

**Spring 2019****Course Number: CHE 2355-01****Course Title: Descriptive Inorganic Chemistry****Date and Time:****Lecture: MWF 9:25-10:25, PS 200****Laboratory: H 2:00-4:50 PS 222****Faculty Information:****Faculty Name:** Dr. Carmen Valdez Gauthier**Office Location:** PS 217**Office Phone:** 863-680-4320**Email:** cgauthier@flsouthern.edu**Office Hours:** MW: 3:30-5:00 PM, H: 11:00-12:00, F: 2:00-3:00 PM and by appointment**Office hours are subject to change. Changes will be posted on the Portal and will be announced in class****Review Sessions:** TBA**Course Description:**

Four hours. Prerequisite CHE 1112. Fundamental topics in inorganic chemistry will be explored, among them: atomic theory and periodicity of the elements, bonding and properties of solid state materials, main group chemistry, structure and bonding of coordination compounds, and bio-inorganic systems. The laboratory component of the course will give students experience with a various laboratory techniques used in the synthesis and characterization of inorganic compounds. Students will be involved in engaged learning activities including inquiry based experiments, collaborative problem solving, team-based laboratory projects, and searching the literature using discipline specific databases.

**Student learning Outcomes:**

Upon finishing this course students will be able to:

- Utilize the concepts of atomic theory to explain the periodic trend in transition metals and main group elements.
- Understand the different bonding theories as they apply to inorganic compounds.
- Utilize the IUPAC rules to name and write transition metal complexes.
- Explore and correlate the properties of conductors, semi-conductors and insulators to chemical bonding.
- Develop an understanding of the acid-base theories as they apply to main group elements.
- Apply the principles of structure and bonding to predict and explain reactions involving inorganic compounds.
- Explain the role metals play in biological systems.
- Utilize chemical software to visualize chemical compounds and their basic physical and chemical properties.
- Collect and analyze data, and formulate a reasonable scientific explanation for processes involving inorganic compounds.

- Use a variety of synthetic methods used in synthesis.
- Use purification methods such as column/ion exchange chromatography and re-crystallization in inorganic synthesis.
- Use multiple spectroscopic techniques such as infrared, ultraviolet-visible, and nuclear magnetic resonance.

Additionally students will be able to demonstrate:

- **Problem solving** skills in classroom assignments and laboratory work.
- Laboratory safety skills when working individually and in groups.
- Effective communication skills as evidenced in classroom discussion and presentations, laboratory reports using scientific journal format.
- Good interpersonal skills and an ability to work in small groups in the classroom and in the laboratory setting.
- Ability to access and employ scientific databases.

#### **Required Books and Materials:**

- Inorganic Chemistry, 7<sup>th</sup> Edition by Weller, Overton, Rourke, and Armstrong
- Laboratory notebook
- Scientific Calculator (Graphing calculators are not allowed during the final exam)
- Safety goggles

#### **Engaged Learning:**

A modified process oriented guided inquiry approach will be utilized in this course. Prior to the introduction of a new concept, students will work on short activities that emphasize the basic concepts to be discussed. In the laboratory students will work in pairs using a guided inquiry approach.

#### **Use of Instructional Technology:**

Students will use SciFinder, a chemical database, to retrieve information required to solve the problems sets; they will use the Odyssey software to model the atomic orbitals involved in a chemical reaction. Students will also use Mercury and Crystal Maker visualization software and the Cambridge Crystallographic Data Base to investigate crystalline structures. Additionally students will utilize instrumentation such as infrared and UV-vis spectroscopy in the characterization of inorganic compounds.

