



## CREDIT COURSE OUTLINE

### I. COVER PAGE

(1) CHEM 28B	(2) ORGANIC CHEMISTRY II	(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: 30%;">Total Lec hours:</td> <td style="width: 10%;"></td> <td style="width: 60%; text-align: center;">3.00</td> </tr> <tr> <td>Total Lab hours:</td> <td></td> <td style="text-align: center;">0</td> </tr> <tr> <td>Total Contact hours:</td> <td></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>Grading Scale Only</td> <td></td> <td></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"><i>No defined advisories.</i></td> </tr> <tr> <td colspan="3">(7) Pre-requisites (requires C grade or better):</td> </tr> <tr> <td colspan="3">CHEM 28A</td> </tr> <tr> <td colspan="3">Corequisites:</td> </tr> <tr> <td colspan="3"></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:			<i>No defined advisories.</i>			(7) Pre-requisites (requires C grade or better):			CHEM 28A			Corequisites:						<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="3">(8) Classification:</td> </tr> <tr> <td style="width: 30%;"></td> <td style="width: 30%;"></td> <td style="width: 40%;"></td> </tr> <tr> <td></td> <td>Degree applicable:</td> <td style="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>(9) RC</td> <td>Fulfills AS/AA degree requirement: (area)</td> <td></td> </tr> <tr> <td></td> <td>General education category:</td> <td></td> </tr> <tr> <td></td> <td>Major:</td> <td></td> </tr> <tr> <td></td> <td>Certificate of:</td> <td></td> </tr> <tr> <td></td> <td>Certificate in:</td> <td></td> </tr> <tr> <td>(10) CSU</td> <td>Baccalaureate:</td> <td style="text-align: center;">X</td> </tr> <tr> <td>(11) Repeatable: (A course may be repeated three times)</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:			Major:			Certificate of:			Certificate in:		(10) CSU	Baccalaureate:	X	(11) Repeatable: (A course may be repeated three times)		0
(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:																																																																																								
<i>No defined advisories.</i>																																																																																								
(7) Pre-requisites (requires C grade or better):																																																																																								
CHEM 28A																																																																																								
Corequisites:																																																																																								
(8) Classification:																																																																																								
	Degree applicable:	X																																																																																						
	Non-degree applicable:																																																																																							
	Basic skills:																																																																																							
(9) RC	Fulfills AS/AA degree requirement: (area)																																																																																							
	General education category:																																																																																							
	Major:																																																																																							
	Certificate of:																																																																																							
	Certificate in:																																																																																							
(10) CSU	Baccalaureate:	X																																																																																						
(11) Repeatable: (A course may be repeated three times)		0																																																																																						

(12) Catalog Description:  
Structures, properties, reactions, and nomenclature of aromatic compounds, benzene derivatives, amines, carbonyl compounds and their derivatives, carbohydrates, amino acids, lipids, and nucleic acids. Structural analysis of aromatic, carbonyl, and amine containing compounds. Oxidation-reduction chemistry of organic functional groups. Multistep synthesis, separation, identification, and reaction mechanisms of representative compounds. Protecting groups in multistep synthesis.

### 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. predict the products of reactions of aromatic compounds.
- II. draw the reaction mechanism of an electrophilic aromatic substitution.
- III. complete reactions involving the carbonyl functional group such as aldehydes, ketones and carboxylic acids.
- IV. recognize bio-molecules such as carbohydrates, lipids, amino acids, proteins and nucleic acids.
- V. understand how DNA sequencing takes place and what its role is in the current developments in biochemistry.

### 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. learn how to predict the products of reactions of aromatic compounds.
- II. gain an understanding how to write the reaction mechanism of an electrophilic aromatic substitution using Lewis structures and curved arrow notation.
- III. learn how to predict the products of reactions involving the carbonyl functional group such as aldehydes, ketones, carboxylic acids and their derivatives.
- IV. gain an understanding of the building blocks of bio-molecules such as carbohydrates, lipids, amino acids, proteins and nucleic acids.
- V. acquire knowledge on how DNA sequencing is performed and what its role is in the current developments in biochemistry.

