San Jose State University
Chemistry Department
Chem 146 – Physical-Inorganic Techniques
Spring 2016

Contact Information

Instructor: Dr. Subha Viswanathan
Office Location: DH 001
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Email: subha.viswanathan@sjsu.edu (preferred means of contact)
Office Hours: Fridays, 5:00-6:00 PM (other times by appointment)
Class Days/Time: Fridays, 10:00 AM – 4:40 PM
Classroom: DH 010
Prerequisites: A letter grade of “C” or better in CHEM 100W, 101, and 145

Course Description (from SJSU Course Catalog)

Application of advanced instrumental and preparative techniques to the study of structure, reactivity, and spectroscopy of inorganic and organic substances including materials. This is a capstone course.

Course Learning Outcomes (CLO)

Upon successful completion of the course, students will be able to

1. CLO 1 Employ proper laboratory procedures including safety, handling chemicals and waste disposal.
2. CLO 2 Maintain an organized and accurate laboratory notebook.
3. CLO 3 Understand and implement experimental protocols to analyze inorganic and organic compounds using modern techniques and instrumentation.
4. CLO 4 Apply previously learned concepts in chemistry and knowledge gained from searching scientific literature to effectively design and implement physical-inorganic experiments.
5. CLO 5 Analyze and interpret experimental results and arrive at reasonable conclusions.
6. CLO 6 Communicate findings effectively through scientific oral presentations and reports.
Chemistry Program Learning Objectives Covered by CHEM 146

1. PLO 1 Demonstrate understanding of core concepts, methods and limits of scientific investigation to effectively solve problems in inorganic chemistry.
2. PLO 4 Demonstrate understanding of core concepts, methods and limits of scientific investigation to effectively solve problems in physical chemistry.
3. PLO 6 Answer questions regarding safe practices in the laboratory and chemical safety.
4. PLO 7 Demonstrate safe laboratory skills (including proper handling of materials and chemical waste) for particular laboratory experiments.
5. PLO 9 Effectively present a oral presentation on a scientific paper, by applying the scientific approach, as at an American Chemical Society symposium
6. PLO 10 Write a formal scientific laboratory report which applies the scientific approach to address a chemical problem and follows the formal and style of an article in a peer-reviewed American Chemical Society journal.

Required Texts/Readings

Textbook
There is no specific textbook for CHEM 146

Other Readings
Basic physical, analytical and inorganic textbooks will be helpful. Journal articles will be an important source of information because the experiments will be largely from current chemistry literature.

This course will also make use of the chemical literature found in the library. You may need to consult previous inorganic or instrumental methods texts as review and/or make use of various databases including:

- Electronic Journal Index (on-campus access at http://www.sjlibrary.org/research/ejournals/index.htm),
- SciFinder Scholar (on-campus login access at http://www.sjlibrary.org/research/databases/index.htm?getType=3), MSDS (http://sjsu.chemwatchna.com/),
- www.scholar.google.com,

Please note that some of them may only work with Internet Explorer. You should have a student library account with the King Library that allows you to access the library electronic databases. If you plan to access the library services from off-campus, you may need to obtain a password and/or proxy in order to do so. Check the Library website for more information.

Other equipment/material requirements
A bound 8.5”x11” quadrille lined laboratory notebook with duplicate pages (ex: National #43-591) and a scientific calculator.
Library Liaison
Name: Jennifer Dinalo
Email Address: jen.dinalo@sjsu.edu
Telephone: (408) 808-2038

Course Requirements and Assignments
SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in University Policy S12-3 at http://www.sjsu.edu/senate/docs/S12-3.pdf.

Seminars (Friday, 10:00 AM – 10:50 AM)
Theoretical, fundamental, and technical aspects underlying the research projects that will be performed during the laboratory sessions throughout the semester will be discussed.

Laboratory sessions (Friday, 11:00 AM – 4:40 PM)
Students are expected to plan and implement a semester-long research project that will be assigned to them in the beginning of the semester. No experimental procedures will be provided. Students are required to search relevant scientific literature and come up with an experimental design followed by performing the designed experiments as well as recording, analyzing, interpreting, and presenting the results obtained. Students will be working with inorganic complexes. They will be synthesizing ligands, and coordinating with metals. The metal complexes will be investigated using UV-Vis, fluorescence, IR and other analytical techniques.

