

Chemistry Department  
**CHEM 213-02**  
**ORGANIC SYNTHESIS**  
Spring 2016

**Contact Information**

<b>Instructor:</b>	Dr. Mircea Gheorghiu
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<b>Office Hours:</b>	Tu/Th, 17:30-18:30 ( <i>appointment by e-mail</i> )
<b>Class Days/Time:</b>	Tu/Th 18:30-19:45
<b>Classroom:</b>	<b>DH 416</b>
<b>Prerequisites:</b>	CHEM 112B (or equivalent with a grade of "C" or better; "C-" not accepted). Alternate years 3 units.

**eCampus Course Page**

Course materials such as lecture slides (ppt); pdf articles, handouts, and updates to this greensheet (syllabus) may be obtained by logging into [Canvas](http://www.sjsu.edu/at/ec/canvas/index.html) at <http://www.sjsu.edu/at/ec/canvas/index.html>.

**Course Description**

Synthetic methods and their application to multistep organic syntheses. Emphasis will be placed on synthetic strategy and a mechanistic understanding of synthetic reactions.

Course Goals and Learning Objectives

Program Learning Outcomes (PLO)

[PLO's](http://www.sjsu.edu/chemistry/Academic_Programs/graduate_program_learning_objectives.html) for the MS or MA degree in Chemistry may be found at the following URL:

[http://www.sjsu.edu/chemistry/Academic\\_Programs/graduate\\_program\\_learning\\_objectives.html](http://www.sjsu.edu/chemistry/Academic_Programs/graduate_program_learning_objectives.html)

**Course Learning Outcomes (CLO)**

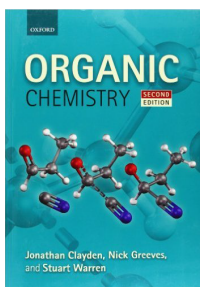
- (1) To become familiar with many of the biophysical techniques used in research and industry for analyzing the structure and function of macromolecules, especially proteins;
- (2) To appreciate the role of water structure in biological interactions;
- (3) to read and critique multiple journal articles from the scientific literature;
- (4) to improve written and verbal communication skills as applied to topics in biophysical chemistry.

**Textbook**

Clayden, J., Greeves, N., Warren, S.; *Organic Chemistry 2nd ed.*, Oxford University Press: Oxford, 2012

ISBN: 9780199270293

1,264 pages; Paperback



### Optional Texts:

1. Lewis, D. E.; *Advanced Organic Chemistry*, Oxford University Press: Oxford, 2015  
ISBN: 9780199758975  
1176 pages; Paperback
2. Carey, F.A., Sundberg, R.J.; *Advanced Organic Chemistry, Part B: Reactions and Synthesis, 5th. Ed.*, Plenum: New York, NY, 2007. (Edition 4<sup>th</sup>, 2001, available free electronically <http://site.ebrary.com.libaccess.sjlibrary.org/lib/sjsu/detail.action?docID=10047037>)
3. L. Kurti, L., Czako, B.; *Strategic Applications of Named Reactions in Organic Synthesis* Elsevier Academic Press: Burlington, MA, 2005.

### On-Line Resources:

Sci-Finder Scholar (Chemical Abstracts Service) (make arrangement with Chemical Liaison: Ann Agee ([ann.agee@sjsu.edu](mailto:ann.agee@sjsu.edu))) Web of Science (alternate name Web Knowledge): [http://discover.sjlibrary.org/iii/encore\\_sjsu/record/C\\_\\_Re1000002?lang=eng](http://discover.sjlibrary.org/iii/encore_sjsu/record/C__Re1000002?lang=eng)

### Molecular model sets.

If you wish to enhance your ability to visualize 3-dimensional features and movements in organic structures, you may benefit from using a molecular model set. Some reasonably priced kits, yet adequate for student use, can be obtained from the following vendors.

