**CHEM 444/644**
**Organic Structure Determination Laboratory**
Spring 2015

**Lab Time:** TR, 8:00am – 10:50am (CB 110). **Attendance required.**
**Office Hours:** MWF 9:00am – 10:00am, or by appointment
**Teaching Assistant:** Casey Philbin; philbin.9@gmail.com

**Web Page:** Available on WebCampus ([https://webcampus.unr.edu](https://webcampus.unr.edu))
The website will contain the course syllabus, calendar, relevant links, announcements, etc. You are responsible for checking it regularly for updates.

**Required:**
One bound laboratory manual.

**Recommended Text:**

All students are assumed to know (or to be able to look up) the material covered in introductory organic chemistry.

**Course Description:**
Laboratory identification of unknown organic compounds using spectroscopic instruments (IR, NMR, UV, mass spectrometry); microtechniques; separation of mixtures (GLC, TLC, HPLC).

**Prerequisite:** CHEM 345 or 348, junior or senior standing, completion of all General Education courses that build CO 1-3 and satisfy CO 4-8.

**Corequisite:** CHEM 443

This course satisfies **Core Objective 14: Application**
Students will be able to demonstrate their knowledge and skills developed in previous Core and major classes by completing a project or structured experience of practical significance.

**Student Learning Objectives**
Upon completion of this course:
1. Students will be able to practice methods of natural product isolation and advanced synthesis. (CO14, develops CO4)
2. Students will be able to operate hands-on the GC-MS, HPLC-MS, NMR, UV-Vis, IR, and other instruments. (CO14, develops CO4)
3. Students will be able to work in a laboratory without stepwise instructions. (CO14, develops CO4)
4. Students will be able to improve scientific writing through preparing laboratory reports. (develops CO1, CO3)
5. Students will be able to prove de novo the structure of organic molecules from real data. (CO14, develops CO4)
6. Students will be able to discriminate between sound and unsound interpretation of data and employ cogent reasoning methods in the examination of experimental results. (develops CO3, CO4, CO9)

**Grade Breakdown:**
Laboratory Reports: 50%
Midterm Report: 10%
Final Report: 20%
Laboratory Notebook: 10%
Laboratory Performance: 10%
Course Grading Scheme:

The course grades may be curved, but the following weighted percentages guarantee, at a minimum, the letter grades shown. +/- grades will be used sparingly at the borderlines (e.g. at the A/B or B/C interface).

90.0-100%: A  
80.0-89.9%: B– to B+  
70.0-79.9%: C– to C+  
60.0-69.9%: D– to D+  
59.9% or lower: F

Safety: Safety is the most important thing in the lab. Goggles, full, closed toe shoes and pants must be worn at all times. Although we may deal with foodstuffs in the laboratory, do not taste anything in the laboratory. Failure to comply with safety regulations will result in your grade being lowered and/or your dismissal from the laboratory for the period and/or the term.

Laboratory Reports:
Most laboratory reports will be brief and the bulk of the grade will go to correctly identifying your organic compound. Part marks will be available, but full marks will be awarded only for a priori correct identification.

Midterm and Final Report:
There will be one formal report due part way through the course, and one at the end. A large proportion of the marks for each lab depend on the quality of your discussion. You may type or neatly hand-write your reports on 8½ × 11 paper. Chemical structures may be hand drawn in appropriate places in the text, or inserted using a computer program. The formal write up will include all of all items from your rough work in the labbook (see below), as well as a detailed discussion of your observations and results. The purpose of all reagents should be made clear, and the significance of all spectral signals in assigning the structure of the product(s) should be described. You will be judged on the accuracy and sophistication of your discussion. You should bring in outside sources of information to support your discussion when necessary, but ensure that they are properly referenced. Attach the original plots of all spectra to your reports.

Laboratory Notebook:
All students in the laboratory program must purchase a bound laboratory notebook (available at the bookstore) for recording each experiment.

