This course marries organic and inorganic concepts, and will cover the development of the most interesting catalytic and/or asymmetric reactions in the last ~20-30 years. The emphasis will be primarily on how these reactions work and how catalysts and conditions were redesigned to improve efficiency and selectivity, resulting in very exciting and useful reactions. Coverage of each major catalytic reaction will be accompanied by discussion of its use in multistep synthesis, with some discussion of additional reactions used in the synthesis, illustrating how diverse synthetic tools are combined to accomplish the construction of beautiful or useful complex molecules.

**Learning Goals:** By the end of the semester, students will 1) be comfortable reading articles from the primary organic synthetic and organometallic literature 2) be familiar with the major modern catalytic reactions and 3) understand the principles underlying reaction and catalyst optimization.

**Textbook:** Required: Organotransition Metal Chemistry: From Bonding to Catalysis, by John Hartwig. This book only covers certain aspects of what will be covered in the course. A great deal of additional reading will be assigned from seminal journal articles, reviews, and handouts. Recommended: Advanced Organic Chemistry, Part B: Reactions and Synthesis, by Carey and Sundberg (5th edition). This book will be a useful reference for further background on miscellaneous reactions covered in our discussion of multistep synthesis.

**Note on prerequisites:** although a satisfactory grade in 1st-year organic chem (25b) or equivalent is required, a B+ grade or higher is highly recommended. If your preparation is not quite at this level, you may still do well in this class, but we should talk at the beginning of the semester. This course should require at least 3 hours of time studying for each credit hour (4 of those), so about 12 hours per week of study time will be necessary. If your preparation is less than ideal, more time may be required.

**Office Hours:** Fridays from 1:30-3:30 (except on 8/28, which will be 10-12am instead), and by appointment. If the Friday time does not work for anyone, we might change it. I want to be accessible for questions, so do not hesitate to contact me or visit my office outside of the set hours.

**1st Homework Assignment:** Due 9/6 in turned in to the Chem Office by 12pm. Download off of LATTE.

**2nd Homework Assignment:** Due 9/13 in class.

**Reading for first two days of class:** Chapters 1 and 2, omitting sections 1.3.3, 1.3.6, 2.2.6, 2.3.4-7, 2.5, 2.6.1.2.2, 2.6.1.3, 2.6.2-4, 2.7.1.3, 2.8.2.2-3

**Reading for 3rd Day:** Chapters 6.1.1-2, 8.1.1-2, 9.1, 9.2.1.1.1, 9.2.2.1.1, 10.3.1.1.

**Reading for 4th Day:** Chapter 21, omitting section 21.3.

Subsequent readings from textbook and journals will be posted on LATTE.

**Organizational information:**
Grade composition: Final exam 35%, 2 midterms 25% each, problem sets and essays 15% (problem set grades will be Pass/Fail based on completion, though feedback will be provided, essay topics TBA)

Midterm dates: 10/15, 11/19 (in class)
Final exam date: TBA (pending registrar)

**Topics to be covered (may change slightly):**
Organometallics Basics (electron counting, ligand survey, basic catalytic reaction steps)
Olefin Metathesis (ROMP, RCM, enyne, relay, cross)
Palladium Cross Couplings (RX with alkenes, organo-boron, -zinc, -tin, -copper, -silicon reagents, etc.)
Palladium (II-IV) C-H activation chemistry
Asymmetric Conjugate Additions
Asymmetric Hydrogenations (and discussion of Curtin-Hammett principle)
Asymmetric Dihydroxylations
Asymmetric Epoxidations
Organocatalysis

[Chemical structures and reactions shown]