

LSC Use Only Proposal No: _____ LSC Action-Date: _____
 UWUCC Use Only Proposal No: 12-246 UWUCC Action-Date: AP 9/4/12 Senate Action Date: App-10/9/12

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 231 Organic Chemistry I

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

Part II.

CHEM 231 – New Syllabus of Record

I. Catalog Description

CHEM 231 Organic Chemistry I

(3c-4l-4cr)

Prerequisites: CHEM 112 or CHEM 114

A study of the compounds of carbon, with a special emphasis on structure-reactivity relationships. Laboratory work emphasizes methods of separation and purification of organic compounds.

II. Course Outcomes

Student will be able to

Lecture:

1. Explain bonding and identify functional group structures.
2. Describe bonding and its consequences on molecular structure and reactivity.
3. Apply the interplay between electronic, steric, and orbital interactions in the behavior and properties of molecules.
4. Describe the dependence of structure and reactivity on context, the environment, whether gaseous, liquid or solid; or in solution.
5. Explain Lewis and Bronsted acid-base chemistry.
6. Analyze chemical structures for stereochemistry and conformational analysis.
7. Compare the addition, elimination, substitution and rearrangement mechanisms, and reactive intermediates.

Laboratory:

1. Explain the logic of organic experimental procedures: the logic of glassware design and how physical properties influence compound isolation.
2. Document and record experimental data and observations.
3. Demonstrate the isolation and purification of chemical compounds.
4. Analyze experimental data and observations.
5. Apply proton NMR and IR spectroscopic analysis to elucidate organic structures.

III. Course Outline (1 academic hour = 50 minutes)

Lecture:

- A. Carbon Compounds and Chemical Bonds 3 hours
Structure and Bonding. Lewis structure and the Octet Rule. Drawing organic structures. Lewis acids and Lewis bases.
- B. Alkanes and Cycloalkanes 3 hours
Structure, nomenclature, physical properties and chemical reactions. Synthesis.
- C. Conformations and cis-trans Stereoisomers 3 hours
Conformations, cis-trans isomerism and conformational analysis of disubstituted cyclohexanes.
- D. Alcohols and Alkyl Halides 3 hours
Introduction to all organic functional groups. Structure, nomenclature, physical properties and chemical reactions of alcohols and alkyl halides.
- E. Exam I 1 hour
- F. Alkenes and Elimination Reactions 3 hours
Structure, nomenclature, physical properties, cis-trans isomerism and chemical reactions.
- G. Alkenes and Addition Reactions 3 hours
Addition of hydrogen halides, stereochemistry and regioselectivity of addition. Addition of halogens, oxidation, epoxidation, indirect addition of water.
- H. Stereochemistry 3 hours
Stereoisomerism, enantiomers and diastereomers, configurational notations, optical rotation, molecules with more than one chiral center.
- I. Nucleophilic Substitution 4 hours
 S_N1 and S_N2 reactions, rates and mechanism, transition states, stereochemistry of the reactions, potential energy diagrams, solvent effects, elimination reactions, competing reactions.

J.	<u>Exam II</u>	1 hour
K.	<u>Alkynes</u> Structure and bonding, nomenclature, physical properties. Preparation, addition of hydrogen halides, addition of halogens, and oxidation.	3 hours
L.	<u>Alkadienes and Allylic Systems</u> Butadiene, allyl and benzyl radicals and cations, resonance. Rules of resonance, conjugated dienes and electron delocalization, 1,2 and 1,4 addition, Diels-Alder reaction.	3 hours
M.	<u>Arenes and Aromaticity</u> Structure of Benzene, Huckel's Rule, other aromatic compounds.	3 hours
N.	<u>Reactions of Arenes</u> Mechanism for electrophilic aromatic substitution, substituent effects, reactivity and orientation.	3 hours
O.	<u>Spectroscopy</u> Principles of molecular spectroscopy, interpreting proton and carbon NMR, mass spectroscopy, and Ultraviolet-Visible,	3 hours
P.	<u>Final Exam</u> – During Final Exam Week	2 hours

Laboratory:

- Week 1. Safety, Check-In
- Week 2. Molecular Models (Alkanes/Cycloalkanes)
- Week 3. Melting Point/Boiling Point
- Week 4. Distillation
- Week 5. Recrystallization
- Week 6. Simple and Reaction Extraction
- Week 7. Preparation of *t*-Butyl Chloride (Calculation of Percent Yield)
- Week 8. Dehydration of an Alcohol (Gas Chromatography)
- Week 9. Thin-Layer Chromatography and Molecular Models (Stereoisomers)

and Stereospecific Reactions)

Week 10. Kinetics of Solvolysis

Week 11. Diels-Alder Reaction

Week 12. Electrophilic Aromatic Substitution

Week 13. Proton NMR Spectroscopy

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 232.