#### **Course Evaluation:**

	<b>Percentage of Grade</b>	<b>Date</b>
In-class participation	10 %	POGIL reports and i-clicker responses
Problem sets	10 %	Dates posted on the Portal
Project	10 %	To be determined by students
Exams	30 %	See tentative schedule
Final Exam	15 %	May 1, 2019
Laboratory work	25 %	See laboratory syllabus

**Evaluation and Grading Scale:**

- *In-class Participation* (10 %) you will work in groups on activities, modeling and solving problems using Classroom Response Systems
- *Problem sets* (10%) The problem sets may involve you reading peer-reviewed articles and answering questions related to your reading as well as other problems assigned to you.
- *Project* (10%) This is a peer led instruction project. Each pair will give a presentation over a selective topic in inorganic chemistry. List of topics will be provided on January 18, 2019 along with a rubric.
- *Exams* (30 %) In-class exams will cover lecture and laboratory material. Each exam will focus on material covered up until this point in the semester.
  - Exam 1: February 8
  - Exam 2: March 15
  - Exam 3: April 17
- *Final Exam* (15 %): American Chemical Society standardized *Foundations of Inorganic Exam*.
- *Laboratory* (25%) The laboratory component will consist of weekly laboratory exercises including a pre-lab assignment, maintaining a laboratory notebook and preparing laboratory reports using science journal standards.

**Extra Credit**

The Department of Chemistry and Physics invites speakers from off-campus to come to FSC to give seminars on topics of current scientific interest. You are **highly** encouraged to attend these seminars as part of your own intellectual growth and to learn about topics and fields which you may become interested in for future research projects or as a future career! To entice you to come to these seminars, your attendance for the ~1 hour seminar and submission of a short summary of the seminar will be rewarded with the addition of up to 1.5% to your final grade, i.e. you will need to attend and submit a report for at least three seminars. This is the **only** opportunity for extra credit in this class. Additional details of the seminars and the required summaries will be provided in class.

**Grading Scale:**

≥ 90	A
80 to 89	B
70 to 79	C
60 to 69	D
59 or lower	F

**ACCESS FOR STUDENTS WITH DISABILITIES SPRING 2019**

Florida Southern College and the Office of Student Disability Services (SDS) are committed to providing accessible and inclusive learning environments for students with disabilities and/or temporary medical needs. Conditions include but are not limited to mental health, attention-related, learning, vision, hearing, physical, or health needs. If you anticipate or experience any barriers to learning based on a disability or temporary medical condition, you are welcome to contact SDS to engage in an interactive process that will include you, your professor, and SDS to explore solutions.

Your SDS contact is Dr. Marcie Pospichal, Coordinator of Student Disability Services, Carlisle Rogers Building Room 120, tel: (863) 680-4197, e-mail: [disabilityservices@flsouthern.edu](mailto:disabilityservices@flsouthern.edu). Documentation of disabilities can also be faxed to Dr. Pospichal at (863) 680-4195.

For more information on disability accommodations and access, please also visit our website at <http://www.flsouthern.edu/campus-resources/student-disability-services.aspx>.

**Attendance:**

The college *Academic Catalog* states the following: “Students are expected to attend all class and laboratory sessions on time and may be absent only for unavoidable documented reasons.” *Faculty members should be very clear about any additional attendance/absence policies they require on the syllabus and any penalties attached to absences. Such policies must be consistent with the Catalog policy*

**Honor Code:**

As an academic community, Florida Southern College is firmly committed to honor and integrity in the pursuit of knowledge. Therefore, as a member of this academic community, each student acknowledges responsibility for his or her actions and commits to the highest standards of integrity. In doing so through this Honor Code, each student makes a covenant with the college not to engage in any form of academic dishonesty, fraud, cheating, or theft. Further information on the Honor Code is available in the current Catalog. Any plagiarized work will receive an “F” and will be reported to the Dean. Please see your professors before you submit work about which you have a question concerning proper documentation. Further information is available in the College Catalog.

**NOTES:**

1. This course is not graded on a curve, so, in principle, everyone can receive an A. One proven way to master the material is to explain it to another student. You may want to consider this method.
2. You will definitely need to take notes in class. A good way to study is to transcribe your notes and augment them with notes from your textbook or other sources. Some notes will be posted in <http://portal.flsouthern.edu>.
3. The lectures cover selected topics from the textbook. Questions on the problem sets and exams will come from material covered in class plus reading material given in class.
4. **Read the textbook!** (You paid enough for it!) At least skim through the chapter as each new section is begun, to familiarize yourself with the vocabulary and general ideas. Reading the chapter summary first is a good idea! Also consult other textbook that are in the library.

