

LSC Use Only Proposal No:
LSC Action-Date:

UWUCC Use Only Proposal No: 12-24c
UWUCC Action-Date: AP 9/4/12

Senate Action Date: App-12/4/12

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person(s) Justin Fair	Email Address jfair@iup.edu
Proposing Department/Unit Chemistry	Phone 74477

Check all appropriate lines and complete all information. Use a separate cover sheet for each course proposal and/or program proposal.

1. Course Proposals (check all that apply)

New Course Course Prefix Change Course Deletion
 Course Revision Course Number and/or Title Change Catalog Description Change

Current course prefix, number and full title: CHEM 232 Organic Chemistry II

Proposed course prefix, number and full title, if changing: _____

2. Liberal Studies Course Designations, as appropriate

This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)
 Learning Skills Knowledge Area Global and Multicultural Awareness Writing Intensive (include W cover sheet)
 Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)
 Global Citizenship Information Literacy Oral Communication
 Quantitative Reasoning Scientific Literacy Technological Literacy

3. Other Designations, as appropriate

Honors College Course Other: (e.g. Women's Studies, Pan African)

4. Program Proposals

Catalog Description Change Program Revision Program Title Change New Track
 New Degree Program New Minor Program Liberal Studies Requirement Changes Other

Current program name: _____

Proposed program name, if changing: _____

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)		4/11/12
Department Chairperson(s)		4/11/12
College Curriculum Committee Chair		4/20/12
College Dean		4/20/12
Director of Liberal Studies (as needed)		
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs		9/6/12

Received
SEP 6 2012
Liberal Studies

Received
APR 20 2012
Liberal Studies

Part II.

CHEM 232 – New Syllabus of Record

I. Catalog Description

CHEM 232 Organic Chemistry II

(3c-4l-4cr)

Prerequisites: Grade of C or better in CHEM 231

A continuation of Organic Chemistry I with an introduction to spectroscopic techniques. Laboratory work emphasizes the synthesis of representative compounds.

II. Course Outcomes

Student will be able to

Lecture:

1. Analyze and describe functional groups, with particular emphasis on the centrality of the carbonyl group in organic reactions.
2. Compare the dependence of structure and reactivity on context, the environment, whether gaseous, liquid or solid; or in solution.
3. Analyze an organic synthetic route, including retrosynthetic analysis of target molecules.
4. Describe the synthesis and behavior of macromolecular species, including biomolecules such as proteins and polysaccharides and synthetic polymers.

Laboratory:

1. Explain the logic of organic experimental procedures: selecting the optimum equipment for a particular reaction or operation.
2. Demonstrate sufficient knowledge of the planning and carrying out of a variety of organic reactions, including safety considerations.
3. Analyze written experimental data and observations.
4. Utilize modern instrumentation to analyze and identify key organic transformations.

III. Course Outline

Lecture: (1 academic hour = 50 minutes)

- | | | |
|----|---|---------|
| A. | <u>Organometallic Compounds</u> | 3 hours |
| | Reduction of carbonyl compounds, oxidation of alcohols. Organolithium and organomagnesium compounds, the Grignard reaction. | |
| B. | <u>Alcohols, Diols, and Thiols</u> | 4 hours |
| | Nomenclature, physical properties, chemical properties, synthesis of alcohols, syntheses from alcohols. | |
| C. | <u>Ethers, Epoxides, and Sulfides</u> | 3 hours |
| | Nomenclature, physical properties, chemical properties, synthesis of alcohols epoxides, and sulfides. | |
| D. | <u>Aldehydes and Ketones</u> | 3 hours |
| | Nomenclature, physical properties, synthetic methods, reactions involving nucleophilic addition to the carbonyl group | |
| E. | <u>Exam I</u> | 1 hour |
| F. | <u>Carboxylic Acids</u> | 4 hours |
| | Nomenclature, physical properties, methods of preparation, derivatives of carboxylic acids. | |
| G. | <u>Carboxylic Acid Derivatives</u> | 3 hours |
| | Nomenclature, physical properties, methods of preparation, derivatives of acid anhydrides, esters, amides and acyl chlorides. | |
| H. | <u>Enols and Enolates</u> | 3 hours |
| | Structure and reactivity of enols and enolates. Aldol and Claisen condensations. | |
| I. | <u>Amines</u> | 3 hours |
| | Nomenclature, physical properties, basicity, methods of preparation, reactions of amines. | |
| J. | <u>Exam II</u> | 1 hour |