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

Laboratory: *Laboratory Methods in Organic Chemistry: Part I CHEM 231*, 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., *Macroscopic and Microscale Organic Experiments, Fifth Edition*, Houghton Mifflin Company, Boston (2007).

2. Summary of the proposed revisions.

1. Expanded/changed course objectives to fit current expected student learning outcomes.
2. Minimum Lab Grade of 70% required for passing course.
3. Updated course text and bibliography

3. Justification/rationale for the revision.

1. **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 231 was updated in the process.
2. **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.
3. **Updated course text and bibliography** - the syllabus of record was last updated in 2003.

4. The old syllabus of record for CHEM 231

SYLLABUS FOR CHEM 231 ORGANIC CHEMISTRY I

I. CATALOG DESCRIPTION

COURSE TITLE:	CHEM 231, Organic Chemistry I
NUMBER OF CREDITS:	4 cr (3c-4l-4sh)
PREQUISITES:	CHEM 112 or CHEM 114
COURSE DESCRIPTION:	A study of the compounds of carbon, with a special emphasis on structure-reactivity relationships. Laboratory work emphasizes methods of separation and purification of organic compounds.

II. COURSE OBJECTIVES

The objective of this course is to teach the student the basic concepts of organic chemistry.

III. DETAILED COURSE OUTLINE

LECTURE

1. Carbon Compounds and Chemical Bonds 3 lectures

Structure and Bonding. Structure and physical properties.
Hybridization of carbon atomic orbitals. Shapes and bond

angles.

2. Representative Carbon Compounds 3 lectures
Aliphatic and aromatic hydrocarbons. Acid-base properties, intermolecular forces and physical properties.
3. Alkanes and Cycloalkanes 4 lectures
Structure, nomenclature, conformations, isomerism and chemical reactions. Synthesis.
4. Stereochemistry: Chiral Molecules 4 lectures
Stereoisomerism, enantiomers and diastereomers, configurational notations, optical rotation, molecules with more than one chiral center.
5. Ionic Reactions: Nucleophilic Substitution and Elimination 6 lectures
 S_N1 and S_N2 reactions, rates and mechanism, transition states, stereochemistry of the reactions, potential energy diagrams, carbocations, solvent effects, elimination reactions, E-1 and E-2 mechanisms, competing reactions.
6. Alkenes and Alkynes I. Properties and Synthesis 5 lectures
Structure, nomenclature, preparation of alkenes and alkynes. Cycloalkenes, terminal alkynes, reactions of alkenes and alkynes.
7. Alkenes and Alkynes II. Addition Reactions 6 lectures
Addition of hydrogen halides, stereochemistry and regioselectivity of addition. Addition of halogens, oxidation, epoxidation, indirect addition of water.
8. Free Radical Reactions 4 lectures
Chlorination of methane, chain reaction, free-radical addition to alkenes, polymerization.
9. Conjugated Unsaturated Systems 5 lectures
Butadiene, allyl and benzyl radicals and cations, resonance. Rules of resonance, conjugated dienes and electron delocalization, 1,2 and 1,4 addition, Diels-Alder reaction.

LABORATORY

1. Safety, Molecular Models (Alkanes/Cycloalkanes)
2. Melting Point/Boiling Point
3. Distillation
4. Crystallization
5. Extraction Part I (Trimyristin & Simple Extraction)
6. Extraction Part II (Multiple Extraction)
7. Thin-Layer Chromatography/Molecular Models (Stereoisomers)
8. Preparation of t-Butyl Chloride/Percent Yield
9. Preparation of an Aryl Ether
10. Kinetics of Solvolysis
11. Dehydration of an Alcohol (Gas Chromatography)
12. Identification of an Unknown Hydrocarbon

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 I*, ProPacket, Indiana, Pa., 2001.

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