- Darling Models / Molecular Visions. <http://www.darlingmodels.com>
- Indigo. Has Molymod sets for organic chemistry. <http://indigo.com/models/molymodmolecular-model-sets.html>
- Amazon. Search for “molymod.” A wide variety of molecular model sets will be displayed. The recommended set is the Prentice-Hall molecular model set for organic chemistry (about \$40 on last check). <http://www.amazon.com/exec/obidos/subst/home/home.html/002-9078151-4305639>

Be careful what you buy. Not all models are adequate. If you go too cheap you will end up with Junk. Models priced between \$20 and \$40 are usually adequate for use in this course.

### Library Liaison

Ann Agee ([ann.agee@sjsu.edu](mailto:ann.agee@sjsu.edu))

### Course Requirements

#### General

SJSU classes are designed such that, in order to be successful, a student is expected to spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in [University Policy S12-3](#) at <http://www.sjsu.edu/senate/docs/S12-3.pdf>.

NOTE that [University policy F69-24](http://www.sjsu.edu/senate/docs/F69-24.pdf) at <http://www.sjsu.edu/senate/docs/F69-24.pdf> states that “Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading.”

### Miscellaneous Assignments

Miscellaneous: (i) 10 homework assignments (10 points each; there will be a 20% deduction for any late assignment) and (ii) 10 Lecture quizzes (8 points each)..

### Oral Presentation and the Term Paper

A standard benchmark for the competence of a synthetic organic chemist is the ability to propose a reasonable multistep synthesis of a complex molecular target.

**Synthesis Project:** You will be assigned a synthesis project. The project will describe the enantioselective synthesis of an approved organic compound. The project will be split into two parts:

1) **oral presentation (20 points):** a power point presentation outlining the retrosynthetic approach and the key steps of your synthesis. 3 peer evaluations of oral presentations.

2) **term paper (100 points):** an *Organic Letters*-style report (**ACS format**) detailing all the steps of the synthesis with references for all the key reactions.

You will be provided with an *Organic Letters* paper writing template and a paper already published in *Organic Letters*.

**Chemical structure** must be incorporated into the body of your paper (see the published paper provided).

**Literature must be cited** according to American Chemical Society format (see the published paper provided).

For **drawing of chemical structure** you can use ChemDraw (is not free, but is available also as a cheap app on iPad) or download the freely available ChemSketch (ACD/ChemSketch).

Details for writing the term paper will be discussed in class. Writing expectations and grading criteria will be issued to each student in the form of a table near the beginning of the semester. See the course schedule for deadlines in preparation of the term paper.

### Exams

The midterm (**75 points, March 05, 2016, 1830-1945**) and final exams (**125 points; Thursday, May 19, 1645-2100**) will be taken in class. **THERE ARE NO MAKE-UP EXAMS. The final exam must be taken to pass the course.** Any form of cheating is a serious violation of SJSU's Academic Integrity Policy (see below). A student caught cheating on an exam will receive a zero score and may be subject to further administrative sanctions, including probation, suspension, or expulsion. No one may leave the room during an exam (except for unforeseen emergency). No one may answer a phone call during an exam. If you suspect that someone is copying off of you during an exam, please ask the instructor to be moved to a different seat immediately.

### Grading Policy and Criteria

LETTER GRADE ASSIGNMENT TABLE

A+: 100 - 97%	B(+): 89 - 87%	C(+): 79 - 77%	D(+): 69 - 67%
A: 96 - 93 %	B: 86 - 83%	C: 76 - 73%	D: 66 - 63%
A- 92 - 90%	B(-): 82 - 80%	C(-): 72 - 70%	D(-): 62 - 60%

**The instructor reserves the right may modify the point total up to 10% higher or lower based on a student's performance if he deems it to be appropriate.**

**Overall course grade will generally follow the following correlations:**

Lecture Quiz (10)	80 points
Home works (10)	100 points
Oral presentation	20 points
<b>Midterm exam</b>	<b>75 points (March 05, 2016)</b>
Term Paper	100 points
<b>Final Exam</b>	<b>125 points</b>
<b>Total</b>	<b>500 points</b>