Written communication is the most important method by which chemists (and other scientists) transmit their work to the scientific community. It begins with the record kept in the laboratory notebook. The basis of all scientific work is the accurate observation of the system under study and the accurate (and readable) accounting of the experiment and observations. You are expected to record ALL your observations and conclusions in the laboratory notebook. Part of each experiment should be written up prior to coming to the laboratory. The actual observations and results are to be written into the laboratory notebook during the experiment. RESULTS ARE NOT TO BE WRITTEN ON ODD SCRAPS OF PAPER!

Note: You will submit your laboratory notebook at the end of the term. The completeness and organization of your notebook accounts for ten percent of your final grade.

Writing up the Lab Notebook:
There are a number of key parts to writing up a lab notebook - please observe them.
1. Date experiment was conducted  
2. Title of experiment  
3. Reaction scheme (if appropriate)  
4. Literature reference to product(s) and procedure(s) if any  
5. Table of reagents and products.  
6. Details of procedure actually used (in sufficient detail to be repeated)
7. Characteristics of the product(s) [i.e. mp, bp, colour]
8. Analytical and spectral data tabulated

Items 1-5 must be written into the lab notebook prior to the actual laboratory session. Item 6 requires a description of any unusual equipment used, amounts of reagents (in weight or volume units as appropriate for reagents, substrates and solvents, and also moles for reagents and substrates), the sequence of experimental operations, and the method used to isolate and purify the product(s). Any colour or temperature changes should be noted.

The notebook must be bound and the pages must be numbered in consecutive order. Several blank pages for an index should be left at the beginning of the book, and entries made as you go along. ENTRIES MUST BE MADE IN INK and any errors simply crossed out with a single line so that the words remain legible. If a page will not be used, draw a large X through it. Write-ups are to be in sufficient detail to allow someone else to repeat the experiment using only your notebook.

LEFT-HAND PAGE: Notes on the nature and mechanism of the reaction. Table of reagents, including molecular formula and molecular weights, with amounts to be used expressed in grams or mL and moles. Theoretical yield in grams of product(s). Literature values for physical constants (i.e. mp and/or bp) and the literature reference for such values.

RIGHT-HAND PAGE: Headed with the date of the experiment and the equation which defines the reaction being carried out. A concise but detailed account of your actual experimental method (including any errors or changes). The yield of your product is to be expressed in grams, moles and % of theoretical. The physical constants of your product are also to be listed. The signature of the TA must be obtained when you have completed the experiment.

Get the approval of the TA on all spectra before proceeding to write up the experiment.

Samples of all compounds prepared must be kept in a sample vial which has been labeled with the tare weight of the vial plus label, the structure of the product, physical properties of the product, and the lab notebook page reference. This is conveniently done using your initials followed by a page number; Img-15a refers to the lab notebook of L.M. Geary, book i, page 15, the first product obtained on that page. **All NMR, IR, MS, LC, GC spectra should also be identified using this same sample name.** The printed spectra should be labeled with the structure of the compound and the notebook page reference.

**Laboratory Performance:**
Ten percent of the final mark will be assigned by the teaching assistant and lecturer based on observation of the student’s performance in the lab (safety, cooperation with other students, neatness, technique, independence and comprehension).

**Academic Dishonesty:**
"Cheating, plagiarism or otherwise obtaining grades under false pretenses" constitute academic dishonesty according to the code of this university. Academic dishonesty will not be tolerated and penalties can include canceling a student’s enrollment without a grade, giving an F for the course or for the assignment, or expulsion from the university.

**Disability statement:**
If you have a disability and will be requiring assistance, please contact me or the Disability Resource Center (Thompson Building Suite 100) as soon as possible to arrange for appropriate accommodations.

**Audio and Video Recording:**
Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be video-taped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may be given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.
**Academic Success Services:**

Your student fees cover usage of:
- Math Center (784--4433 or www.unr.edu/mathcenter/)
- Tutoring Center (784--6801 or www.unr.edu/tutoring-center/)
- Writing Center (784--6030 or http://www.unr.edu/writing_center/)

These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign of a responsible and successful student.