K.	<u>Phenols</u>	3 hours
	Nomenclature, structure, properties, acidity, and reactions of phenols.	
L.	<u>Carbohydrates</u>	4 hours
	Classification and D/L nomenclature of carbohydrates. Mutarotation of hemiacetals. Conformations	
M.	<u>Lipids</u>	3 hours
	Description of fats, oils, and fatty acids.	
N.	<u>Amino Acids, Peptides, and Proteins</u>	4 hours
	Classification, stereochemistry, synthesis, and reactions of amino acids.	
O.	<u>Final Exam</u> – During Final Exam Week	2 hours

Laboratory:

Week 1.	Laboratory Safety
Week 2.	Infrared Spectroscopy and Identification of Hydrocarbons
Week 3.	Triphenylmethanol Synthesis: Grignard Reagents
Week 4.	Identification of an Unknown Aldehyde or Ketone
Week 5.	Reduction of Benzil to Hydrobenzoin
Week 6.	Wittig Reaction and Introduction to Green Chemistry
Week 7.	Oxidation of Cyclohexanone and Balancing Redox Reactions
Week 8.	Esterification Reaction
Week 9.	Synthesis of Salicylic Acid from Oil of Wintergreen
Week 10.	Synthesis of Diamide
Week 11.	Sandmeyer Reaction
Week 12.	Mass Spectrometry and NMR Review
Week 13.	Aldol Condensation
Week 14.	Check Out, Final Exam

IV. Evaluation Methods

The final grade will be determined as follows:

20% The laboratory grade will make up approximately 20 percent of the overall grade. The laboratory grade is made up of quiz grades, grades on laboratory reports, and notebooks. Students must earn no less than 70% in the laboratory portion to pass CHEM 231.

80% The lecture portion will make up approximately 80 percent of the overall grade. Evaluation consists of quizzes, hourly exams, assignments and a final exam. The final exam usually contributes 25-30% of the lecture grade. Items of the lecture may also include, but are not limited to problem sets, quizzes, and in class activities.

V. Example Grading Scale

Grading Scale: A: 90-100% B: 80-89% C: 70-79% D: 60-69% F: <60%

VI. Attendance Policy

Attendance is expected for all classes. Individual faculty will include in their syllabus an attendance policy consistent with the Undergraduate Course Attendance Policy in the IUP Undergraduate Catalog.

VII. Required Textbooks, Supplemental Books and Readings

Lecture: Carey, F. *Organic Chemistry*, 8th Ed., McGraw Hill, New York, 2010.

Laboratory: *Laboratory Methods in Organic Chemistry: Part II CHEM 232*, ProPacket, Indiana, Pa.

VIII. Special Resources Requirements

Safety: Some approved form of eye protection must be worn at all times in the laboratory. Students who do not comply with this regulation will be required to withdraw from the course. It is suggested that contact lenses not be worn, if possible, as there is a tendency for organic vapors to be absorbed and cause eye irritation.

Breakage: Each student has his/her own laboratory desk and is responsible for the equipment in it as well as ensuring its security through use of the provided combination lock. If a piece of equipment is broken, it must be replaced by going to the main stockroom and signing a slip for a new piece. The slip is filed with the bursars office and will be charged to the student's account to pay for the material listed on his/her slip.

Students are expected to have their own scientific calculators and access to a computer to use the computer-based programs and web-sites that provide supplementary materials. Some sections of the course utilize course management software as part of the instruction.

IX. Bibliography

1. Jones Jr., Maitland, Fleming, and Steven A., *Organic Chemistry, Fourth Edition*, W. W. Norton & Company, New York (2009).
2. Loudon, G. Marc, *Organic Chemistry, Fifth Edition*, Roberts and Company Publishers, New York (2009).
3. McMurry, John, *Organic Chemistry, Seventh Edition*, Brooks Cole, New York (2007).
4. Padias, Anne B. *Making the Connections: A How to Guide for Organic Chemistry Lab Techniques*, Hayden-McNeil Publishing, Inc., New York (2007).
5. Smith, Janice, G. , *Organic Chemistry, Third Edition* McGraw Hill, New York (2010).
6. Vollhardt, K. Peter C., Schore, Neil E. *Organic Chemistry Structure and Function, Sixth Edition*, W.H. Freeman and Company, New York (2009).
7. Williamson, Kenneth L., Minard, Robert D., and Masters, Katherine M., *Macroscale and Microscale Organic Experiments, Fifth Edition*, Houghton Mifflin Company, Boston (2007).

