Course Syllabus
CH2411 – Organic Chemistry Lab I
College of Science and Arts
Fall 2009

Lab Supervisor Information
Lab Supervisor: Andrew Galerneau
Office Location: 601B Chemical Sciences and Engineering Building
Telephone: Office – (906)281-7725
E-mail: ajgalern@mtu.edu
Office Hours: WF 10:00am – 12:00pm or by appointment

General Instructor Information
Additional instructor information can be located on the course website (URL below).
Instructor: Email: Teaching Sections:
Andrew Chapp achapp@mtu.edu 07, 09, 14
Xi Lin xilin@mtu.edu 01, 06, 10
Srinivas Mandalapu smandala@mtu.edu 02, 04
Giri Vegesna gkvegesn@mtu.edu 03, 12, 13
Zezhou Wang zewang@mtu.edu 05, 08, 11

Course Identification
Course Number: CH2411-LXX
Course Name: Organic Chemistry Lab I
Course Location: 601N & 601S Chemical Sciences and Engineering Building
Class Times: TR 8:05am – 10:55am, 11:35am – 2:25pm, 3:05pm – 5:55pm
W 2:05pm – 4:55pm

Course Description/Overview
This is a laboratory course designed to develop your skills in dealing with experimental problems. A good experimentalist must have several important qualifications: the ability to pay strict attention to detail, to reason scientifically, to record and communicate what has been accomplished, and to master new techniques and manipulate equipment.
Course Learning Objectives

We will be executing a number of experiments designed to both provide you access to organic chemistry techniques and to demonstrate concepts learned in lecture. Additionally, learning to keep and maintain a laboratory notebook is major component of the course. We will also expand upon your ability to research chemistry through a library component of the course.

1. Students will execute a range of organic techniques which include: extractions, distillation, chromatography, and recrystallization.
2. Students will record experimental procedures in their lab notebooks to a high degree of detail such that their work could be replicated by another student.
3. Students will be able to identify a number of resources for researching chemical substances and evaluate the strengths and weaknesses of each.

Course Resources

Course Website
- <http://www.chemistry.mtu.edu/~kmsmith/Organic/> (case sensitive)

Required Course Text
- A bound lab notebook published by Chemical Education Resources, Inc. (ISBN #087540-249-6) with duplicate pages. (Available in MTU Bookstore.)

Course Fees
There is a required lab fee of $169.00.

Course Supplies
You are required to supply your own safety goggles for this lab. They are available from MTU Bookstore cashier or Chem. Stores, Room B002 of the ChemSci & Eng Bldg. The goggles should be indirectly vented.
### Grading Scheme

#### Grading System

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Percentage</th>
<th>Grade points/credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90% &amp; above</td>
<td>4.00</td>
</tr>
<tr>
<td>AB</td>
<td>85% - 89%</td>
<td>3.50</td>
</tr>
<tr>
<td>B</td>
<td>80% - 84%</td>
<td>3.00</td>
</tr>
<tr>
<td>BC</td>
<td>75% - 79%</td>
<td>2.50</td>
</tr>
<tr>
<td>C</td>
<td>70% - 74%</td>
<td>2.00</td>
</tr>
<tr>
<td>CD</td>
<td>65% - 69%</td>
<td>1.50</td>
</tr>
<tr>
<td>D</td>
<td>60% - 64%</td>
<td>1.00</td>
</tr>
<tr>
<td>F</td>
<td>59% and below</td>
<td>0.00</td>
</tr>
<tr>
<td>I</td>
<td>Incomplete; given only when a student is unable to complete a segment of the course because of circumstances beyond the student's control. A grade of incomplete may be given only when approved in writing by the department chair or school dean.</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Conditional, with no grade points per credit; given only when the student is at fault in failing to complete a minor segment of a course, but in the judgment of the instructor does not need to repeat the course. It must be made up within the next semester in residence or the grade becomes a failure (F). A (X) grade is computed into the grade point average as a (F) grade.</td>
<td></td>
</tr>
</tbody>
</table>

#### Grading Policy

Grades will be based on the following:

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiments (7 lab x 100 points each)</td>
<td>700</td>
</tr>
<tr>
<td>Library Lab Session</td>
<td>65</td>
</tr>
<tr>
<td>Second Library Session</td>
<td>25</td>
</tr>
<tr>
<td>Notebook Assignment</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total Points</strong></td>
<td><strong>810</strong></td>
</tr>
</tbody>
</table>

Points for experiments are divided into the following categories:

<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prelab (Due at beginning of experiment):</td>
<td>10</td>
</tr>
<tr>
<td>Quiz (Issued at beginning of a new experiment):</td>
<td>5</td>
</tr>
<tr>
<td>Experimental Section (Due upon completion of experiment):</td>
<td>40</td>
</tr>
<tr>
<td>Postlab (Due the lab period following completion of experiment):</td>
<td>30</td>
</tr>
<tr>
<td>Instructor Evaluation (Assigned upon completion of experiment):</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total Points</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
For more information on the specifics of each component of the experiment, please review "Course Information" on the course website at the URL listed earlier.

**Late Assignments**

Students with an incomplete prelab will receive a zero for that assignment and will not be allowed to work in the lab until the prelab has been completed. All late work will receive 0 points if not turned in on time. No excuses will be accepted.

**Course Policies**

A responsible attitude towards attendance is critical to the efficient operation of this laboratory course. Much of the same responsibility and courtesy shown to an employer are expected from students enrolled in this course, including attendance during the weekly scheduled lab time. Please make note of the following:

1. To make up a lab, you must email the supervisor or obtain permission from the lab faculty advisor. Note: contacting your instructor will not ensure placement into a make-up lab session as they are not responsible for assigning make-up sessions.
2. If after approval of the absence request you decide to perform the experiment in your own section, please email the lab supervisor. Remember there could be other students whose request was not approved due to lack of space availability.

**IMPORTANT ABSENCE POLICY NOTES**

- All absences must be made up within one week of the missed lab. To facilitate this, please complete an absence request form or notify the lab supervisor as soon as you know you will miss a laboratory!
- Postlab exercises must be handed in the week they are due. Postlab turned in late will be assigned 0 points.
- Three unexcused absences will result in an F for the course. If you suspect that you will be absent more than once, it is strongly recommended that you obtain validation of your absence from a physician, counselor, or clergy.

**SAFETY NOTES**

General lab safety protocols are followed. The following are a few general safety guidelines which should be observed. Additional guidelines may be found on the lab website under "Course Information".

- Safety goggles must be worn at all times when chemicals are in use.
- Shoes should be closed toed. Sandals and shorts are prohibited.
- Clothes should cover a majority of your skin’s surface and it is strongly recommended that you wear the provided lab coat. Latex gloves are provided for handling hazardous substances. Keep all loose hair tied back.
- Never eat or drink in the lab.
- Bags and coats must be stored in the coves in the hallway. They are a tripping hazard in the lab.

**Collaboration/Plagiarism Rules**

Lab exercises are to be completed individually. Students may discuss content of exercises but only after working on them individually. Experiments will be performed individually except when partnerships are specified.

**University Policies**

Academic regulations and procedures are governed by University policy. Academic dishonesty cases will be handled in accordance the University’s policies.

If you have a disability that could affect your performance in this class or that requires an accommodation under the Americans with Disabilities Act, please see me as soon as possible so that we can make appropriate arrangements. The Affirmative Action Office has asked that you be made aware of the following:

*Michigan Tech complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act of 1990. If you have a disability and need a reasonable accommodation for equal access to education or services at Michigan Tech, please call the Dean of Students Office, at 487-2212. For other concerns about discrimination, you may contact your advisor, department head or the Affirmative Action Office, at 487-3310.*

**Academic Integrity:**
http://www.studentaffairs.mtu.edu/dean/judicial/policies/academic_integrity.html

**Affirmative Action:**
http://www.admin.mtu.edu/aaop/

**Disability Services:**
http://www.admin.mtu.edu/urel/studenthandbook/student_services.html#disability

**Equal Opportunity Statement:**
Course Schedule

Additional information and specific notes for each weekly meeting can be found on the course website under the "Experiment Schedules" page. It is your responsibility to review this information prior to each weekly meeting. Failure to do so will result in your inability to attend lab.

