# **SYLLABUS**<sup>1</sup>

#### CHEM 2125 – ORGANIC CHEMISTRY LABORATORY II Spring 2013

**Professor:** Dr. Umut Bulut **Phone**: 972-883-2906 **Hours**: TBA Office: BE 3.330C Email: <u>umut.bulut@utdallas.edu</u>

**COURSE PREREQUISITES:** CHEM 2323 & 2123 (Organic Chemistry I lecture and laboratory) **COURSE COREQUISITES:** CHEM 2325 (Organic Chemistry II lecture)

**COURSE DESCRIPTION:** This course is designed to provide the skills necessary to conceptualize, design, and execute organic experiments with an emphasis on syntheses. Students gain exposure to representative types of organic transformations and mechanisms, spectroscopy and structure determination, and the use of the chemical literature. Correlation with the lecture course is adequate, but practical factors prevent full overlap.

### LEARNING OBJECTIVES AND OUTCOMES

- Learn to use the organic chemistry literature & scientific databases for research.
- Perform representative reaction types, either in isolation or as part of a synthesis. These include, but are not limited to, oxidations, reductions, aromatic substitutions, and select name reactions.
- Use spectroscopic techniques such as IR and NMR to characterize organic substances.

**TEXTBOOK**: Pavia, Lampman, Kriz, and Engel. *A Microscale Approach to Organic Laboratory Techniques*. **5th** ed. Thomson Brooks/Cole, 2013. Please refer to the publisher's website for ISBN and price information: http://www.cengagebrain.com/shop/search/9781133106524

**NOTE**: The 5<sup>th</sup> edition is substantially different from older editions. Previous editions will not do for this course. You are not required to bring the textbook to class, so you can share a copy with other students if necessary.

**SUPPLIES**: The combination padlock is required for check-in during the first lab meeting (see calendar on next page). The rest of the items are required for the second lab meeting and thereafter.

- COMBINATION PADLOCK for your drawer. Only one per group is required.
- APPROVED SAFETY GLASSES:
  - $\checkmark$  Must have the *Z87* code engraved on them.
  - The spectacle type is recommended over the goggle type. Spectacles look like regular glasses, are comfortable, and can be worn over prescription glasses. Certain retail outlets offer safety glasses made to prescription.
  - ✓ The goggle type relies on a rubber band to stay in place and is therefore less comfortable. Its use is discouraged because it's less conducive to wear over long periods of time.
  - ✓ The Chemistry Student Association (CSA) sells safety glasses year round for about \$5. Please go to BE 3.518 (Dr. Sibert's lab).
  - $\checkmark$  For more details about these and other types of glasses go to the <u>CNA services</u> website.
- HARDBOUND NOTEBOOK with duplicate sheets (carbon copies) for prelabs.
- DISHWASHING GLOVES: Can be obtained at any store. Although disposable gloves are available in the lab, they are not chemical resistant and can tear easily. Having your own gloves is recommended.
- PROTECTIVE CLOTHING: A lab coat is strongly recommended. Coats can be obtained at retail outlets such as Sears, and at most uniform and medical supplies stores (scrubs are OK too).
- ITEMS OF PERSONAL USE (one set for a group of two is adequate): Towel, sponge pack for cleaning, tweezers, marker or pen, and masking tape for labeling.

<sup>&</sup>lt;sup>1</sup> The descriptions and timelines presented in this syllabus are subject to change at the discretion of the Professor.

# CLASS SCHEDULE - Org. Lab II - Spring 2013

#### ORGANIC LAB OPERATIONS BEGIN JAN. 22.

Relevant materials will post on eLearning and will be discussed during the first lab meeting.

DATES	EXPERIMENTS			
Jan. 22 – 28	Check-in & Library Instruction (see schedule below)			
Jan. 29 – Feb. 4	Exp. 33 A: Grignard Reaction First library assignment due in your lab section			
Feb. 5 – 11	Exp. 33 A (continued)			
Feb. 12 – 18Exp. 42: Preparation of BenzocaineSecond library assignment due in your lab section				
Feb. 19 – 25	Exp. 65: Esterification of Vanillin			
Feb. 26 – Mar. 4	Exp. 32 C: Prep. of Benzilic Acid			
Mar. 5 – 18	Exp. 60: Aldehyde Disproportionation Dry lab, no prelab required. Read the class notes.			
Mar. 19 – Apr. 1	Exp. 45 A,B: Synthesis of Sulfanilamide (two period lab)			
Apr. 2 – 8	Exp. 39 C: Prep. of a diene using the Wittig Reaction. Glassware & drawer cleanup in preparation for check-out			
Apr. 9 – 15	Exp. 37: Aldol Condensation Reaction			
Apr. 16 – 22	Final exam & Check-out			

#### CHECK-IN AND LIBRARY INSTRUCTION SCHEDULE

For the dates shown below only, please follow this schedule. For library instruction report to the library lobby and a librarian will guide you to a classroom. For check-in, report to the organic labs (SLC 3.203 and 3.215). Pay close attention to the times. Some sections receive library instruction first, while others check-in first.