2. Summary of the proposed revisions.

1. Added pre-requisite of “Grade of C or better in CHEM 231”, instead of “CHEM 231”.
2. Expanded/changed course objectives to fit current expected student learning outcomes.
3. Minimum Lab Grade of 70% required for passing course.
4. Updated course text and bibliography

3. Justification/rationale for the revision.

1. **Added pre-requisite of “Grade of C better in CHEM 231”:** In keeping with the recommendations of the external evaluators about minimum standards, students will need a “C” in CHEM 231 to progress to CHEM 232. Students who do not achieve at least a “C” in CHEM 231 are less likely to pass CHEM 232, which builds on the knowledge in CHEM 231.
2. **Course objectives:** The old syllabus of record dates to 2003. Recent changes to the certification requirements of the American Chemical Society prompted the Chemistry department to review all its required courses. CHEM 232 was updated in the process.
3. **Minimum Lab Grade of 70%** required for passing course was the recommendation of two external evaluators at our last program review. Faculty approved raising the minimum passing lab grade from 65% to 70% to improve student learning and standards.
4. **Updated course text and bibliography** - the syllabus of record was last updated in 2003.

4. Old Syllabus of Record

SYLLABUS FOR CHEM 232

ORGANIC CHEMISTRY II

I. CATALOG DESCRIPTION

COURSE TITLE:	CHEM 232, Organic Chemistry II
NUMBER OF CREDITS:	4 cr (3c-4l-4sh)
PREREQUISITES:	CHEM 231
COURSE DESCRIPTION:	A continuation of Organic Chemistry I with an introduction to spectroscopic techniques. Laboratory work emphasizes the synthesis of representative compounds.

II. COURSE OBJECTIVES

The objective of this course is to teach the student the structure, synthesis and reactivity of all the common organic functional groups. Analysis of organic compounds by chemical tests and spectroscopic methods will also be introduced.

III. DETAILED COURSE OUTLINE

LECTURE

1. Aromatic Compounds I: The Phenomenon of Aromaticity 3 lectures
Structure of Benzene, Huckel's Rule, other aromatic compounds.

- | | | |
|----|---|---------------|
| 2. | <u>Aromatic Compounds II: Electrophilic Aromatic Substitution</u> | 5
lectures |
| | Mechanism for electrophilic aromatic substitution, substituent effects, reactivity and orientation. | |
| 3. | <u>Spectroscopic Methods of Structure Determination</u> | 6
lectures |
| | The electromagnetic spectrum, visible and ultraviolet spectroscopy, infrared spectroscopy, NMR spectroscopy, mass spectrometry. | |
| 4. | <u>Alcohols and Ethers</u> | 4
lectures |
| | Nomenclature, physical properties, chemical properties, synthesis of alcohols, syntheses from alcohols. | |
| 5. | <u>Phenols and Aryl Halides: Nucleophilic Aromatic Substitution</u> | 2
lectures |
| | Nomenclature, physical and chemical properties, acidic properties, synthesis of phenols. | |
| 6. | <u>Organic Oxidation Reduction Reactions: Organometallic Compounds</u> | 3
lectures |
| | Reduction of carbonyl compounds, oxidation of alcohols. Organolithium and organomagnesium compounds, the Grignard reaction. | |
| 7. | <u>Aldehydes and Ketones I. Nucleophilic Addition to the Carbonyl Group</u> | 3
lectures |
| | Nomenclature, physical properties, synthetic methods, reactions involving nucleophilic addition to the carbonyl group | |
| 8. | <u>Aldehydes and Ketones II. Reactions at the Alpha Carbon: Aldol Reactions</u> | 5
lectures |
| | Acidity of the alpha hydrogen, tautomerism, aldol and related reactions | |
| 9. | <u>Carboxylic Acids and their Derivatives: Nucleophilic Substitution at the Acyl Carbon</u> | 6
lectures |
| | Nomenclature, physical properties, methods of preparation, derivatives of carboxylic acids, acid anhydrides, esters, amides and acyl chlorides. | |

10. Amines

3
lectures

Nomenclature, physical properties, basicity, methods of preparation, reactions of amines.

