

The Scripps Research Institute  
Graduate Program  
Modern Organic Synthesis I: Synthetic Chemistry

**Contact Information**

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**Course Information**

Fall 2009

Boger section: Tuesday and Thursday 9:45 am – 11:15 am

Micalizio section: Tuesday and Thursday 1:00 pm – 2:30 pm (est)

TSRI CA Keck Amphitheater BCC-1 and Scripps FL TBA

**Course Description**

An introductory section of this course on Modern Organic Synthesis composes a half a quarter course with an exhaustive survey of oxidations, reductions, nucleophilic additions, chemistry of enolates, alkene synthesis, ring forming reactions, and synthetic analysis.

**Background Preparation (Prerequisites)**

Students are strongly encouraged to review background material relevant to this course that is presented in the provided lecture notes. A list of relevant references have also been provided. It is assumed that all students have completed at least one undergraduate course in organic chemistry. An advanced course would be beneficial, but not required.

**Texts and Journal References**

All relevant and required materials will be provided in class.

Texts:

- (1) Dale L. Boger, "Modern Organic Synthesis, Lecture Notes", TSRI Press, 1999.
- (2) E. J. Corey and X. Cheng, "The Logic of Chemical Synthesis", John Wiley & Sons, 1989.
- (3) F. A. Carey & R. J. Sundberg, "Advanced Organic Chemistry. Part B: Reactions and Synthesis", 3rd ed., Plenum Press, 1990.

Useful Reference Texts (Library Reserve)

- (1) L. F. Fieser & M. Fieser, "Reagents for Organic Synthesis", Vol. 1-18.

- (2) T. W. Greene and Peter G. M. Wuts, "Protective Groups in Organic Synthesis", 3rd ed., John Wiley & Sons, 1999.
- (3) W. Carruthers, "Some Modern Methods of Organic Synthesis", 3rd ed. Cambridge Univ. Press, 1989.
- (4) H. O. House, "Modern Synthetic Reactions", 2nd ed., Benjamin, 1972.
- (5) J. C. Stowell, "Carbanions in Organic Synthesis", John Wiley & Sons, 1979.
- (6) J. March, "Advanced Organic Chemistry", 4th ed., John Wiley & Sons, 1992.
- (7) R. C. Larock, "Comprehensive Organic Transformations", VCH, 1989.
- (8) S. Warren, "Organic Synthesis: The Disconnection Approach", John Wiley & Sons, 1982.
- (9) T. Lindberg (ed.), "Strategies and Tactics in Organic Synthesis", Vol. 1-3, Academic Press, 1984, 1989, 1991.
- (10) J. D. Morrison (ed.), "Asymmetric Synthesis", Vol. 1-5, Academic Press.
- (11) Trost, B. M.; Fleming, I., Eds. "Comprehensive Organic Synthesis", Vol. 1-9, Pergamon Press, 1991.

### **Course Learning Outcomes**

By the end of this course, students have a general understanding and working knowledge of:

1. Conformational analysis and its effect on organic reactivity,
2. Oxidations, cycloadditions, and reductions employed in organic synthetic chemistry,
3. Transition states and their effect on enolate chemistry,
4. Ring forming reactions and stereoselective alkene synthesis,
5. Stereoelectronic effects in organic chemistry, and

Ultimately, students are expected to be able to develop and solve reasonable mechanisms for the above reactions.

### **Course Requirements & Assignments**

40%: **Problem Sets.** One from Professor Boger worth 20% and one from Professor Micalizio worth 20%.

**Learning Purpose:** Supports all of the learning outcomes. These assignments will give the students opportunities to test their developing understanding of the principles discussed in class, and allows assessment of mastery of course material.

20%: **Total Synthesis Outline.** From Professor Boger.

**Learning Purpose:** Clearly demonstrate that all presented course materials have been mastered.

40%: **Final exams.** One from Professor Boger worth 20% and one from Professor Micalizio worth 20%.

**Learning Purpose:** Demonstrate mastery of course material and its application to problem solving.

### **Grading**

Letter Grade	Grade Point	Description	Learning Outcome
A = 90%**	4.0	Superior Achievement	Exemplary
B = 80%**	3.0	Satisfactorily demonstrated ability in field of study	Proficient
C = 70%**	2.0	Below average, work not at level expected of a TSRI graduate student	Developing
F = 60%	0.0	Not acceptable	Fail

\*\* Percentage based on top score.

### **Attendance**

Attendance is mandatory. Students who are unable to attend must request prior approval and may be required to make up the missed lectures. Students will be responsible for all course material regardless if they are present for the lecture.

### **Scientific and Professional Ethics**

The work completed in this course must be your own. You must be aware when you are building on someone else's ideas, including ideas of classmates, professors, and authors you read. The work you do in this course should reflect your own ideas and efforts. While working together is encouraged, your assignments should reflect your own thoughts and ideas.

### **Expectations and Logistics**

Mastery of organic chemistry requires a working knowledge of chemical reactions. Applications of these reactions to the construction of complex molecules and a better understanding of chemical reactivity are central themes throughout this course. Lectures will be presented in both PowerPoint and "chalk talk" formats and, where appropriate, examples to highlight the topics of interest will be given from our own laboratories.

### **Schedule\*\***

Boger Lecture 1

Boger Lecture 2

Boger Lecture 3

Boger Lecture 4

Boger Lecture 5 – Hand out first problem set.

Boger Lecture 6

Boger Lecture 7

Boger Lecture 8 – First problem set due. Hand out total synthesis outline.

Boger Lecture 9

Boger Lecture 10 – Total synthesis outline due.

Boger Final Exam

Micalizio Lecture 1

Micalizio Lecture 2

Micalizio Lecture 3

Micalizio Lecture 4

Micalizio Lecture 5

Micalizio Lecture 6

Micalizio Lecture 7

No class. Closed in observance of Thanksgiving.

Micalizio Lecture 8 – Hand out problem set.

Micalizio Lecture 9

Micalizio Lecture 10 – Problem set due.

Micalizio Lecture 11

Micalizio Final Exam

\*\* Schedule is subject to change.