CHEM 7160: Organometallic Chemistry
Spring A 2020
Tuesday/Thursday 9:10-10:30 am; HEB 2002

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Suggested Materials
John Hartwig, “Organotransition Metal Chemistry”,
http://www.uscibooks.com/hartwig.htm

Course Description
This class will focus on the underlying concepts and mechanisms that govern modern transition metal catalysis. We will use numerous case studies to interrogate reaction mechanisms of such processes covering the original discoveries and progressing to recent applications. The course is 2 credit hours.

Course Outcomes
Students will gain and demonstrate an understanding of:
• how the commonly-used methods today came into being.
• general reactivity, including the origins of selectivity in transition metal-catalyzed processes and how the transition metals differ in their reactivity.
• how to gauge when a reaction would appropriate for one’s own synthetic endeavor
• hypothesis driven scientific inquiry

Teaching and Learning Methods
This course will utilize lectures to summarize and emphasize important concepts and to explore relevant case studies. Problem sets and two (2) formal examinations will be used to reinforce concepts and evaluate student progress. Supplementary sessions will be held outside of the scheduled class time with the intent to engage students in discussion-based problem solving.
University Policies

1. **The Americans with Disabilities Act.** The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

2. **University Safety Statement.** The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.

3. **Addressing Sexual Misconduct.** Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran’s status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

4. **Student Code.** By submitting an assignment or laboratory report, you are representing that it is your own work and that you have followed the rules associated with the assignment. Incidents of academic misconduct (including cheating, plagiarizing, research misconduct, misrepresenting one’s work, and/or inappropriately collaborating on an assignment) will be dealt with severely, in accordance with the Student Code (http://www.admin.utah.edu/ppmanual/8/8-10.html). A single instance of academic misconduct may result in a failing grade for the course. multiple instances of academic misconduct may result in probation, suspension or dismissal from a program, suspension or dismissal from the University, or revocation of a degree or certificate.

5. **Wellness Statement.** Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, substance-abuse, etc, can interfere with a student’s ability to succeed and thrive. For helpful resources contact the Center for Student Wellness at www.wellness.utah.edu or 801-581-7776.

6. **Undocumented Student Support Statement.** Immigration is a complex phenomenon with broad impact—those who are directly affected by it, as well as those who are indirectly affected by their relationships with family members, friends, and loved ones. If your immigration status presents obstacles to engaging in specific activities or fulfilling specific course criteria, confidential arrangements may be requested from
the Dream Center. Arrangements with the Dream Center will not jeopardize your student status, your financial aid, or any other part of your residence. The Dream Center offers a wide range of resources to support undocumented students (with and without DACA) as well as students from mixed-status families. To learn more, please contact the Dream Center at 801.213.3697 or visit dream.utah.edu.

7. **Student Names and Personal Pronouns.** “Preferred first name” (if previously entered by you in the Student Profile section of your CIS account, which can be managed at any time). While CIS refers to this as merely a preference, I will honor you by referring to you with the name and pronoun that feels best for you in class or on assignments. Please advise me of any name or pronoun changes so I can help create a learning environment in which you, your name, and your pronouns are respected. If you need any assistance or support, please reach out to the LGBT Resource Center at https://lgbt.utah.edu/campus/faculty_resources.php.

8. **Veterans Center.** If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8-5 pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: http://veteranscenter.utah.edu/. Please also let me know if you need any additional support in this class for any reason.

9. **English Language Learners.** If you are an English language learner, please be aware of several resources on campus that will support you with your language and writing development. These resources include: the Writing Center (http://writingcenter.utah.edu/); the Writing Program (http://writing--program.utah.edu/); the English Language Institute (http://continue.utah.edu/eli/). Please let me know if there is any additional support you would like to discuss for this class.

10. **Diversity and Inclusivity Statement.** Course instructors are dedicated to maintaining a classroom environment and dialogue that facilitates intellectual and personal growth for all persons. The diversity that students bring to this class is viewed as a resource, strength, and benefit. Students are encouraged to contact the instructor(s) if they feel diversity and inclusivity is being compromised, or with suggestions to improve inclusivity.

