



CREDIT COURSE OUTLINE

I. COVER PAGE

(1) CHEM 8	(2) ELEMENTARY ORGANIC CHEMISTRY	(3) 3
Number	Title	Units

<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="3">(4) Lecture / Lab Hours:</td> </tr> <tr> <td colspan="3">Total Course Hours</td> </tr> <tr> <td style="width: 20%;"></td> <td style="width: 20%;">Total Lec hours:</td> <td style="width: 20%; text-align: center;">3.00</td> </tr> <tr> <td></td> <td>Total Lab hours:</td> <td style="text-align: center;">0</td> </tr> <tr> <td></td> <td>Total Contact hours:</td> <td style="text-align: center;">54.00</td> </tr> <tr> <td colspan="3">Lec will generate <u>0</u> hour(s) outside work.</td> </tr> <tr> <td colspan="3">Lab will generate <u>0</u> hour(s) outside work.</td> </tr> <tr> <td colspan="3">(5) Grading Basis:</td> </tr> <tr> <td style="width: 20%;">Grading Scale Only</td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> </tr> <tr> <td>Pass/No Pass option</td> <td></td> <td style="text-align: center;">X</td> </tr> <tr> <td>Pass/No Pass only</td> <td></td> <td></td> </tr> <tr> <td colspan="3">(6) Advisories:</td> </tr> <tr> <td colspan="3">ENGL 1A - READING AND COMPOSITION</td> </tr> <tr> <td colspan="3">(7) Pre-requisites(requires C grade or better):</td> </tr> <tr> <td colspan="3">CHEM 1A or CHEM 3A</td> </tr> <tr> <td colspan="3">Corequisites:</td> </tr> </table>	(4) Lecture / Lab Hours:			Total Course Hours				Total Lec hours:	3.00		Total Lab hours:	0		Total Contact hours:	54.00	Lec will generate <u>0</u> hour(s) outside work.			Lab will generate <u>0</u> hour(s) outside work.			(5) Grading Basis:			Grading Scale Only			Pass/No Pass option		X	Pass/No Pass only			(6) Advisories:			ENGL 1A - READING AND COMPOSITION			(7) Pre-requisites(requires C grade or better):			CHEM 1A or CHEM 3A			Corequisites:			<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="3">(8) Classification:</td> </tr> <tr> <td style="width: 20%;"></td> <td style="width: 20%;">Degree applicable:</td> <td style="width: 20%; text-align: center;">X</td> </tr> <tr> <td></td> <td>Non-degree applicable:</td> <td></td> </tr> <tr> <td></td> <td>Basic skills:</td> <td></td> </tr> <tr> <td colspan="3">(9) RC Fulfills AS/AA degree requirement: (area)</td> </tr> <tr> <td colspan="3">General education category:</td> </tr> <tr> <td colspan="3">Area A Natural Sciences</td> </tr> <tr> <td colspan="3">Major: LIBERAL ARTS & SCIENCES - NATURAL SCIENCES - PHYSICAL SCIENCE PLANT & SOIL SCIENCE</td> </tr> <tr> <td colspan="3">Certificate of:</td> </tr> <tr> <td colspan="3">Certificate in:</td> </tr> <tr> <td colspan="3">(10) CSU Baccalaureate:</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">X</td> </tr> <tr> <td colspan="3">(11) Repeatable: (A course may be repeated three times)</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">0</td> </tr> </table>	(8) Classification:				Degree applicable:	X		Non-degree applicable:			Basic skills:		(9) RC Fulfills AS/AA degree requirement: (area)			General education category:			Area A Natural Sciences			Major: LIBERAL ARTS & SCIENCES - NATURAL SCIENCES - PHYSICAL SCIENCE PLANT & SOIL SCIENCE			Certificate of:			Certificate in:			(10) CSU Baccalaureate:					X	(11) Repeatable: (A course may be repeated three times)					0
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(12) Catalog Description:

A survey of the important classes of organic compounds with emphasis upon materials of interest to students in the biological sciences. This thorough introduction to organic chemistry is recommended for students who need to take Chemistry 28A or for biology majors, students in prehealth sciences or environmental sciences.

II. COURSE OUTCOMES:

(Specify the learning skills the student demonstrates through completing the course and link critical thinking skills to specific course content and objectives.)