### IV. COURSE OUTLINE:

**Lecture Content:**

- A. Benzene and aromatic character; Huckel rule
- B. Electrophilic substitution of aromatic compounds
- C. Aldehydes and ketones. Nucleophilic addition reactions
- D. Carboxylic acids and its derivatives
- E. Carbanions I: aldol and Claisen condensations
- F. Amines I: preparation and physical properties
- G. Amines II: reactions
- H. Phenols
- I.  $\alpha$ ,  $\beta$ -unsaturated carbonyl compounds (conjugate addition)
- J. Macromolecules: polymers and polymerization
- K. Bio-molecules: carbohydrates, lipids, amino acids, proteins
- L. Nucleic acids, DNA

**V. APPROPRIATE READINGS****Reading assignments may include but are not limited to the following:**

## I. Sample Text Title:

1. Recommended - McMurray, J *Organic Chemistry with Biological Applications*, ed. 2nd Brooks Cole, 2010,

## II. Other Readings

1. Recommended - Traynham, J. *Organic Nomenclature*, 6th ed. Prentice Hall, 2008.
2. Recommended - *Computer Programs: 1. B. Luceigh Organic Chem TV II*, Jones and Bartlett Publishers, 2004. 2. G. Lampman *Organic Nomenclature*, Trinity Software, 1990.

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.

<b>A. Writing</b>			
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:**

Explaining the overall reactions and reaction mechanisms using structural formulas. Describe the use of protecting groups in certain reactions.

<b>B. Problem Solving</b>			
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:**

Complete reaction equations using structural formulas and write names for each compound. Propose multi-step reaction sequences to convert reactants into the desired products. Identify and draw the structural formulas for the amino acids in a poly-peptide. Interpret spectra to identify an unknown compound.

<b>C. Skill demonstrations, including:</b>			
<input type="checkbox"/>	a) class performance(s)	<input type="checkbox"/>	c) performance exams(s)
<input type="checkbox"/>	b) field work	<input type="checkbox"/>	d) other (specify)

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

<b>D. Objective examinations including:</b>			
<input type="checkbox"/>	a) multiple choice	<input type="checkbox"/>	d) completion
<input type="checkbox"/>	b) true/false	X	e) other (specify):
<input type="checkbox"/>	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.

Homework Assignments and Worksheets 16.67% Quizzes 33.33% Exams 50.00%

Does Course Require Social Facilities? No

Attached Files:

<p><b><u>BASIC SKILLS ADVISORIES PAGE</u></b> 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 <b>three</b> major basic skills needed at the beginning of the target course and check off the corresponding basic skills listed at the left.</p> <p>Check the appropriate spaces.</p> <p><input type="checkbox"/> Eligibility for Math 101 is advisory for the target course.</p> <p><input type="checkbox"/> Eligibility for English 126 is advisory for the target course.</p> <p><input type="checkbox"/> Eligibility for English 125 is advisory for the target course.</p> <p><i><u>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.</u></i></p>
---

<b>CONTENT REVIEW</b>	
<b>CHEM 28A ORGANIC CHEMISTRY</b>	
draw a structural formula given the systematical name of an organic compound.	To fully understand the geometry of organic reactions, the students need to be familiar with the three types of hybridization of carbon.
complete the reactions of many aliphatic molecules and write the correct reaction mechanism.	The basic reaction mechanisms need to be recognized instantaneously to explain various organic syntheses.
analyze MS, IR and NMR spectra and determine the structure of an unknown compound.	To analyze complex unknown organic compounds knowledge of M.S., I.R. and NMR Spectra is needed.

<b>REQUISITES</b>	
<b>Subject Prerequisite -- CHEM 28A ORGANIC CHEMISTRY</b>	
<ul style="list-style-type: none"> <li>analyze the structural formula of an organic compound, recognize its functional groups and name it properly.</li> <li>draw a structural formula given the systematical name of an organic compound.</li> <li>complete the reactions of many aliphatic molecules and write the correct reaction mechanism.</li> </ul>	<ul style="list-style-type: none"> <li>learn how to predict the products of reactions of aromatic compounds.</li> <li>gain an understanding how to write the reaction mechanism of an electrophilic aromatic substitution using Lewis structures and curved arrow notation.</li> <li>learn how to predict the products of reactions involving the carbonyl functional group such as aldehydes, ketones, carboxylic acids and their derivatives.</li> </ul>

**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:  
CSU Fresno CHEM 128B CHEM 128A Cal Poly SLO CHEM 316 CHEM 317 UC Berkeley CHEM 112B CHEM 112A