TUE. JAN 22	LIBRARY	CHECK-IN		
Sect. 106/ 107	12:00 PM	1:00 PM		
WED. JAN 23				
Sect. 108	8:00 AM	9:00 AM		
Sect. 109	12:00 PM	1:00 PM		
THUR. JAN 24				
Sect. 110	12:00 PM	1:00 PM		
FRI. JAN 25				
Sect. 112	8:00 AM	9:00 AM		
Sect. 113/ 114	12:00 PM	1:00 PM		
MON. JAN 28				
Sect. 101/102	8:00 AM	9:00 AM		
Sect. 103/ 104	12:00 PM	1:00 PM		
Sect. 105	5:00 PM	4:00 PM		

After this week students will meet in the regular classroom for the remainder of the semester.

### DETAILED DESCRIPTIONS, READINGS, & ASSIGNMENTS

## CHECK-IN, LIBRARY INSTRUCTION & FIRST ASSIGNMENT

Check-in – The check-in procedure takes place in the lab and goes as follows:

- Students will form groups of two. Each group must provide a combination padlock, or the stockroom manager cannot assign a drawer. The Chemistry Student Association sells them in the SLC lobby (first level). Other outlets include the UTD bookstore, off-campus bookstore, Tom Thumb, Target, Staples, and Home Depot.
- Organic lab rules require proper attire, which means covered torso, covered legs, and covered feet. Students wearing tank tops, sleeveless garments, shorts, sandals, open shoes, and the like can be barred from entering the lab.

**Library Instruction** – Library instruction takes place in the library, according to the schedule shown above. It consists of an introduction to the chemical literature and use of scientific databases for research. An assignment related to this lecture is described below.

**Library Assignment:** This assignment is posted online and consists of two parts, each worth 100 pts. Look for the *Chemical Literature Exercises* in eLearning. These exercises are to be completed after attending the library lecture and are due on the dates indicated in the class schedule.

EXP. 33 A – PREP. OF TRIPHENYLMETHANOL. Grignard reactions & carbon nucleophiles in organic synthesis.

- Readings: Posted notes and p. 305 312.
- Suggested study questions from the textbook (see note below): # 1, 3, 5(a,b,d) on p. 315).
- First library assignment due the first week of this experiment.

*NOTE:* The suggested study questions will get you thinking about the experiment, but you may or may not be able to answer them before doing the experiment. They might appear in the post-lab as well, so giving these questions some thought will make it easier to understand the experiment and to answer the post-lab questions.

**EXP. 42 – PREPARATION OF BENZOCAINE**. Local anesthetics, controlled conditions esterification, use of high field NMR for product characterization.

- Readings: Posted notes and p. 364 371. Note: the quiz for this experiment may include questions about the introductory essay (*Local Anesthetics*).
- Suggested study questions from the textbook: # 1 4, p. 371.
- Second library assignment due.

**EXP. 65 – ACID AND BASE CATALYZED ESTERIFICATION OF VANILLIN**. Use of the chemical literature and NMR to solve a structure proof problem.

- Readings: Posted notes and p. 568 570.
- Obtain the following article and read it: Kochlar, S.K. *et. al. J. Org. Chem.*, **48**, 1765 1767 (1983). Please consult your instructor or a reference librarian if help is needed.

EXP. 32 C - SYNTHESIS OF BENZILIC ACID. Organic oxidations and reductions, skeletal rearrangements.

- Readings: Posted notes and p. 301 304.
- Suggested study questions from the textbook: # 1, 2(a,c) on p. 304.

**EXP. 60 – ALDEHYDE DISPROPORTIONATION REACTIONS**. Use of critical thinking and spectral data to identify reaction products.

- Readings: Posted notes and p. 548 550.
- Suggested study questions from the textbook: None.

**EXP 45 A, B – PREPARATION OF SULFANILAMIDE**. Multistep synthesis, protecting groups, electrophilic aromatic substitution.

- Readings: Posted notes and p. 389 396. Note: the quiz for this experiment may include questions about the introductory essay (*Sulfa Drugs*).
- Suggested study questions from the textbook: # 3, p. 396.

**EXP 39 C – PREPARATION OF CONJUGATED DIENE**. Use of the Wittig reaction in alkene synthesis, organic mechanisms involving phosphorus.

- Readings: Posted notes and p. 347 349, and 352 354. Note: The TLC part of this experiment will not be performed.
- Suggested study questions from the textbook: # 1, 2 (p. 354).