Upon completion of this course, students will be able to:

- I. Draw a structural formula of an organic compound given the systematical name.
- II. Analyze the structural formula of an organic compound, recognize its functional groups and name it properly.
- III. Identify S and R stereoisomers.
- IV. Complete the reactions of simple aliphatic and aromatic molecules, showing the reaction mechanisms.
- V. Analyze simple IR and NMR spectra to determine the structure of an unknown compound.

III. COURSE OBJECTIVES:

(Specify major objectives in terms of the observable knowledge and/or skills to be attained.)

In the process of completing this course, students will:

- I. Analyze the structural formula and line-bond formula of an organic compound, recognize its functional groups and name it properly using the IUPAC nomenclature.
- II. Draw structural formulas and line-bond formulas given the systematical name of an organic compound.
- III. Identify isomers and stereoisomers, recognizing asymmetric carbon atoms that cause chirality.
- IV. Complete the reactions of simple aliphatic and aromatic molecules, including amines and carbonyls.
- V. Illustrate the mechanism of reactions by correctly writing a balanced chemical equation and when appropriate using arrow notation.
- VI. Evaluate the molecular structure of biomolecules such as carbohydrates, lipids, amino acids, proteins and nucleic acids.
- VII. Analyze simple IR and NMR spectra to determine the structure of an unknown compound.

IV. COURSE OUTLINE:

Lecture Content:

A. Covalent bonding and shapes of molecules.

- I. Electronic configuration and orbital diagrams.
- II. Lewis structures and formal charges.
- III. Polar covalent and non-polar covalent bonds.
- IV. Intermolecular forces and their effects on physical properties of organic molecules.
- V. Hybridization of molecular orbitals (sp , sp^2 , and sp^3).
- VI. Formal charges

B. Acids and Bases.

- I. Lewis and Bronsted definitions.
- II. Nucleophiles and Electrophiles.

C. Alkanes, cycloalkanes and alkyl halides.

- I. The basics of organic nomenclature.
- II. Classification and properties of alkanes, alkylhalides, alcohols, ethers and amines.
- III. Newman projections
- IV. Chair conformation of cycloalkanes.

D. Alkenes and alkynes.

- I. Nomenclature of organic molecules containing double and triple bonds.
- II. Classification of isomers using the *cis/trans* and *E/Z* notation systems.
- III. Degrees of unsaturation.

E. Reactions of alkenes.

- I. Addition reactions
- II. The rule of Markovnikov and its mechanistic background.
- III. Hydride shift.

F. Chirality and stereo-isomerism.

- I. Asymmetric carbon atoms and their effects on stereochemical behavior.
- II. S and R classification of chiral carbons.
- III. Fischer projections

G. Alkyl halides.

- I. Nucleophilic substitution reactions.
- II. Replacement of the halogen by nucleophiles such as cyanide, alkoxide, and azide, including the reaction mechanisms.

H. Benzene and its derivatives.

- I. Nomenclature
- II. Substitution reactions, including reaction mechanisms
- III. Reactions of substituted benzene rings considering ortho/para directors and meta directors.

I. Alcohols, ethers, and thiols.

- I. Nomenclature.
- II. Physical properties.
- III. Syntheses and reactions, including reaction mechanisms.

J. Amines.

- I. Nomenclature.
- II. Physical properties.
- III. Simple reactions, including reaction mechanisms.

K. Aldehydes and ketones

- I. Nomenclature.
- II. Physical properties.
- III. Syntheses and reactions, including reaction mechanisms.

L. Carboxylic acids and other carbonyls.

- I. Nomenclature of carboxylic acids, acyl chlorides, esters and amides.
- II. Physical properties.
- III. Syntheses and reactions, including reaction mechanisms.

K. Structure determination.

- I. Analysis of simple infrared spectra.
- II. Analysis of simple nuclear magnetic resonance spectra.

L. Introduction to bio-molecules.

- I. Carbohydrates
- II. Lipids
- III. Amino acids
- IV. Proteins
- V. Nucleic acids.