5. **Seek help if you start to feel lost, ASAP.** Take advantage of my office. Not everyone comes into this course with the same background, and some may need a bit more guidance than others. I will be happy to meet with you to see what I can do to help you get the most from this course, but I can't help if I don't know about the problem
6. The problem sets are to be worked independently or collaboratively. These problems are designed to help you master the concepts in inorganic chemistry and are the important topics to be stressed in the examinations. The problem set must be neat and clear. **I will not accept late work!**
7. **Speak up in class.** I encourage you to participate in class, particularly if you are unclear with the material. I cannot read your mind.
8. **In-Class Assignments:** You will work on teams of four students. Each of you will have a role and each of you will be required to complete each one of the assignment. I will announce at the end of the class which students from each team will submit the work for grading.
9. The laboratory is an important component of this course. The labs I have chosen for you will help you appreciate the vastness of inorganic chemistry.

**TENTATIVE SCHEDULE FOR TOPICS TO BE COVERED (Please note that exam dates will NOT be changed) -Updated Feb 5**

<b>Week 1</b>	1/9-1/11	Course overview Basic Concepts Atoms: orbitals, early quantum theory, and the periodic table (CH 1)
<b>Week 2</b>	1/14-1/18	Continuation of atomic theory (CH 1) and introduction to basic concepts of bonding (CH 2) Problem set # 1
<b>Week 3</b>	1/21-1/25	1/21 MLK Holiday Bonding theories (CH2)
<b>Week 4</b>	1/28-2/1	Introduction to solid state chemistry (CH4) Problem set # 2 (January 28)
<b>Week 5</b>	2/4-2/8	Acids and bases Bronsted and Lewis theories (CH 5) <b>EXAM 1 – February 8</b>
<b>Week 6</b>	2/11-2/15	Acids and bases Bronsted and Lewis theories (CH 5)
<b>Week 7</b>	2/18-2/22	Introduction to coordination chemistry (CH 7) Problem set # 3 (February 18)

<b>Week 8</b>	2/25-3/1	Chemical Bonding in coordination chemistry (CH 20) Problem set # 4 (February 27)
<b>Week 9</b>		<b>Spring Break</b>
<b>Week 10</b>	3/11-15	Reactions in Coordination chemistry (CH 21) <b>Exam 2 (March 15)</b>
<b>Week 11</b>	3/18- 3/22	Review of periodic trends and the anomalous nature of first member of each group (CH 9) and chemistry of hydrogen (CH 10)
<b>Week 12</b>	3/25- 3/29	The chemistry of alkali metals (CH 11) Work on project – ACS National Meeting
<b>Week 13</b>	4/1-4/5	Chemistry of the alkaline earth metals (CH 11) and Chemistry of Group 13 (CH 13) Problem set # 5 (April 3)
<b>Week 14</b>	4/8-4/12	Chemistry of the groups 14 and 15 (CH 14 and CH 15)
<b>Week 15</b>	4/15- 4/19	Chemistry of groups 16-18 (CH 16 and CH 17) Problem set # 6 (April 15) <b>Exam 3 (April 17)</b>
<b>Week 16</b>	4/22- 4/26	Advances and applications in inorganic chemistry Student projects Problem set # 7 (April 22)
		<b>FINAL EXAM: May 1, 2019 from 8:00 – 10:00 am</b>

### **CHE 2355 Laboratory Policies**

**Lab Attire:** Students must wear long pants, close-toed shoes, and shirts that cover at least halfway to the elbow. Lab coats are recommended but not required. Long-hair must be tied back. Eye protection (splash goggles) must be worn at all times in the lab, and contact lenses cannot be worn. Students not wearing proper attire will be asked to change before beginning the experiment.

**Lab Safety:** Each student must adhere strictly to the Chemistry/Physics Department safety regulations. The safety rules and regulations are included in the document titled “Florida Southern College Laboratory Safety Rules and Procedures.” Your signature on the bottom of the Check-In/Out Sheet and Safety Agreement indicates that you have read and agree to follow these guidelines. Any students not following the safety regulations will be asked to leave the lab and will receive a **zero** and an absence for the lab.

**Grading:** The laboratory accounts for 25% of your total grade for CHE 2355. All laboratories must be completed in order to receive a passing grade for the course.

