Chem F325 Organic Chem II Lab Syllabus
University of Alaska Fairbanks Spring 2019

Course Information
Chemistry F325, Organic Chemistry II Laboratory, 1.0 Credits
Reichardt 241

Co-Requisites: Lecture component of Chem 325, Organic Chemistry II

Pre-requisites: Chem 321 Organic Chemistry I with Minimum Grade of C-

Sections	Day	Time	Teaching Assistant
33374 F04	Wednesday	2:15 - 5:15	Anil Damarancha, ardamarancha@alaska.edu
33371 F01	Thursday	11:30 – 2:30	Anil Damarancha, ardamarancha@alaska.edu
33372 F02	Thursday	2:45 – 5:45	Ameneh Arabi, aarabi@alaska.edu
33373 F03	Thursday	6:00 – 9:00	Ameneh Arabi, aarabi@alaska.edu

Instructor:
Thomas Green, Professor of Chemistry
Reichardt 174, Phone: 474-1559, Email: tkgreen@alaska.edu
Office Hours: Tuesday 1-3 pm

Course Materials Required:

1. Lab notebook for recording experimental data, results and conclusions. The lab notebook will be supplied by the department. Student Lab Notebook, 2012 Book Factory, Lab-050-7GSS, 50 pages.
2. Textbook: Making the Connections[3]; A How-to-Guide for Organic Chemistry Lab Techniques, 3rd edition, Anne B. Padias, 2015, Hayden McNeil.

Course Description: The lab component of Chem F325 Organic Chemistry II. A laboratory designed to illustrate modern techniques of isolation, purification, analysis and structure determination of covalent, principally organic, compounds. Lab portion will include an introduction to synthetic techniques and spectroscopy. Special fees apply.

Course Goals: Learn the following practical aspects of organic synthesis.
1. Common safety procedures.
2. Reaction methods
3. Isolation Procedures
4. Purification techniques
5. Spectroscopic and chromatographic analyses
6. Molecular Modeling to interpret reaction chemistry

Student Learning Outcomes:
1. Know the hazards associated with common chemicals, especially those encountered in the experiments..
2. Know how to safely assemble reaction systems using glassware commonly employed in the organic laboratory. These methods include reflux, heating and cooling of reactions, and addition of reagents.
3. Know how to isolate and purify organic products using methods such as extraction, filtration, crystallization, distillation, and solvent removal.
4. Learn the importance of stoichiometry to a chemical reaction. Learn how to assess the efficient of a chemical reaction (percent yield and atom economy).
5. Learn the practical aspects of spectroscopic analyses of organic compounds.
6. Learn how to use molecular modeling software.

Instructional Methods:

1. The instructor/teaching assistant will lecture on the practical aspects of organic chemistry, using a combination of Power Point slides and Chalkboard, providing copies of notes and reading material to the students via Blackboard. The Lab Schedule will be available on Blackboard and at the end of this syllabus. Students need to read assigned material from the "Making the Connections[3]; A How-to-Guide for Organic Chemistry Lab Techniques" prior to coming to lab.
2. Laboratory sessions will consist of conducting reactions of organic compounds and their isolation, purification and characterization.
3. Each experiment will require a "Lab Report" which will consist of Pre-lab and Post-lab components. The Pre-lab portion should be completed prior to coming to lab. If it is not completed, you will not be allowed to work in the lab for that day's experiment until it is completed.
4. Lab Notebook: A separate lab notebook is required which is supplied by the department. The lab notebook should be used consistently throughout the semester. The notebook will be submitted at mid-term for the TA to evaluate (not graded), and then returned with suggestions for improvement. The lab notebook will be graded at the end of the semester.

Lab Notebook Guidelines:

Before each lab, you should enter the following in the notebook (with pen).

1. Title of Experiment
2. Hypothesis or Goal of Experiment
3. Overall reaction. Show structures and names of reactants, products, and reaction solvent.
4. Physical properties. Make a table of MW, boiling point (if liquid), melting point (if solid) of solvents, reactants, and products. Usually you can just copy these from your pre-lab tables.
5. Procedure. The procedure should be taken from the handout. Include amounts to be used for each reagent and solvent. If changes are made later, this can be noted later in the notebook.

During lab, you should enter the following,

6. Data and observations. Record actual amounts (volumes or mass) used for each reagent. Record physical constants such as melting point range of the product. If you ran a TLC plate, sketch plate in the notebook and indicate what developing solvent was used. If you recrystallized a product, indicate how you did it, e.g. what solvent was used. Describe the product that you obtained (color and/or appearance). If the IR and/or NMR spectra were obtained, state this here.
7. Calculations. Include the following
   a. Identify the **Limiting Reagent**. To do this properly, you need to know the millimoles (mmol) of each reactant used. The limiting is the one that is not present in a stoichiometric excess.
   b. Calculate the **Theoretical Yield** in grams. This calculation is based on the limiting reagent.
   c. Calculate the **Percent Yield**.
8. Conclusions
   a. Is the product pure from the mp range and the NMR/IR spectra? Compare to literature where possible.
   b. If impure, can any impurities be identified?
   c. Is the yield consistent with expectations for this experiment? If not, why was the yield low?