V. APPROPRIATE READINGS

Reading assignments may include but are not limited to the following:

- I. Sample Text Title:
 1. Recommended - Bruice *Essentials of Organic Chemistry*, ed. 2nd Pearson, Prentice Hall, 2009,
 2. Recommended - Bailey and Bailey *Organic Chemistry, A Brief Survey of Concepts and Applications*, ed. 6th Prentice Hall, 2004,
- II. Other Readings
 1. Recommended - *Luceigh, Organic Chem TV CD-ROM and Lampman Organic Nomenclature CD-ROM*
 2. Recommended - *McMurray, Fundamentals of Organic Chemistry, 6th Edition, Thomson, 20027, ISBN 0495012033*

- Global or international materials or concepts are appropriately included in this course
- Multicultural materials and concepts are appropriately included in this course

If either line is checked, write a paragraph indicating specifically how global/international and/or multicultural materials and concepts relate to content outline and/or readings.

VI. METHODS TO MEASURE STUDENT ACHIEVEMENT AND DETERMINE GRADES:

Students in this course will be graded in at least one of the following four categories. Please check those appropriate. A degree applicable course must have a minimum of one response in category A, B, or C.

A. Writing			
Check either 1 or 2 below			
X	1. Substantial writing assignments are required. Check the appropriate boxes below and provide a written description in the space provided.		
	2. Substantial writing assignments are NOT required. If this box is checked leave this section blank. For degree applicable courses you must complete category B and/or C.		
X	a) essay exam(s)	X	d) written homework
	b) term or other paper(s)		e) reading reports
	c) laboratory report(s)		f) other (specify)

Required assignments may include but are not limited to the following:

Study questions similar to those in the textbook.
Comprehend journal and newspaper articles and paraphrase ideas.

B. Problem Solving			
Computational or non-computational problem-solving demonstrations, including:			
X	a) exam(s)		d) laboratory reports
X	b) quizzes		e) field work
X	c) homework problems		f) other (specify):

Required assignments may include but are not limited to the following:

Questions requiring evaluation of data and application of knowledge to new situations.

C. Skill demonstrations, including:			
	a) class performance(s)		c) performance exams(s)
	b) field work		d) other (specify)

Required assignments may include but are not limited to the following:

D. Objective examinations including:			
	a) multiple choice		d) completion
	b) true/false	X	e) other (specify): Essay questions, including drawing of structural formulas and reaction mechanisms
	c) matching items		

COURSE GRADE DETERMINATION:

Description/Explanation: Based on the categories checked in A-D, it is the recommendation of the department that the instructor's grading methods fall within the following departmental guidelines; however, the final method of grading is still at the discretion of the individual instructor. The instructor's syllabus must reflect the criteria by which the student's grade has been determined. (A minimum of five (5) grades must be recorded on the final roster.)

If several methods to measure student achievement are used, indicate here the approximate weight or percentage each has in determining student final grades.

Sample grading distribution: Homework Assignments: 15% Quizzes: 35% Exams: 50% Alternatively: Homework Assignments: 34% Exams: 33% Final exam: 33%

VII. EDUCATIONAL MATERIALS

For degree applicable courses, the adopted texts, as listed in the college bookstore, or instructor-prepared materials have been certified to contain college-level materials.

Validation Language Level (check where applicable):	College-Level Criteria Met	
	YES	NO
Textbook	<u> X </u>	<u> </u>
Reference materials	<u> X </u>	<u> </u>
Instructor-prepared materials	<u> X </u>	<u> </u>
Audio-visual materials	<u> X </u>	<u> </u>

Indicate Method of evaluation:

- Used readability formulae (grade level 10 or higher)
- Text is used in a college-level course X
- Used grading provided by publisher
- Other: (please explain; relate to Skills Levels)

<i>Computation Level</i> (Eligible for MATH 101 level or higher where applicable)	<u> X </u>	<u> </u>
Content		
Breadth of ideas covered clearly meets college-level learning objectives of this course	<u> X </u>	<u> </u>
Presentation of content and/or exercises/projects:		
Requires a variety of problem-solving strategies including inductive and deductive reasoning.	<u> X </u>	<u> </u>
Requires independent thought and study	<u> X </u>	<u> </u>
Applies transferring knowledge and skills appropriately and efficiently to new situations or problems.	<u> X </u>	<u> </u>

List of Reading/Educational Materials

Recommended - Bruice *Essentials of Organic Chemistry*, ed. 2nd Pearson, Prentice Hall, 2009, ISBN: 0321596951
Recommended - Bailey and Bailey *Organic Chemistry, A Brief Survey of Concepts and Applications*, ed. 6th Prentice Hall, 2004, ISBN: 0139241191

Comments:

 This course requires special or additional library materials (list attached).