EXP. 37 - ALDOL CONDENSATION. Crossed aldol condensation, preparation of benzalacetophenones.

- Readings: Posted notes and p. 337 340.
- Suggested study questions from the textbook: # 1, 2, 4(a, b, c) on p. 340.

**CHECK-OUT**. ALL students must be present for check-out. Anyone missing will continue to be responsible for the equipment in their drawer until they check out. No check-out is allowed prior to this date unless you drop the course.

### **GRADING POLICY**

The final grade for this course is based on the items listed below. One prelab, one experiment (or assignment), and one quiz will be dropped at semester end. The grades dropped don't have to be for the same experiment. **THIS IS YOUR ALLOWANCE FOR EMERGENCIES**. All prelabs, reports, and assignments are graded on a 100 point scale.

•	Individual prelabs	35%
•	Post-labs and individual assignments	35%
•	Quizzes	15%
•	Final exam	15%

**INDIVIDUAL PRELABS** are required prior to the performance of every experiment and are due on the day of the experiment at the start of the lab session. Please refer to the guidelines for writing prelabs that will post in *eLearning*.

**POST-LABS** are a group effort and consist of a form to be filled out and turned in following completion of the experiment. The grade obtained applies to all members of the group.

**INDIVIDUAL ASSIGNMENTS**. These are individual write-ups intended to be completed outside the lab, and handed in during lab time at the beginning of the lab session. See class schedule for due dates.

**QUIZZES**. Quizzes are given during the prelab lecture period and are intended to make sure students are prepared before they attempt to perform the experiment. Therefore, the following applies:

- Students arriving after the quiz has started but before the experiment begins may take the quiz but will receive 10 point off the quiz grade.
- Students arriving after the experiment begins may not take the quiz.

**FINAL EXAM**. The questions in the final exam are largely based on the questions from the quizzes. A guide to the final exam will be timely distributed. Students arriving late to the final exam will receive 10 points off the exam grade.

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95 - 100 = <b>A</b> +	$80 - 84 = \mathbf{B} +$	$65 - 69 = \mathbf{C} + \mathbf{C}$	$50 - 54 = \mathbf{D} +$
$90 - 94 = \mathbf{A}$	$75 - 79 = \mathbf{B}$	$60 - 64 = \mathbf{C}$	$45 - 49 = \mathbf{D}$
85 - 89 = A-	70 - 74 = B-	55 – 59 = <b>C</b> -	$40 - 44 = \mathbf{D}$ -

#### POLICY REGARDING MISSED EXPERIMENTS OR ASSIGNMENTS

- ONE EXPERIMENT (or assignment) and ONE PRELAB grade will be dropped. This is your allowance for emergencies, unexpected problems, or personal commitments that conflict with labs. Do not ask for makeups until you have used this allowance (see special requests policy below).
- TWO-PERIOD EXPERIMENTS:
  - If you miss the first period of a two-period experiment, you miss the entire experiment. There is no need to show up for the second period of that experiment.
  - If you miss only the second period, you get 50% off the experiment grade.
- Missing more than two experiments is grounds for failing this class. Students who miss more than two experiments are advised to withdraw from the course.
- All members of the group must be present during the entire experiment. Any member that leaves early or takes long breaks during the experiment will receive a grade of zero for that experiment.

### SPECIAL REQUESTS POLICY

The university provides students with the option to make special requests such as taking exams off schedule or waiving an absence when they are **due to reasons covered by university policy or state law, and which can be properly documented**. Examples of such reasons are military duty, jury duty, major illness and medical procedures, and participation in certain university-sponsored events such as tournaments. Examples of reasons **not covered** by university policy are personal reasons such as travel, social engagements, common emergencies like accidents and minor illness, and any others that cannot be properly documented.

Special requests based on reasons not covered by university policy or state law typically impose an added burden on instructors and TAs, or result in unnecessary disruptions to organic lab operations. For these reasons the following policies apply:

- 1. Instructors and TAs reserve the right to refuse such requests altogether.
- 2. Students are encouraged to use their emergency allowances (see grading and missed experiments policies above) before making such requests.
- 3. Only **ONE special request** can be granted during the semester.
- 4. If granted, the following penalties will automatically apply to the types of requests listed below, regardless of the reason.
  - Making up experiments in another section -10 points off the experiment grade.
  - Taking the final exam and/or checking out off schedule 10 points off the final exam grade.
  - Turning in late assignments 5 points off per day late (however, assignments may be turned in early).
  - Taking a quiz late 10 points off. Note: "Late" means after the quiz has started and before the experiment begins. Students arriving after the experiment begins may not take the quiz.
  - Any other requests not listed here, at the discretion of the instructor and/or TA 10 points off the relevant assignment or experiment.