Problem set
A literature search problem set will be distributed at the first class meeting of the semester. You will be expected to demonstrate competency in using SJSU library databases and literature search techniques to uncover various synthetic targets and answer mechanistic questions based on scientific literature.

Written Assignments – to be submitted both electronically as well as paper.
Initial project proposal – The initial project proposal will include a summary of your plans to make the required complex. All possible synthetic routes that will be tried will be detailed in the proposal.

Progress reports – Three written progress reports are intended to be “short” updates of your projects. Please do not give detailed experimental or calculation details in these reports; simply present a summary of the results achieved between progress reports deadlines, and an outlook of what needs to be done over the next two to three weeks.

Written report – There will be one final written report. This is intended to be formal, scientific written reports of your semester project aims, theoretical background, and results obtained over the course of the semester. This report will be in full adherence to ACS journal guidelines (Inorganic Chemistry) is expected, including footnote citations. Detailed information, including grading rubrics, will be discussed in class.
Oral Presentations
There will be two oral presentations in CHEM 146. A mid-term oral presentation (8-10 mins) on literature relevant to the assigned project and a final oral presentation (12-15 min) on the assigned semester-long project. Guidelines and details for the presentations will be discussed later in the semester.

Final Examination
There will be a final exam at the end of the semester. It will include the fundamental, theoretical, and technical information provided in seminars as well as the semester-long projects. Please take notes and learn from your classmates about what projects they are working on during the semester.

Grading Policy
Grading will be done as outlined below:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
<th>Percentage, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project proposal</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>Three progress reports</td>
<td>30 (3 x 10)</td>
<td>6</td>
</tr>
<tr>
<td>Laboratory note book</td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td>Mid-term oral presentation</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>Final oral presentation</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>Final written report</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>Final examination</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>500</td>
<td>100</td>
</tr>
</tbody>
</table>

Grades will be calculated as a percentage of the points earned out of the total points possible and a letter grade will be assigned based on the scale given below:

<table>
<thead>
<tr>
<th>Percentage, %</th>
<th>Letter Grade</th>
<th>Percentage, %</th>
<th>Letter Grade</th>
<th>Percentage, %</th>
<th>Letter Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>97-100</td>
<td>A'</td>
<td>84-80</td>
<td>B</td>
<td>60-64</td>
<td>C'</td>
</tr>
<tr>
<td>94-96</td>
<td>A</td>
<td>75-79</td>
<td>B</td>
<td>55-69</td>
<td>D'</td>
</tr>
<tr>
<td>90-93</td>
<td>A'</td>
<td>70-74</td>
<td>C'</td>
<td>50-54</td>
<td>D</td>
</tr>
<tr>
<td>85-89</td>
<td>B'</td>
<td>65-69</td>
<td>C</td>
<td>&lt;50</td>
<td>F</td>
</tr>
</tbody>
</table>

Classroom Protocol

Attendance policy
Attendance is mandatory for this course. However, under unavoidable circumstances, students are required to provide explanations in writing with supporting documentation from authorized personnel. Attendance of 80% or higher is required to receive a passing grade in the course.

Safety quiz
Students are required to take a safety quiz on the first day of class and pass with a score of 80% or higher in two attempts to remain enrolled in the course.
Laboratory sessions
Students MUST adhere to safety regulations outlined during first day of class at all times. Persistent failure to adhere to safety protocols will result in a failing grade. Experiments unrelated to the assigned project will not be allowed in the laboratory under any circumstances, and students engaging in such experiments will be withdrawn from the laboratory immediately.

Reagents
Request for reagents for next week’s lab session must be made by 5:00 PM on the preceding Monday. If a request is not received by that time, it will be assumed no additional reagents are needed, other than those already available in the lab. Every effort will be made to honor reagent requests.

Collaborative work
Working on the assigned project will be done in groups. However, every member of the group is required to contribute equally! In addition, every member is required to maintain their own laboratory notebook, submit their own written reports, and do their own oral presentations. Plagiarism of any sort will not be tolerated. Students who do not submit their own work will receive a zero on that particular assignment, and continuing to do so will result in a failing grade in the course.

