It is SRSU policy to provide reasonable accommodations to students with documented disabilities. It is the student's responsibility to initiate a request for accessibility service. Please contact Ms. Rebecca Greathouse Wren, M.Ed., LPC-S, Director/Counselor, Accessibility Services Coordinator, Ferguson Hall (Suite 112) at 432.837.8203; mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas 79832. E-mail: rebecca.wren@sulross.edu Students should then contact the instructor as soon as possible to initiate the recommended accommodations.*

Academic Integrity: *Academic dishonesty hurts everyone and reduces the value of college degrees. Doing someone else's work, presenting the ideas and work of others as your own, submitting the same paper for multiple classes, and/or failing to cite your sources when you utilize the ideas of others, are all examples of academic dishonesty. It is your responsibility to read and understand the university's policy on academic dishonesty in the SRSU Student Handbook, as all violations will be taken seriously and handled through the appropriate university process. The Student Handbook can be found at: <https://www.sulross.edu/catalog/undergraduate-academic-regulations-2/#1605412215143-c8b265dc-3e01>*

In addition, please note that plagiarism detection software will be used in this class for written assignments.