**University Policies**

**General Expectations, Rights and Responsibilities of the Student**

As members of the academic community, students accept both the rights and responsibilities incumbent upon all members of the institution. Students are encouraged to familiarize themselves with SJSU's policies and practices pertaining to the procedures to follow if and when questions or concerns about a class arise. See University Policy S90-5 at <http://www.sjsu.edu/senate/docs/S90-5.pdf>. More detailed information on a variety of related topics is available in the SJSU catalog, at <http://info.sjsu.edu/web-dbgen/narr/catalog/rec-12234.12506.html>. In general, it is recommended that students begin by seeking clarification or discussing concerns with their instructor. If such conversation is not possible, or if it does not serve to address the issue, it is recommended that the student contact the Department Chair as a next step.

**Dropping and Adding**

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester's Catalog Policies section at <http://info.sjsu.edu/static/catalog/policies.html>. Add/drop deadlines can be found on the current academic year calendars document on the Academic Calendars webpage at [http://www.sjsu.edu/provost/services/academic\\_calendars/](http://www.sjsu.edu/provost/services/academic_calendars/). The Late Drop Policy is available at <http://www.sjsu.edu/aars/policies/latedrops/policy/>. Students should be aware of the current deadlines and penalties for dropping classes.

Information about the latest changes and news is available at the Advising Hub at <http://www.sjsu.edu/advising/>.

**Consent for Recording of Class and Public Sharing of Instructor Material**

University Policy S12-7, <http://www.sjsu.edu/senate/docs/S12-7.pdf>, requires students to obtain instructor's permission to record the course and the following items to be included in the syllabus: "Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material." It is suggested that the greensheet include the instructor's process for granting permission, whether in writing or orally and whether for the whole semester or on a class by class basis. In classes where active participation of students or guests may be on the recording, permission of those students or guests should be obtained as well. "Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or

upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent.”

### **Academic Integrity**

Your commitment as a student to learning is evidenced by your enrollment at San Jose State University. The [University Academic Integrity Policy S07-2](http://www.sjsu.edu/senate/docs/S07-2.pdf) at <http://www.sjsu.edu/senate/docs/S07-2.pdf> requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The [Student Conduct and Ethical Development website](http://www.sjsu.edu/studentconduct/) is available at <http://www.sjsu.edu/studentconduct/>.

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism will result in a failing grade and possible sanctions by the University. An online tutorial on [Plagiarism](http://tutorials.sjlibrary.org/tutorial/plagiarism/index.htm) may be found at <http://tutorials.sjlibrary.org/tutorial/plagiarism/index.htm>.

### **Campus Policy in Compliance with the American Disabilities Act**

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. [Presidential Directive 97-03](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) at [http://www.sjsu.edu/president/docs/directives/PD\\_1997-03.pdf](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) requires that students with disabilities requesting accommodations must register with the [Accessible Education Center](http://www.sjsu.edu/aec/) (EAC) at <http://www.sjsu.edu/aec/> to establish a record of their disability.

### **Accommodation to Students' Religious Holidays**

San José State University shall provide accommodation on any graded class work or activities for students wishing to observe religious holidays when such observances require students to be absent from class. It is the responsibility of the student to inform the instructor, in writing, about such holidays before the add deadline at the start of each semester. If such holidays occur before the add deadline, the student must notify the instructor, in writing, at least three days before the date that he/she will be absent. It is the responsibility of the instructor to make every reasonable effort to honor the student request without penalty, and of the student to make up the work missed. See [University Policy S14-7](http://www.sjsu.edu/senate/docs/S14-7.pdf) at <http://www.sjsu.edu/senate/docs/S14-7.pdf>. SJSU

### **SJSU Counseling Services**

The SJSU Counseling Services is located on the corner of 7<sup>th</sup> Street and San Fernando Street, in Room 201, Administration Building. Professional psychologists, social workers, and counselors are available to provide consultations on issues of student mental health, campus climate or psychological and academic issues on an individual, couple, or group basis. To schedule an appointment or learn more information, visit [Counseling Services website](http://www.sjsu.edu/counseling) at <http://www.sjsu.edu/counseling>.