 X This course requires special facilities:
Computer lab with programs for course

Attached Files:

[Chem 8 ABC Forms](#)

BASIC SKILLS ADVISORIES PAGE The skills listed are those needed for eligibility for English 125, 126, and Math 101. These skills are listed as the outcomes from English 252, 262, and Math 250. In the right hand column, list at least three major basic skills needed at the beginning of the target course and check off the corresponding basic skills listed at the left.

Check the appropriate spaces.

- Eligibility for Math 101 is advisory for the target course.
- Eligibility for English 126 is advisory for the target course.
- Eligibility for English 125 is advisory for the target course.

If the reviewers determine that an advisory or advisories in Basic Skills are all that are necessary for success in the target course, stop here, provide the required signatures, and forward this form to the department chair, the appropriate associate dean, and the curriculum committee.

CONTENT REVIEW

CHEM 3A INTRODUCTORY GENERAL CHEMISTRY

CHEM 1A GENERAL CHEMISTRY

Competent knowledge of the periodic table, molecules, and compounds. Assessed from a pre-test administered at the beginning of the semester and the final exam administered at the end of the semester.

REQUISITES**Subject Prerequisite -- CHEM 1A GENERAL CHEMISTRY**

1. Students learn how to work with Lewis structures and geometrical shapes of molecules. 2. Students learn the principles of chemical bonding. They learn the differences between ionic and covalent bonds. 3. Students learn the principles of balancing oxidation and reduction reactions, as well as completing and balancing other reactions

- Analyze the structural formula and line-bond formula of an organic compound, recognize its functional groups and name it properly using the IUPAC nomenclature.
- Draw structural formulas and line-bond formulas given the systematic name of an organic compound.
- Complete the reactions of simple aliphatic and aromatic molecules, including amines and carbonyls.

Subject Prerequisite -- CHEM 3A INTRODUCTORY GENERAL CHEMISTRY

1. Students learn how to work with Lewis structures and geometrical shapes of molecules. 2. Students learn the principles of chemical bonding. They learn the difference between ionic and covalent bonds. 3. Students learn the principles of completing and balancing reactions.

- Analyze the structural formula and line-bond formula of an organic compound, recognize its functional groups and name it properly using the IUPAC nomenclature.
- Draw structural formulas and line-bond formulas given the systematic name of an organic compound.
- Complete the reactions of simple aliphatic and aromatic molecules, including amines and carbonyls.

Subject Advisory -- ENGL 1A READING AND COMPOSITION

- Write a documented research paper of at least 1000 words that includes:
- a clearly defined, arguable thesis sentence
- sentences that exhibit a command of the complex/compound with minimal comma splices, sentence fuses, fragments, and mechanics

- Identify isomers and stereoisomers, recognizing asymmetric carbon atoms that cause chirality.
- Analyze simple IR and NMR spectra to determine the structure of an unknown compound.
- Evaluate the molecular structure of biomolecules such as carbohydrates, lipids, amino acids, proteins and nucleic acids.

ESTABLISHING PREREQUISITES OR COREQUISITES

Every prerequisite or corequisite requires content review plus justification of at least one of the seven kinds below. Prerequisite courses in communication and math outside of their disciplines require justification through statistical evidence. Kinds of justification that may establish a prerequisite are listed below.

Check one of the following that apply. Documentation may be attached.

1. ___ The prerequisite/corequisite is required by law or government regulations.
Explain or cite regulation numbers:
2. ___ The health or safety of the students in this course requires the prerequisite.
Justification: Indicate how this is so.
3. ___ The safety or equipment operation skills learned in the prerequisite course are required for the successful or safe completion of this course.
Justification: Indicate how this is so.
4. ___ The prerequisite is required in order for the course to be accepted for transfer to the UC or CSU systems.
Justification: Indicate how this is so.
5. ___ Significant statistical evidence indicates that the absence of the prerequisite course is related to unsatisfactory performance in the target course.
Justification: Cite the statistical evidence from the research.
6. The prerequisite course is part of a sequence of courses within or across a discipline.
7. ___ Three CSU/UC campuses require an equivalent prerequisite or corequisite for a course equivalent to the target course: