CHEM 713 Prof. Laina M Geary
Organometallics **E-mail**: lgeary@unr.edu
Spring 2020 **Office**: CB 336

Class Time: MWF, 9:00am – 9:50am (EJCH 240L)
Office Hours: by appointment or stop in if my office is open

Web Page: Available on WebCampus (https://webcampus.unr.edu)
The website will contain the course syllabus, calendar, relevant links, announcements, etc. You are responsible for checking it regularly for updates.

Required Text:
Organotransition Metal Chemistry, John F. Hartwig

Other useful textbooks and references:
1. *Organometallic Chemistry,* Spessard and Miessler
2. *Organometallics,* Elschenbroich
3. *The Organometallic Chemistry of the Transition Metals,* Crabtree
4. *Homogenous Catalysis: Understanding the Art,* van Leeuwen

Course Topics:
The goal of this course is to provide an in-depth introduction to the broad subject of organometallic chemistry. Selected topics include: main group organometallics, oxidation states, ligands, structure and bonding, mechanism and mechanistic analysis, cross coupling, hydrogenation, hydroformylation, olefin polymerization, olefin metathesis, and other applications in homogeneous catalysis and organic synthesis.

Student Learning Outcomes: At the end of the semester, a student will be expected to be able to:
(1) count valence electrons for organometallic compounds
(2) describe bonding in organometallic compounds
(3) explain fundamental organometallic processes, such as ligand substitution, oxidative addition, reductive elimination, migratory insertion, and elimination
(4) apply knowledge of fundamental reaction processes to catalysis
(5) analyze organometallic reaction mechanisms based on experimental data

All students are assumed to know (or to be able to look up) the material covered in introductory organic chemistry and inorganic chemistry courses. This includes trends in the electronegativities of atoms, atomic sizes, approximate bond lengths and angles, qualitative descriptions of electronic structure, and general reactivity.

Grade Breakdown:
Problem Sets: 20%
In Class Tests (2): 30%
Catalytic Cycle Project: 10%
Mini Lecture: 15%
Final Exam: 25%

Problem Sets: These will be distributed approximately once a month. These may be worked on in small groups and discussions are encouraged. However, the submitted assignment must clearly indicate all names of those who actively contributed to the solution(s). Failure to submit an assignment will result in a mark of zero for that assignment. Late assignments are not accepted for any reason. Students may be called upon at any time to facilitate a discussion related to the problem set(s).

In Class Tests: The in class tests will be held on **Friday, February 28th** and **Friday, April 24th**. The better of the two will count for 20% and the worse will count for 10% of your final grade. If you have a legitimate excuse for missing a test, the grading scheme will be adjusted and the final will be worth more towards your final grade.

Catalytic Cycle Project: This will evaluate your ability to understand an organometallic mechanistic paper. I will have a list of papers outside of my office (CB336); please stop by before **5 pm on Friday, March 6** to sign up for your paper of choice (first come, first serve; one student per paper). Failure to sign up for a paper prior to this deadline will result in a 50% loss in the grade on the presentation.

You will be required to use Scott McIndoe's Catacycle tool (catacycle.com) to make an appropriate catalytic cycle that is fully consistent with the mechanistic data presented in the paper you signed up for. In addition to providing an appropriate catalytic cycle, you will need to submit a short (<1 page) justification of your choice of arrows/steps. You will likely need to read the Supporting Information and references, as well as the paper itself. This will be due on **Friday, April 3** at 5 pm.

Mini Lecture: This will evaluate your ability to explain an organometallic mechanistic paper to others. This will be on the *same paper* that you read for your catalytic cycle challenge. Presentations will occur during scheduled class time beginning the week of **April 20** as required.

Presentations should be professional in appearance and content. Use ChemDraw (or an analogous program) for drawing schemes. You may NOT just copy and paste schemes from the paper. You should use PowerPoint or something similar for the presentation. Your slides should look nice and clearly convey your message. Your presentation should explain why the paper is important, what mechanistic questions they asked, and how they answered them. You should explain the methods and analysis that they used, as well as the results of the mechanistic experiments. You will likely need to read the Supporting Information and references, as well as the paper itself. Include the catalytic cycle you generated previously as one of your concluding slides. You should be prepared to intelligently answer questions about all aspects of the paper and their methods. Questions on at least one paper will be included on the final exam.

Final Exam: The final is tentatively scheduled for **Monday, May 11th** from 7:30-9:30 am, and will be comprehensive.

Academic Dishonesty**:**

"Cheating, plagiarism or otherwise obtaining grades under false pretenses" constitute academic dishonesty according to the code of this university. Academic dishonesty will not be tolerated and penalties can include canceling a student's enrollment without a grade, giving an F for the course or for the assignment.

Disability statement**:**

If you have a disability and will be requiring assistance, please contact me or the Disability Resource Center (Thompson Building Suite 100) as soon as possible to arrange for appropriate accommodations.

Audio and Video Recording**:**

Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be video-taped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may be given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.

Academic Success Services**:**

Your student fees cover usage of: Math Center (784--4433 or www.unr.edu/mathcenter/); Tutoring Center (784--6801 or www.unr.edu/tutoring-center/); Writing Center (784--6030 or http://www.unr.edu/writing_center/)

These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign a responsible and successful student.

Tentative Schedule (topics and pacing subject to change)

week	topic	chapter(s)
1 (Jan 20)	introduction; structure and bonding	1
2 (Jan 27)	structure and bonding / electron counting	1
3 (Feb 3)	dative ligands	2
4 (Feb 10)	anionic ligands	3 & 4
5 (Feb 17)	ligand substitution	5
6 (Feb 24)	ligand substitution / oxidative addition *test 1*	5 -7
7 (Mar 2)	oxidative addition / reductive elimination *choose your paper*	8
8 (Mar 9)	migratory insertion / elimination	9 & 10
(Mar 16)	*spring break – no classes*	*N/A*
10 (Mar 23)	catalysis	14
11 (Mar 30)	catalysis *catalytic cycle due*	15 – 19 (selected topics)
12 (Apr 6)	main group chemistry *test 2*	
13 (Apr 20)	*lecture and/or student paper presentations* *(depends on enrollment)*	*N/A*
14 (Apr 27)	*student paper presentations*	*N/A*
15 (May 4)	*student paper presentations*	*N/A*
16 (May 11)	*final exam – Monday, May 11, 7:30 – 9:30 am*	*N/A*