**Chem 213-02 Organic Synthesis, Spring 2016, Course Schedule**  
(check Canvas for details and updates)

Week	Date	Topics, Readings, Assignments, Deadlines
1	Jan 28	<b>Basic Concepts of Organic Chemistry: Six pillars of Organic Chemistry part I: Chap. 4, 6 (133-135), 7.</b>
2	Feb 02 Feb 04	<b>Basic Concepts of Organic Chemistry: Six pillars of Organic Chemistry part II: Chap. 7</b> <b>Quiz #1; Homework #1 due</b> <b>Introduction to Frontier Orbital Theory part I: Chap 4, 5, 6, 7,</b>
3	Feb 09 Feb 11	<b>Introduction to Frontier Orbital Theory part II: Hyperconjugation: Chap 4, 5, 6, 7, 27 (pages 672-674), 31 (800-805).</b> <b>Quiz #2; Homework #2 due</b> <b>Alkenes addition Part I: Chap 14, 19 (429-432, 438, 439), 41 (1120-1126)</b>
4	Feb 16 Feb 18	<b>Alkenes addition Part II: Chap 14, 19, 41 (1120-1126)</b> <b>Quiz #3; Homework #3 due</b> <b>Electronic Databases and Searching the Literature at SJSU</b>
5	Feb 23 Feb 25	<b>Retrosynthetic analysis Part I: Chap 28</b> <b>Retrosynthetic analysis Part II: Chap 28</b>
6	Mar 01  <b>Mar 05</b>	<b>Quiz #4; Homework #4 due</b> <b>Protecting Groups in Organic Synthesis: Chap 23 (pages 548-561)</b>  <b>Midterm Exam</b>
7	Mar 08 Mar 10	<b>Stereoselective Synthesis Enantioselectivity; Chap 14, 24, 32</b> <b>Quiz #5; Homework #5 due</b> <b>Stereoselective Synthesis Diastereoselectivity Chap 14, 24, 32, 33</b>
8	Mar 15 Mar 17	<b>Asymmetric synthesis I: Chap 41</b> <b>Asymmetric synthesis II: Chap 41</b>
9	Mar 22 Mar 24	<b>Quiz #6; Homework #6 due</b> <b>Pericyclic reactions I: Cycloaddition; Chap 34</b> <b>Pericyclic reactions II: sigmatropic and electrocyclic reactions; Chap 35</b>
10	<b>Mar 29</b>  <b>Mar 31</b>	<b>Spring Recess</b>
11	Apr 05 Apr 07	<b>Quiz #7; Homework #7 due</b> <b>Using organometallic reagents to make C-C bonds: Chap 9</b> <b>Organometallic Chemistry II: Chap 40</b>
12	Apr 12	<b>Quiz #8; Homework #8 due</b> <b>Formation and reactions of enols and enolates; Chap. 20</b>

Week	Date	Topics, Readings, Assignments, Deadlines
	Apr 14	Alkylations of enolates; Chap. 25 Reactions of enolates with carbonyl compounds: the aldol and Claisen reactions; Chap 26
13	Apr 19 Apr 21	<b>Quiz #9; Homework #9 due</b> Oxidation 1: Chap 9 (194), 19 (pages 429- 432, 442-444); 23 (544-546), Oxidation 2: Chap 9 (194), 19 (pages 442- 447); 33 (866-867), 36 (page 953-956)
14	Apr 26 Apr 28	<b>Quiz #10; Homework #10 due</b> Reduction 1: Chap 23 (530-539, 541-543), 33, 41 (pages 1114- 1120) Reduction 2: Chap. 33, 41 (pages 1114- 1120)
15	May 03 May 05	Microwave, Ultrasound, Robotics assisted Organic Synthesis; Green Organic Synthesis (non hazardous reagent, no solvent, in water)
16	May 10 May 12	Oral presentations Oral presentations
Final	May 19	<b>Final Exam: Thursday, May 19, 1845-2100 DH 416</b>