LABORATORY

1. Safety, Diels-Alder Reaction/ Mass Spectrometry
2. C-13, H-1 (PMR) NMR Spectroscopy
3. PMR continued and FTIR Spectroscopy
4. UV-VIS and Problem Solving using All of the Spectroscopic methods
5. Friedel-Crafts Acylation Reaction
6. Metal Hydride Reduction
7. Preparation of Adipic Acid/Balancing Redox Equations
8. Preparation of Triphenylmethanol by the Grignard Reaction
9. Carbanion Intermediates in Synthesis
10. Identification of Unknown Aldehydes and Ketones
11. Esterification and Amide Formation
12. Sandmeyer Reaction

IV. EVALUATION METHODS

The laboratory grade will make up approximately 16% of the overall grade. The exact percentage is determined by the lecture instructor and is stated in the syllabus of that instructor. Evaluation consists of quizzes, hourly exams, assignments and a final exam. The final exam usually contributes 25-30% of the lecture grade. The laboratory grade is made up of quiz grades and grades on laboratory reports and notebooks.

V. REQUIRED TEXTBOOK(S)

Lecture: K. P. C. Vollhardt and N. E. Shore, *Organic Chemistry: Structure and Function*. 3rd ed., W. H. Freeman and Company, New York, 1998.

Laboratory: McKelvey, Bravo, Patsiga and Wood, *Laboratory Methods in Organic Chemistry: Part II*, ProPacket, Indiana, Pa., 2002.

VI. SPECIAL RESOURCE REQUIREMENTS

Safety: Some approved form of eye protection must be worn at all times in the laboratory. Students who do not comply with this regulation will be required to withdraw from the course. It is suggested that contact lenses not be worn, if possible, as there is a tendency for organic vapors to be absorbed and cause eye irritation.

Breakage: Each student has his/her own laboratory desk and is responsible for the equipment in it. If a piece of equipment is broken, it must be replaced by going to the main stockroom and signing a slip for a new piece. The slip is filed in the stockroom and, on check-out day, the student may be required to pay for the material listed on his/her slip in the stockroom .

Students are expected to have their own scientific calculators and access to a computer to use the computer-based programs and web-sites that provide supplementary materials. Some sections of the course utilize WebCT as part of the instruction.

5. Letters of Support or Acknowledgement
Attached.

From: Anne E Kondo
<akondo@iup.edu>

Date: 04/09/12 09:09 AM

To: luciano@iup.edu, lkup@iup.edu, hovan@iup.edu,
talwar@iup.edu, bharathn@iup.edu, ssdahl@iup.edu,
LPalmer@iup.edu

This message has attached files. Show

Dear Colleagues,

As the CHEM department went through its curriculum for Liberal Studies, we also made some other minor changes to CHEM 231/232 (Organic I and II). The proposals are attached. The key changes are a minimum lab grade of 70 % to pass the course, and a minimum grade of "C" to progress from CHEM 231 to CHEM 232. The first change was recommended by our external evaluators, and the second was to impress upon students the importance of lab. As these courses are required or electives in your programs, we would appreciate a letter of support or acknowledgement of these changes,

Sincerely,

Anne Kondo

April 20, 2012

To: Anne Kondo, Chemistry Department

From: Steve Hovan, Geoscience Dept

RE: proposed changes to CHEM 231 and 232 – Organic Chemistry I and II

Dr. Kondo,

Thank you contacting us about the proposed changes to your Organic Chemistry courses (CHEM 232 and 232). The Geoscience faculty reviewed the proposal and we are happy to support the slight revisions outlined in them. Currently these courses are offered as an ancillary science (controlled elective) in each of our track programs in our B.S. Geology degree. It seems to us that requiring a "passing grade of C or above" in Organic Chemistry I is appropriate pre-requisite for Organic Chemistry II. This change should be in the best interest of all students in this course and we applaud your efforts to improve the program.

I wish you and the department all the best with your revisions

Sincerely,

Steve Hovan

Chair, Geoscience Department