COURSE SYLLABUS STEM Ed Abroad Program

Course Title: Organic Chemistry II (including laboratory component)
Course Semester: Fall
University and Country: Adam Mickiewicz University; Poznan, Poland
Number of ECTS: 6 (lecture) and 2 (laboratory)
Course Designations for Transfer Credit: CH223/224 (NCSU), CHEM332/332L (ISU)

Content: Organic Chemistry II is the second course in a two-semester sequence of university-level organic chemistry structure and synthesis courses.

Pre-requisites: Organic Chemistry I with a grade of C- or better. Credit cannot be received for similar level organic Chemistry courses taught specifically for Chemistry Majors.

Aims:

Lecture component:

Upon completing of this course , the student will know:

The mechanism of electron delocalization, the consequences of the delocalization on compound properties and reactivity. Will be able to write resonance structures and verify their relative input into hybrid structure. Will be well acquainted with aromaticity phenomenon, will be able to predict and explain substituent effect in aromatic substitution reactions. Student will know basic classes of organometallic compounds and their application in organic syntheses. Will have thorough knowledge of different reactions of carbonyl compounds, concerning the additions to the carbonyl group, and as well reactions involving alpha carbon reactivity and their importance in constructing carbon skeleton of new compounds. The acquired knowledge will include amines, both aliphatic and aromatic, their reactions and properties, with arene diazonium salts formation and versatility of their reactions. The last two – three of the lectures will concern biologically important compounds and brief overview will be given to students.

Lab component: Upon successful completion of this course, the student will be able (on intermediate level) to:

1. Demonstrate awareness of and implement the safety procedures and regulations that must be observed when performing organic chemistry experiments in a laboratory.

2. Perform separations using Thin Layer Chromatography.

3. Determine melting points and boiling points and use them to characterize organic compounds.

4. Perform Infrared Spectroscopy and use the results obtained to identify organic compounds.
5. Accomplish the separation of predetermined chemical mixtures by using liquid-liquid extraction, microextraction and crystallization.
6. Complete small-scale synthesis of simple organic materials and characterize the products obtained using a variety of techniques.
7. Use Gas Chromatography as a tool for separation and characterization of organic materials.
8. Combine the use of different synthetic and separation methods in order to execute multi-step synthesis.
9. Use the spectroscopic methods (IR and NMR) for verifying synthesis and separation results.

The Learning Objectives for each exam will be posted on each section's web site prior to the first lecture of the sequence leading up to that exam and will serve as both a study outline and a summary of items to review. The Learning Objectives also includes the topics listed below in Course Lecture and Laboratory Topics. A student must know and apply to demonstrate mastery of the material listed in these topics as presented in this course.

Recommended Books: *Organic Chemistry,* Francis A. Carey (all editions are acceptable)

Instructors: Dr. Hab. Jan Milecki (lecture) and Dr. Jakub Grajewski. (laboratory) with consultation by Dr. Kay Sandberg (NC State University).

Grading System and Percentage Contribution

A. Lecture assessment

Lecture participation	5%
Continuous assessment (preparation for class)	5%
Homework	12%
Problem Sessions	12%
Exam (3 @12% each)	36%
Final Exam, Cumulative	30%
Total	100%

B. Laboratory assessment

Preparation for laboratories	35%
Laboratory reports	65%
Total	100%

AMU Grading system and scale

The grading system used at Adam Mickiewicz University, whose name is abbreviated as AMU or UAM, is as follows:

Tests, exams, homework assignments grading scale

5 100%-91%
4+ 90%-86%
4 85%-76%
3+ 75%-71%
3 70%-60%
2 59% and less

This translates into the following ECTS (European internationally recognized system) grading scale:

ECTS Grade	AMU grade	Definition
A	5.0	EXCELLENT – outstanding performance with only minor errors
B	4+ / 4.5	VERY GOOD – above the average standard but with some errors
C	4.0	GOOD – generally sound work with a number of notable errors
D	3+ / 3.5	SATISFACTORY – fair but with significant shortcomings
E	3.0	SUFFICIENT – performance meets the minimum criteria
FX	2.0	FAIL – some more work required before the credit can be awarded
F	2.0	FAIL – considerable further work is required

Hours: 3 Lecture hours and 1 Tutorial hour per week. The laboratory component consists of 10 topics listed below. Each laboratory has a duration of 2.5 hours.

Course Lecture and Laboratory Topics:

Organic Chemistry II Lecture

1 week 2	Conjugation: allylic systems
2 week 2	Conjugation: dienes, Diels-Alder reaction
3 week 3	Aromaticity: properties, nomenclature, benzylic bromination
4 week 3	Aromaticity: attributes that make a system aromatic
5 week 4	Alkenylbenzene reactions & Birch reduction
6 week 4	Electrophilic aromatic substitution
7 week 5	EAS: substituent effects
8 week 5	Organometallic chemistry
9 week 6	Exam 1 Lectures 1 – 7
Exam 1 week 6	Carbonyl reductions to alcohols & alcohol oxidations to carbonyls
10 week 7	More aldehyde & ketone chemistry, hydration, cyanohydrin
11 week 7	Carbonyl reactions: hemiacetal & acetal
12 week 8	Carbonyl reactions: imines, enamines, Wittig, enol
13 week 8	Enol and enolate ion chemistry
14 week 9	Alpha-beta unsaturated carbonyl chemistry, carboxylic acid intro
15 week 9	Carboxylic acid reactions
16 week 11	Carboxylic acid derivatives
Exam 2 week 11	Exam 2 Lectures 8 – 15

17 week 12	Carboxylic acid derivatives – esters & amides
18 week 12	Nitrile chemistry & ester enolates
19 week 13	Ester enolates in synthesis
20 week 13	Amines – nomenclature & properties
21 week 14	Amines – preparations & reactions
22 week 14	Arylamine reactions & aryl halide reactions
23 short week	NAS & phenol chemistry
Exam 3 week 15	Exam 3 Lectures 16 – 22
24 week 15	Phenol reactions & sugars
25 week 16	Selected biochem topics
26 week 16	Selected biochem topics

Organic Chemistry II Laboratory

Day	Experiment
Week2	Safety Briefing Introduction to the Lab, prerequisite quiz
Week 3	Experiment 1: Literature Search Assignment
Week 4	Experiment 2: NMR Spectroscopy
Week 5	Experiment 3: Reduction of Ketone
Week 6	Experiment 4: Oxidation of Acetophenone
Week 7	Experiment 5: Nitration of Methyl Benozate
Week 8	Experiment 6: Aldol Condenstation
Week 9	Experiment 7: Amide Preparation
Week 10	Experiment 8: Arene Diazonium Salts
Week 11	Experiment 9: Wittig Reaction
Week 12	Experiment 10: Hydrolysis of Glycerol Stearate Final Written Quiz Laboratory Cleanup and Checkout