**Percentage Distribution:**

Laboratory Reports	75%
Pre-lab Quizzes	10%
Lab Notebook	15%
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	100%

A cursory understanding of the laboratory experiment is necessary for a safe working environment.

The pre-lab must be completed prior to entering the laboratory. Upon entry, immediately place your notebook on the front desk. Before starting the experiment, I must approve your pre-lab in your laboratory notebook. If the pre-lab is incomplete or poorly written, up to 5% will be deducted from the possible score on your lab report.

You will work in pairs, the lab notebooks and post-lab assignments are to be completed by each individual and should constitute individual work!

Few suggestions on how to prepare for the lab:

- Read the lab handout.
- Read the sections in your textbook that relates to the lab.
- Write the purpose of the lab and what do you expect to gain from the lab.
- Organize and plan ahead

This will save you time and you stand to gain a deeper comprehension of the material.

### **Reports:**

All reports are due at the start of lab one week after completion of the experiment. Each report will be worth a total of 100 pts. Late reports will be reduced by **10 pts per day late**. The experiments denoted with \* indicate that you must turn in a formal lab report. The format for the

lab report will be in the format of a paper in *Inorganic Chemistry*. Information about the format can be found at <http://pubs.acs.org>. The reports must be typed but they do not have to be written in a two column format.

Each report should contain the following sections:

- **Abstract:** containing a brief summary of the results.
- **Introduction:** containing background material and the purpose of the lab.
- **Experimental:** containing an abbreviated procedure for each compound formed and the experimental characterization data for the compound. If a computational method was used be sure to indicate that all calculations were performed using Spartan'18 by wavefunction. Be sure to indicate which type of calculations were performed and if a simulation was performed it must be included.
- **Results and discussion:** containing all the results and observations, and a discussion of your result.
- **Conclusion**
- **Appendixes:** A sample of calculation, spectral data, etc.

### Laboratory Notebooks:

Your notebook will be collected and graded after the completion of each lab. We will use OneNote to keep your individual lab notebook.

#### E-Notebook Instructions

In this lab you will be conducting a series of experiments where you not only be synthesizing compounds but you were also be characterizing the compounds you have made using different instrumentation techniques.

Each student is responsible for creating a Google document that you will share with me ([cgauthier@flsouthern.edu](mailto:cgauthier@flsouthern.edu)).

### Directions:

- 1) Create a folder which you will name: CHE 2355-S19-YOUR NAME
- 2) Within each folder you will create a file for each experiment. The file will have the name of the experiment. For example, Synthesis of nitrogen triiodide
- 3) Pre-lab assignment
  - Read through the procedure
  - Familiarize yourself with the SDS
- 4) During the lab:
  - Record the reagents
  - Record the quantities
  - Record the observations
  - Upload the IR, UV, PXRD files to your Google Doc.
  - Include a reflection paragraph: your reflection should be a brief statement of what you learned from the lab or what specific principle or principles were illustrated by the lab as well as your assessment of your mastery of those ideas.



<u>Week of</u>	<u>Laboratory Topic</u>
1/10	Check in and how to keep a good lab notebook
1/17, 1/22	Lab 1: Synthesis of an $\text{NI}_3$
1/22, 1/31	*Lab 2: Synthesis of ZnO Nanoparticles and completion of tutorial in spectroscopy (see OneNote file)
2/7, 2/14	* <b>Lab 3: Synthesis of DMSO Complexes</b>
2/21	Lab 4: Synthesis of Cisplatin
2/24, 3/12	Continuation of Lab 4: Characterization of Cisplatin  <b>**Lab 5: Synthesis, Characterization, and Computational Modeling of <math>[\text{Co}(\text{acacen})\text{L}_2]^+</math>, an Inhibitor of Zinc Finger Proteins</b>
3/22	<b>**Lab 6: Synthesis of Wilkinson catalyst</b>
3/29, 4/7	*Lab 7: Synthesis and Small Molecule Exchange Studies of a Magnesium Bisformate MOF: An Experiment in Host Guest Chemistry
4/11, 4/18	*Lab 8: Sol Gels or Synthesis of Zeolites
4/25	Clean-up

**\*\*Same lab report as the Organic II lab report.**