Laboratory Safety: Laboratory safety is a major concern of all chemical laboratories but is especially important in organic labs due to the presence of flammable solvents, potentially hazardous fumes, highly reactive reagents, etc. The first lecture will deal explicitly with these hazards and the appropriate safety measures you must follow. Subsequent lectures, besides covering the theory and pitfalls of the coming weeks' experiments and perhaps helping you interpret the previous week's experiment, will also cover specific hazards that you may encounter. Please attend these lectures and be prepared for the lab by doing any assigned readings and completing the Pre-lab exercises before coming to lab. If you are not prepared for lab you may be asked to leave.

Notes and Policies:

1. Students are expected to perform experiments following commonly accepted safety protocols.
2. Safety glasses must be worn at all times during lab.
3. Class attendance is expected and role will be taken.
4. Make-up labs will be allowed with a legitimate excuse. Excuses must be approved by the instructor. Lab make-up sessions are at the end of the semester.
5. All labs must be completed to receive a passing grade.
6. Late reports are penalized 10% per day up to 1 week and then not accepted.
7. You will often be asked to work with another student in pairs. You are expected to contribute equally with your partner in carrying out the experiment. Each student is required to complete and submit a lab report.

Grading and Due Dates:

Experiment/Activity	Points	Due Week of
1. Usnic Acid	75	Feb 4
2. Aldol	50	Feb 18
3. GC/MS	50	Feb 25
4. Soap	50	Mar 4
5. Aspirin	50	Mar 18
6. Iodovanillin	50	Apr 1
7. Suzuki Coupling	50	Apr 1
8. Tetraphenylporphyrin	50	Apr 15
9. Diels-Alder	50	Apr 22
Spectroscopy HW 1	30	Feb 18
Spectroscopy HW 2	30	Mar 18
Spectroscopy HW 3	30	Apr 15
Lab Notebook (submit for review)	--	Mar 4
Lab Notebook (graded)	50	Apr 29
Total Points	**615**	-----

The points that you earn will be normalized to 250 pts and incorporated into your overall grade for the Chem 325 course. For example, if you earn 570 pts, then you will receive 570/615 x 250 = 232 pts. See the lecture syllabus for more detail.

Lab Schedule – see Blackboard for specific Experimental Procedures and Report Forms.

Experiment	Week of	Concepts/Techniques	Concepts in Karty text	Date covered in Lecture
1. Extraction of usnic acid from lichen	Jan 21 Jan 28	Safe Lab Practices and Policies, Column chromatography, polarimetry, NMR, modeling	Chapter 2. Stereochemistry	First semester
2. Aldol Condensation	Feb 4 Feb 11	Aldol condensation, stereochemistry	Ch 18.4 – 18.9	Jan 30
3. GC/MS of Essential Oils and Terpenes	Feb 18	Principles of Gas Chromatography/Mass Spectrometry	Ch 16.16 – 16.19, IC G pp 1295-1306	Jan 14
4. Synthesis of soap from olive oil	Feb 25	Lipids, saponification, ester hydrolysis, micelles, NMR	Ch 20.1 – 20.2	Feb 18
5. Synthesis of aspirin	Mar 4	Esterification, nucleophilic addition-elimination	Ch 21.5	Mar 1
6. Electrophilic iodination of vanillin	Mar 18	Redox Chemistry, electrophilic aromatic substitution,	Ch 22.2	Mar 20
7. Suzuki cross-coupling of iodovanillin	Mar 25	Organometallic coupling	Ch 19.7b	Feb 15
8. Synthesis of tetraphenylporphyrin	Apr 1 Apr 8	EAS of pyrrole, Metalloporphyrin, ring current effect in NMR, modeling	Ch 23.9	Mar 27
9. Diels-Alder Reaction in water.	Apr 15	Thin Layer Chromatography, 2D NMR, Cycloaddition	Ch 24	Apr 8
Make-up Labs	Apr 22	Please schedule missed labs with your TA.		

Disabilities Services: The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. Students with documented disabilities who may need reasonable academic accommodations should discuss these with me during the first two weeks of class. I will work with the Office of Disabilities Services (*208 WHIT, 474-5655) to provide reasonable accommodation to students with disabilities. You will need to provide documentation of your disability to Disability Services.

Veteran Support Services.
Walter Crary is the Veterans Service Officer at the Veterans Resource Center, 111 Eielson Building. 474-2475. (wecrary@alaska.edu) Fairbanks Vet Center 456-4238. VA Community Based Outpatient Clinic at Ft. Wainwright is 361-6370.

Amending this Syllabus: Amendments and changes to the syllabus, including evaluation and grading mechanisms, are possible. The instructor must initiate any changes. Changes to the grading and evaluation scheme can be made before the add/drop date without a vote, but after that date must be voted on by the entire class and approved only with unanimous vote of all students present in class on the day the issue is decided. The lecture schedule and reading assignments (Daily Schedule) will not require a vote and may be altered at the instructor's discretion. This Daily Schedule can be found on Blackboard. Grading changes that unilaterally and equitably improve all students' grades will not require a vote. Once approved, amendments will be distributed in writing to all students via Blackboard.