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# Chemistry 4571 - Organometallic Chemistry (Fall 2008)

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Tuesday - Thursday Lecture 10:40 AM - Noon Williams 202

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This is an advanced undergraduate, introductory graduate level course that covers the organometallic chemistry of the transition metals with emphasis on basic reaction types and the natural extensions to the very relevant area of homogeneous (and heterogeneous) catalysis. A course outline is shown below:

## A. Ligand Systems and Electron Counting

1. Oxidation States, *d* electron configurations, 18-electron "rule"
2. Carbonyls, Phosphines & Hydrides
3.  $\sigma$  bound carbon ligands: alkyls, aryls
4.  $\sigma/\pi$ -bonded carbon ligands: carbenes, carbynes
5.  $\pi$ -bonded carbon ligands: allyl, cyclobutadiene, arenes, cyclopentadienyl
6. Metal-Metal bonding

## B. Fundamental Reactions

1. Ligand substitutions
2. Oxidative addition/Reductive elimination
3. Intramolecular insertions/eliminations

## C. Catalytic Processes

1. Hydrogenation: symmetric and asymmetric
2. Carbonylations: hydroformylation and the Monsanto Acetic Acid Process
3. Polymerization/oligomerization/cyclizations

**Web Site:** [chemistry.lsu.edu/stanley/Chem4571-stanley.htm](http://chemistry.lsu.edu/stanley/Chem4571-stanley.htm). Class materials (notes, homework assignments, answer keys, announcements, etc.) will be posted on this web site and on Moodle.

**Recommended Text:** *"The Organometallic Chemistry of the Transition Metals"* by Robert Crabtree (4th Edition, Wiley). **Reference Text:** *"The Principles and Applications of Transition Metal Chemistry"*, by Collman, Hegedus, Norton and Finke (1<sup>st</sup> or 2<sup>nd</sup> eds, University Science Books).

**Class Lecture Notes (Required):** Copies of the lecture overheads used (and previous homeworks and exams along with answer keys) can be downloaded from the web site above or purchased from the Chemistry NOBCCHE graduate student group (available from Prof. Stanley's office after Aug 28).

**Study Groups:** The class will form study groups of 1-6 students to work together on the homework (each student hands in their own copy of the HW) and to answer questions in class (work alone on quizzes & exams).

<b>Grading:</b>	Two 80 min Exams:	300 pts	30%	(Sept 25 & Nov 6, <i>could change</i> )
	Final Exam (2 hrs):	250 pts	25%	(Tuesday, Dec 9 – 12:30 PM – 2:30 PM)
	4 Homeworks:	300 pts	30%	
	25 in-class Quizzes:	150 pts	15%	
	Bonus Homework:	40 pts		bonus (ChemDemo)

**Grading Scale (no curve):** A (100-90%), B (89-80%), C (79-70%), D (69-60%), F (below 60%)

If I give a test that is too hard (i.e., the class does poorer than I expect) I may curve the scores up to compensate. The exact criteria for when I will do this and the amount of the curving will not be defined here. You will have to trust my judgment. **Grades will be posted on PAWS via Moodle.**

**Please note that the majority of points on the homeworks and exams come during the second half of the semester!! The first 2 homework assignments are only worth 50 points each, while the last two homeworks are worth 100 points each. IT IS CRITICALLY IMPORTANT, HOWEVER, THAT YOU LEARN THE**

**MATERIAL IN THE FIRST 66% OF THE COURSE IN ORDER TO DO WELL ON THE LAST EXAM AND FINAL EXAM.** The final exam, for example, only covers catalysis (last 20% of the course), but uses all the info learned up to that point.

**Bonus Homework:** The bonus homework assignment involves visiting a high school chemistry class and teaching it concepts learned in this and other chemistry classes (General Chemistry). You will enhance your teaching efforts by doing a set of demonstrations that illustrate catalysis and related chemistry topics. There is a 2-4 page typed report required describing your teaching experience (maximum 20 points) and an evaluation sent to the teacher whose class you visit (maximum 20 points). Both must be received to get credit. Details on this assignment will be handed out within a few weeks. **DO NOT PROCRASTINATE!!**

**Office Hours:** I have open office hours.

**Cheating:** DON'T DO IT!!! I hate cheaters and will prosecute them to the full extent of LSU regulations.

**Class Calendar:**

**August, 2008**

Mon	Tue	Wed	Thur	Fri
	5		7	
	12		14	
	19		21	
	26		28	

**September, 2008**

Mon	Tue	Wed	Thur	Fri
	2		4	
	9		11	
	16		18	
	23		25 <i>Test # 1</i>	
	30			

**October, 2008**

Mon	Tue	Wed	Thur	Fri
			2	
	7		9 <i>Fall Break</i>	
	14		16	
	21		23	
	28		30	

**November, 2008**

Mon	Tue	Wed	Thur	Fri
	4		6 <i>Test # 2</i>	
	11		13	
	18		20	
	25		27 <i>Thanksgiving</i>	

**December, 2008**

Mon	Tue	Wed	Thur	Fri
	2		4	
	9 <i>Final</i>			