Assignment deadlines
All assignments are required to be submitted on or before the assigned deadline. No assignments will be accepted after the deadline, and will result in a zero grade for that assignment.

Make-up sessions
There will be no makeup sessions for missed laboratory classes and/or oral presentations.

University Policies

General Expectations, Rights and Responsibilities of the Student
As members of the academic community, students accept both the rights and responsibilities incumbent upon all members of the institution. Students are encouraged to familiarize themselves with SJSU’s policies and practices pertaining to the procedures to follow if and when questions or concerns about a class arise. See University Policy S90–5 at http://www.sjsu.edu/senate/docs/S90-5.pdf. More detailed information on a variety of related topics is available in the SJSU catalog, at http://info.sjsu.edu/web-dbgen/narr/catalog/rec-12234.12506.html. In general, it is recommended that students begin by seeking clarification or discussing concerns with their instructor. If such conversation is not possible, or if it does not serve to address the issue, it is recommended that the student contact the Department Chair as a next step.

Dropping and Adding
Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester’s Catalog Policies section at
http://info.sjsu.edu/static/catalog/policies.html. Add/drop deadlines can be found on the current academic year calendars document on the Academic Calendars webpage at http://www.sjsu.edu/provost/services/academic_calendars/. The Late Drop Policy is available at http://www.sjsu.edu/aars/policies/latedrops/policy/. Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the Advising Hub at http://www.sjsu.edu/advising/.

Consent for Recording of Class and Public Sharing of Instructor Material

University Policy S12-7, http://www.sjsu.edu/senate/docs/S12-7.pdf, requires students to obtain instructor’s permission to record the course and the following items to be included in the syllabus:

- “Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor’s permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material.”
  - It is suggested that the greensheet include the instructor’s process for granting permission, whether in writing or orally and whether for the whole semester or on a class by class basis.
  - In classes where active participation of students or guests may be on the recording, permission of those students or guests should be obtained as well.
- “Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent.”

Academic Integrity

Your commitment as a student to learning is evidenced by your enrollment at San Jose State University. The University Academic Integrity Policy S07-2 at http://www.sjsu.edu/senate/docs/S07-2.pdf requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The Student Conduct and Ethical Development website is available at http://www.sjsu.edu/studentconduct/.

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism will result in a failing grade and possible sanctions by the University. An online tutorial on Plagiarism may be found at http://tutorials.sjlibrary.org/tutorial/plagiarism/index.htm.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours.
Presidential Directive 97-03 at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf requires that students with disabilities requesting accommodations must register with the Accessible Education Center (EAC) at http://www.sjsu.edu/aec/ to establish a record of their disability.

In 2013, the Disability Resource Center changed its name to be known as the Accessible Education Center, to incorporate a philosophy of accessible education for students with disabilities. The new name change reflects the broad scope of attention and support to SJSU students with disabilities and the University's continued advocacy and commitment to increasing accessibility and inclusivity on campus.

**Accommodation to Students' Religious Holidays**
San José State University shall provide accommodation on any graded class work or activities for students wishing to observe religious holidays when such observances require students to be absent from class. It is the responsibility of the student to inform the instructor, in writing, about such holidays before the add deadline at the start of each semester. If such holidays occur before the add deadline, the student must notify the instructor, in writing, at least three days before the date that he/she will be absent. It is the responsibility of the instructor to make every reasonable effort to honor the student request without penalty, and of the student to make up the work missed.

See University Policy S14-7 at http://www.sjsu.edu/senate/docs/S14-7.pdf

**Student Technology Resources**
Computer labs for student use are available in the Academic Success Center at http://www.sjsu.edu/at/asc/ located on the 1st floor of Clark Hall and in the Associated Students Lab on the 2nd floor of the Student Union. Additional computer labs may be available in your department/college. Computers are also available in the Martin Luther King Library.

A wide variety of audio-visual equipment is available for student checkout from Media Services located in IRC 112. These items include DV and HD digital camcorders; digital still cameras; video, slide and overhead projectors; DVD, CD, and audiotape players; sound systems, wireless microphones, projection screens and monitors.