Week 1
Library Lab: Preliminary Research of a Medicinal Compound

Week 2
Check-in, Safety, Course Introduction, and Notebook Instruction

READING: (a) Lab Notes; (b) The Organic Chem Lab Survival Manual, by James W. Zubrick (topics): Safety, notebooks & lab notes, handbooks, jointware, and miscellaneous equipment.

09/09 Last day to drop full semester courses with a refund

Week 3
Isolation and Purification of Trimyristin from Nutmeg with TLC Analysis

PREPARATION: (a) Read experiment; (b) Read Zubrick (topics): recrystallization, heat sources, the steam bath, clamps and clamping of tapered glassware, reflux and addition, and standard reflux; (c) Review Annotated Notebook; (d) Prepare preliminary notebook.

Week 4
Continuation of Isolation and Purification of Trimyristin from Nutmeg with TLC Analysis

PREPARATION: (a) Read experiment; (b) Read Zubrick (topics): products, melting point, and sample preparation.

Week 5
Acid and Base Extractions: Separation of Anthracene, Benzoic Acid, and p-Nitroaniline

PREPARATION: (a) Read experiment; (b) Read Zubrick (topics): Drying agents, extraction and washing, and theory of extraction; (c) Prepare preliminary notebook.

Week 6
Continuation of Acid and Base Extraction: Recrystallization, TLC, and Melting Points

PREPARATION: (a) Read experiment; (b) Read Zubrick (topics): recrystallization and gravity filtration.

Week 7
Separation and Purification of Fluorene and Fluorenone by Column Chromatography
PREPARATION: (a) Read experiment; (b) Read Zubrick (topic): Wet-column chromatography; (c) Prepare preliminary notebook.

Week 8
Fractional Distillation of an Ethyl Acetate - Butyl Acetate Mixture

PREPARATION: (a) Read experiment; (b) Read Zubrick (topics): boiling stones, sources of heat, the heating mantle, clamps and clamping, clamping a distillation setup, distillation, simple, and theory of distillation; (c) Prepare preliminary notebook.

10/23 Last day to drop full semester courses with a 'W'

Week 9
LAB 9 Continuation of Fractional Distillation: Gas Chromatography of Distillation Fractions

PREPARATION: (a) Read experiment; (b) Read Zubrick (topics): syringes, needles and septa, instrumentation in the lab, and gas chromatography.

LAB 10 Determination of E2/SN2 Ratio for the Reaction of an Alkyl Halide with Potassium Hydroxide

PREPARATION: (a) Read experiment; (b) Read Zubrick (topics): boiling stones, jointware, syringes, needles and septa, and reflux; (c) Prepare preliminary lab notebook.

Week 10
Free Radical Chlorination with Sulfuryl Chloride

PREPARATION: (a) Read experiment; (b) Read Zubrick (topics): heating sources, boiling stones, reflux, extraction and washing, drying agent, clamps and clamping, fractional distillation; (c) Prepare preliminary lab notebook; (d) Attach percent yield and reactivity calculations to your postlab. Points are associated for calculations.

Week 11
Continuation of Free Radical Chlorination: Fractional Distillation and GC Analysis of Chlorination Product

PREPARATION: Review experiment and gas chromatography.

Week 12
Preparation of 1-Bromobutane via a Nucleophilic Substitution

PREPARATION: (a) Read experiment; (b) Read Zubrick (topics): heating sources, boiling stones, reflux, extraction and washing, drying agent, and clamps and clamping; (c) Prepare preliminary lab notebook.

Week 13
Continuation of Preparation of 1-Bromobutane: GC and IR Analysis of Product

PREPARATION: (a) Review experiment and techniques; (b) Read Zubrick (topics): gas chromatography, infrared spectroscopy.

Week 14
Introduction to Chemical Abstracts and CA Search for an Assigned Compound, Lab Clean-up, Evaluations, and Check-out

NOTE: All students enrolled in this course must check out of their drawer on or before Thursday, December 10. Students who do not make arrangements to check out of their drawer will be fined $25.00 in addition to the cost of replacement equipment.