**Course Policies**

1. **An Environment Conductive to Learning.** All students are expected to maintain professional behavior in the classroom, according to the Student Code, spelled out in the Student Handbook. Disruptive behaviors including talking, cell phone use and excessive tardiness will not be tolerated and will result in dismissal from the class. Students have specific rights in the classroom as detailed in Article III of the Code. The Code also specifies proscribed conduct (Article XI) that involves cheating on tests, plagiarism and/or collusion, as well as fraud, theft etc. Students should read the Code carefully and know that they are responsible for the content. According to Faculty rules and regulations, it is my responsibility to enforce responsible classroom behaviors and the Student Code, and I will do so, beginning with verbal warnings and progressing to dismissal from the class and assignment of a failing grade. Students have the right to appeal such action to the Student Behavior Committee.
2. **Exam Policy.** There will be no written make-up exams. Students who must miss an exam due to a family emergency, legitimate university conflict, or health emergency may take an oral exam by appointment with Prof. Sigman. Scores for oral exams will be estimated based on the class average and distribution. Legitimate questions about the grading of an exam can be submitted up to one week after the exam is handed back. The procedure for turning in an exam for re-grading is to attach a separate piece of paper to the front of the exam with your name, the question to be re-graded and a brief justification for the re-grade. However, the exam will not be accepted if any writing is on the exam. The entire exam will be re-graded.

3. **Attendance & Punctuality.** Although attendance of scheduled course meetings will not be explicitly monitored, as per the University of Utah's attendance policy regular attendance to all class meetings is expected. Students are responsible for all material missed in the event of an absence. While additional (Saturday) problem sessions are optional, attendance is strongly encouraged and material discussed at these sessions may be relevant to course examinations. Answer keys related to Saturday problems sets will be posted to the course Canvas page.

Students absent from scheduled examinations to participate in officially sanctioned university activities or religious obligations should coordinate with the instructor(s) at least ten days in advance to schedule a make up oral examination.

4. **Participation.** All students are expected to contribute to and participate in class at a level that is demonstrative of graduate-level engagement with material. Failure to participate may result in the reduction of course grades by up to one half-letter grade.

5. **Canvas.** Important information, links, and grades will be posted at appropriate times. Problems worked in class are not available on the web site, nor are they available from me under any circumstances, so come to class! Problems worked in class will be representative of those on exams.

**Assignments and Grading**

**Problem Sets**
These will be used to develop understanding of the class material. These will be handed in and spot-checked (photocopy the assignment so you can present problems in the discussion sessions). A reasonable effort is 5 points and 2 points for a lousy effort (25 pts total). Keys will be posted a few days prior to exams; late work will not be accepted.

**Project**
Develop a modern module of your favorite reaction in the class. The lay out of the should be similar to that of the note set wherein you provide specific examples, detailed mechanism and perhaps a synthetic application depending on the example. The reactions should be published after 2015. Slide and chemdraw templates will be provided. A total of no more than 3 slides should be provided.

Due date: March 5th by noon MST
Grading: a bonus will be added to your final if your project is judged excellent (15 pts) or good (10 pts).

**Exams**
MIDTERM: Tuesday February 4th; FINAL: Saturday, Feb. 29th 9-12, RM:TBD
### Course Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Tuesday</th>
<th>Thursday</th>
<th>Review Sessions (Friday @4)</th>
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<tbody>
<tr>
<td>January 6-10</td>
<td>Class Goals/ TM's/ Orbitals/Ligands</td>
<td>Electron Counting/ RXN Mechanisms/ Intro to cross coupling</td>
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<tr>
<td>January 13-17</td>
<td>Oxidative Addition/ Reductive Elimination</td>
<td>Cross Coupling I/ Stille, Hiyama, Suzuki-Mayura</td>
<td>Problem Session 1</td>
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<tr>
<td>January 20-24</td>
<td>Cross Coupling II/ Sonogashira/Buchwald-Hartwig</td>
<td>Migratory Insertion/ Heck Reaction/ Asymmetric Heck</td>
<td>Problem Set 2 Discussion</td>
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<td>January 27-31</td>
<td>Olefin Metathesis</td>
<td>CO Insertions/ Hydroformylation/ Hydroacylation</td>
<td>Problem Set 3 Discussion</td>
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<tr>
<td>February 3-7</td>
<td>MIDTERM</td>
<td>Cycloadditions [2+2+2]/ Pauson-Khand</td>
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<td>February 10-14</td>
<td>Cycloadditions [5+2]/ Vinyl cyclop propane</td>
<td>Wacker reactions</td>
<td>Problem Set 4 Discussion</td>
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<td>February 17-21</td>
<td>π-allyl Chemistry</td>
<td>Oxidation Chemistry/ C-H Activation</td>
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<tr>
<td>February 24-25</td>
<td>Problem Set 5 Discussion/ Review</td>
<td></td>
<td><strong>FINAL</strong> Saturday, Feb. 29th 9-12</td>
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Note: This syllabus is meant to serve as an outline and guide for our course. Please note that I may modify it with reasonable notice to you. I may also modify the Course Schedule to accommodate the needs of our class. Any changes will be announced in class and posted on Canvas under Announcements.