**SJSU Peer Connections**
Peer Connections, a campus-wide resource for mentoring and tutoring, strives to inspire students to develop their potential as independent learners while they learn to successfully navigate through their university experience. You are encouraged to take advantage of their services which include course-content based tutoring, enhanced study and time management skills, more effective critical thinking strategies, decision making and problem-solving abilities, and campus resource referrals.

In addition to offering small group, individual, and drop-in tutoring for a number of undergraduate courses, consultation with mentors is available on a drop-in or by appointment basis. Workshops are offered on a wide variety of topics including preparing for the Writing Skills Test (WST), improving your learning and memory,
alleviating procrastination, surviving your first semester at SJSU, and other related topics. A computer lab and study space are also available for student use in Room 600 of Student Services Center (SSC).

Peer Connections is located in three locations: SSC, Room 600 (10th Street Garage on the corner of 10th and San Fernando Street), at the 1st floor entrance of Clark Hall, and in the Living Learning Center (LLC) in Campus Village Housing Building B. Visit Peer Connections website at http://peerconnections.sjsu.edu for more information.

SJSU Writing Center
The SJSU Writing Center is located in Clark Hall, Suite 126. All Writing Specialists have gone through a rigorous hiring process, and they are well trained to assist all students at all levels within all disciplines to become better writers. In addition to one-on-one tutoring services, the Writing Center also offers workshops every semester on a variety of writing topics. To make an appointment or to refer to the numerous online resources offered through the Writing Center, visit the Writing Center website at http://www.sjsu.edu/writingcenter. For additional resources and updated information, follow the Writing Center on Twitter and become a fan of the SJSU Writing Center on Facebook.

SJSU Counseling Services
The SJSU Counseling Services is located on the corner of 7th Street and San Fernando Street, in Room 201, Administration Building. Professional psychologists, social workers, and counselors are available to provide consultations on issues of student mental health, campus climate or psychological and academic issues on an individual, couple, or group basis. To schedule an appointment or learn more information, visit Counseling Services website at http://www.sjsu.edu/counseling.
**Course Schedule** (check Canvas for updates and pdf files. Any changes will be announced in class and posted on notice board outside of DH 010)

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics, Readings, Assignments, Deadlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 29</td>
<td>Course introduction, green sheet, safety quiz, literature search, library resources, check-in</td>
</tr>
<tr>
<td>2</td>
<td>Feb 5</td>
<td><strong>Problem set due</strong>&lt;br&gt;Assignment, discussion, and planning of semester-long project.</td>
</tr>
<tr>
<td>3</td>
<td>Feb 12</td>
<td>Begin working on assigned project</td>
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<tr>
<td>4</td>
<td>Feb 19</td>
<td></td>
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<tr>
<td>5</td>
<td>Feb 26</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Mar 4</td>
<td>Deadline to submit Progress Report 1 on assigned project</td>
</tr>
<tr>
<td>7</td>
<td>Mar 11</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Mar 18</td>
<td>MIDTERM ORAL PRESENTATION ON LITERATURE RELEVANT TO THE ASSIGNED PROJECT</td>
</tr>
<tr>
<td>9</td>
<td>Mar 25</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Apr 1</td>
<td>NO CLASS. SPRING BREAK</td>
</tr>
<tr>
<td>11</td>
<td>Apr 8</td>
<td>Deadline to submit Progress Report 2 on assigned project</td>
</tr>
<tr>
<td>12</td>
<td>Apr 15</td>
<td></td>
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<tr>
<td>13</td>
<td>Apr 22</td>
<td></td>
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<tr>
<td>14</td>
<td>Apr 29</td>
<td>Deadline to submit Progress Report 3 on assigned project</td>
</tr>
<tr>
<td>15</td>
<td>May 6</td>
<td>Last day of laboratory workout and check-out&lt;br&gt;Deadline to submit Laboratory notebook, and Final Report on assigned project</td>
</tr>
<tr>
<td>16</td>
<td>May 13</td>
<td>Final oral presentation on assigned project</td>
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<tr>
<td>17</td>
<td>May 20</td>
<td>FINAL EXAMINATION. 07:15 AM - 09:30 AM</td>
</tr>
</tbody>
</table>